Soil Survey of Beaver and Lawrence Counties, Pennsylvania

United States Department of Agriculture, Soil Conservation Service
in cooperation with

The Pennsylvania State University, College of Agriculture, and the
Pennsylvania Department of Environmental Resources, State Conservation Commission

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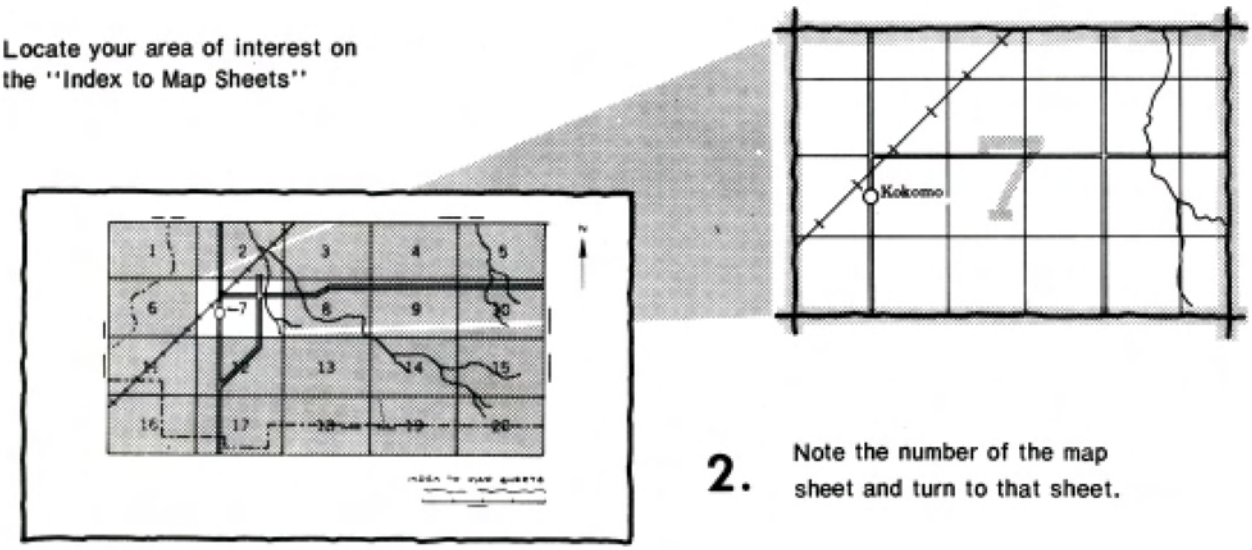

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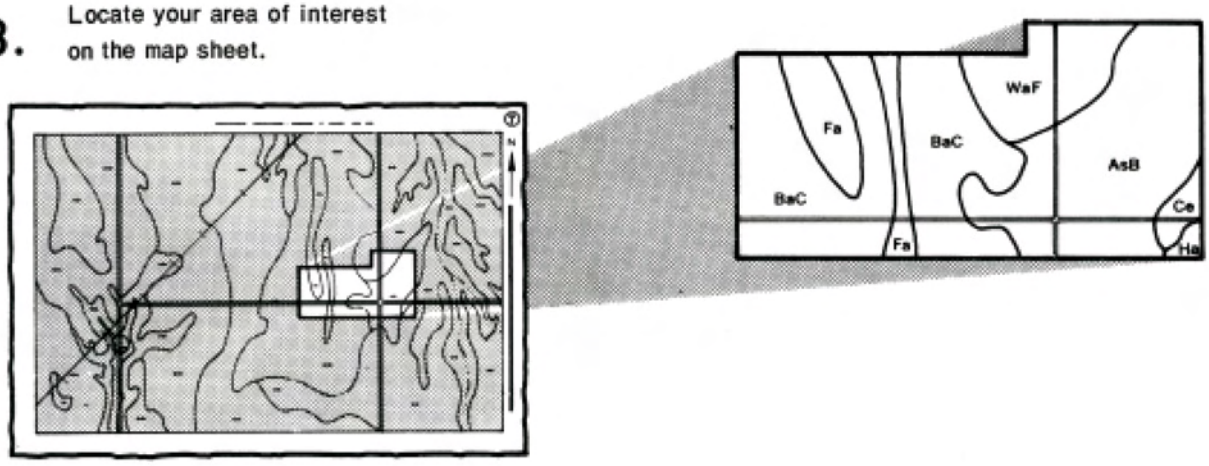

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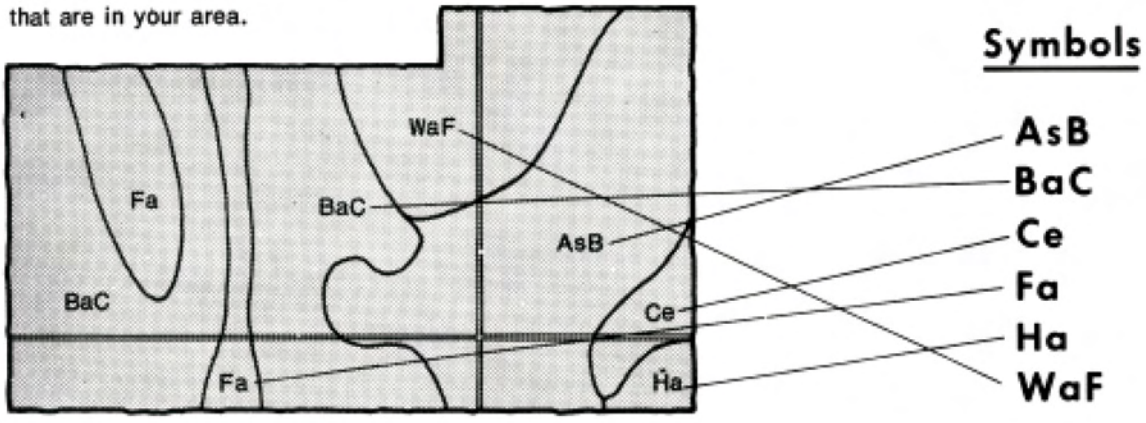

THIS SOIL SURVEY

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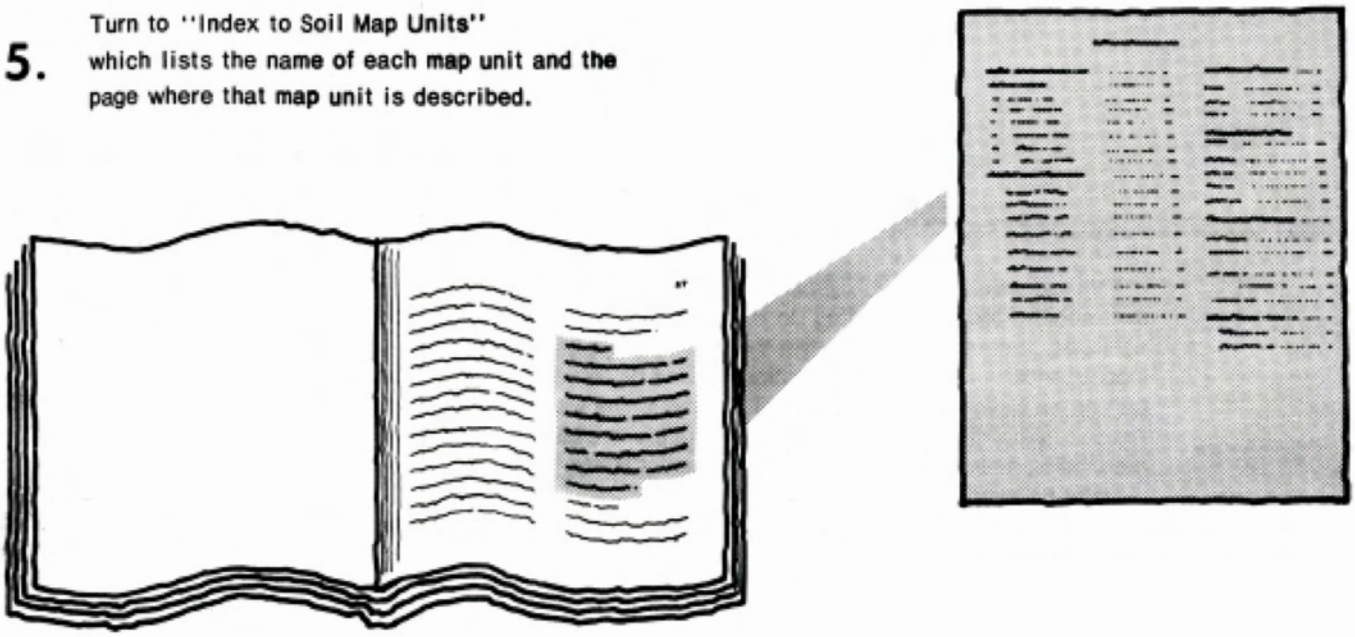

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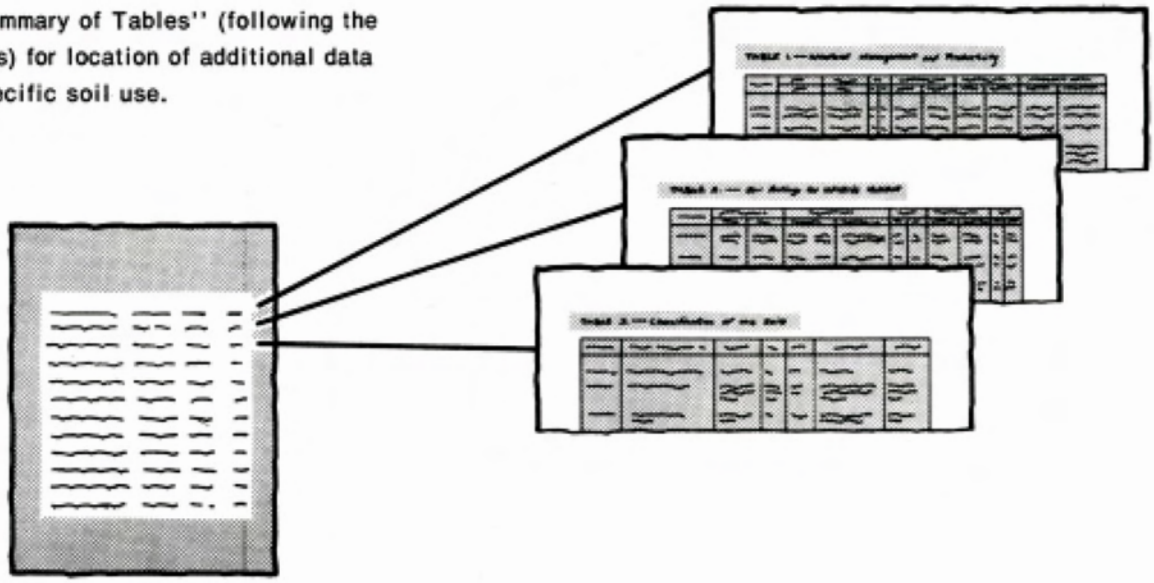

7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists,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

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

Major fieldwork for this soil survey was performed in the period 1967-77. Soil names and descriptions were approved in 1978. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and The Pennsylvania State University, College of Agriculture, and the Pennsylvania Department of Environmental Resources, State Conservation Commission. Financial assistance was provided by the Beaver County Commissioners, Lawrence County Commissioners, Beaver County Planning Commission, Lawrence County Planning Commission, and by the Department of Housing and Urban Development, under provisions of Section 701 of the Housing Act of 1954 as amended. It is part of the technical assistance furnished to the Beaver County Conservation District and the Lawrence County Conservation District.

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

Cover: Contour stripcropping controls erosion and runoff on Ravenna silt loam, 3 to 8 percent slopes, in the foreground and on Canfield silt loam, 3 to 8 percent slopes, in the background.

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Foreword

It is my pleasure to present the soil survey of Beaver and Lawrence Counties, Pennsylvania. This survey contains information that can be used in land planning programs. It contains predictions of soil behavior for selected land uses. It also highlights limitations and hazards to land uses that are inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey has been prepared for many different uses. Community planners, community decisionmakers, engineers, developers, builders, and home buyers can use it to plan land use, select sites for construction, pinpoint areas where potential soil problems are likely to occur, develop soil resources, and identify special practices needed to insure proper land use.

Farmers and woodland owners can use the survey to estimate crop potential, evaluate the management needed for forage production, and determine land improvement practices. Landscape architects and gardeners can use it to determine the potential of soil for shrubs, ornamentals, shade trees, lawn grasses, flowers, and vegetable gardens. Conservationists, teachers, students, and specialists in recreation wildlife management, waste disposal, and pollution control can use the survey to help them understand and enhance the environment.

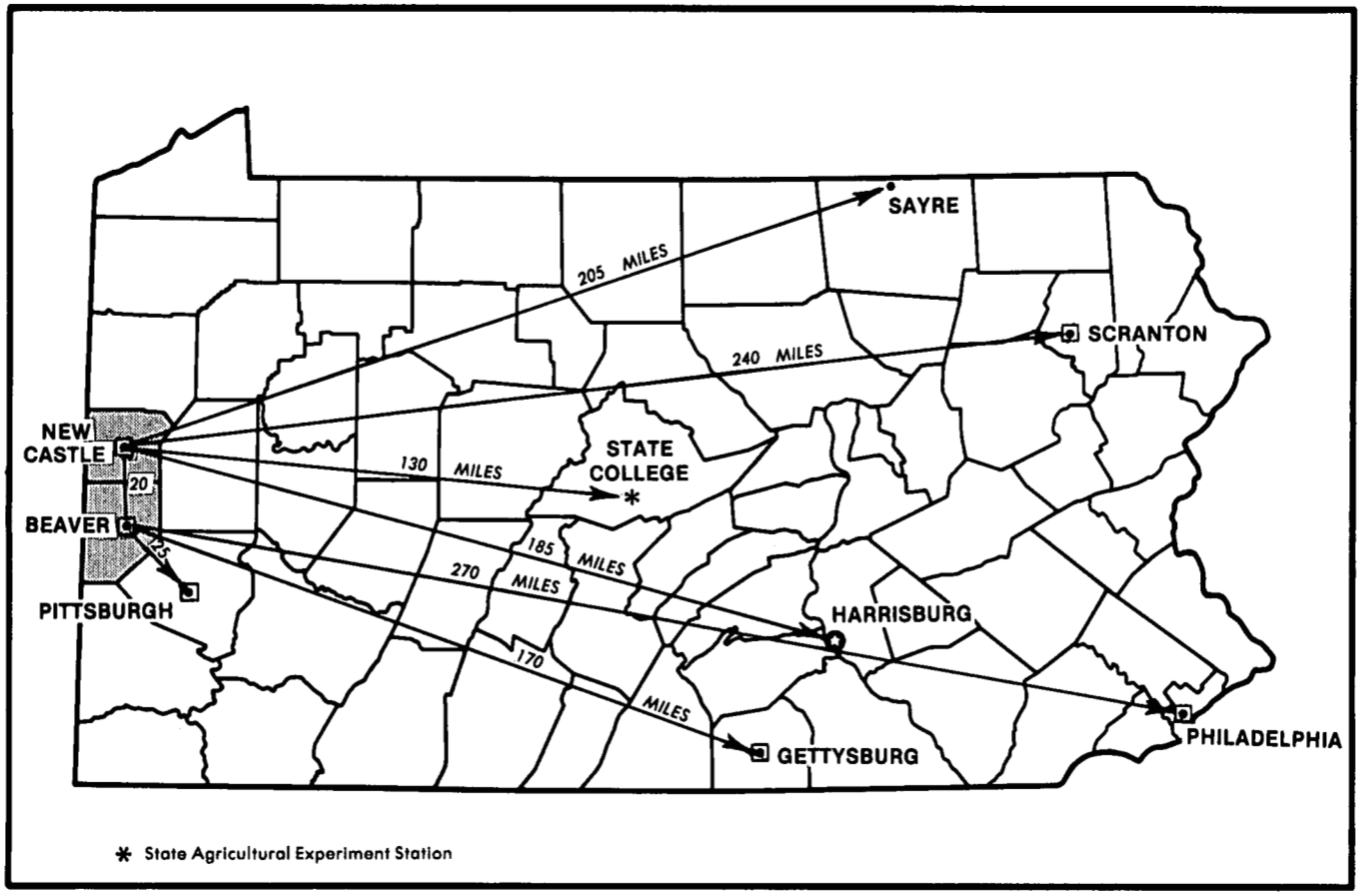
Great differences in soil properties can occur within very short distances. Some soils are continually or seasonally wet. Some are subject to flooding. Other soils may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. A high water table makes a soil poorly suited to basements or underground installations.

This survey consists of two parts. The first part has descriptions, potentials, hazards, and limitations of each soil in Lawrence and Beaver Counties. The second part has detailed maps showing the soils on every acre in these counties. Additional information and assistance can be obtained at your local office of the Soil Conservation Service or the Cooperative Extension Service.

I believe that using the information in this soil survey will help you to have a better environment and a better life. Using this information will greatly assist all of us in the conservation, development, and productive use of our soil, water, and related resources.

Graham T. Munkittrick

Graham T. Munkittrick
State Conservationist
Soil Conservation Service



Location of Beaver and Lawrence Counties in Pennsylvania.

Soil Survey of Beaver and Lawrence Counties, Pennsylvania

United States Department of Agriculture, Soil Conservation Service
in cooperation with
The Pennsylvania State University, College of Agriculture, and the
Pennsylvania Department of Environmental Resources, State Conservation Commission

By Robert V. Smith, Soil Conservation Service

Fieldwork by William L. Braker, Ned B. Ellenberger, John W. Greenawalt, Robert G. Grubb, Joseph S. Hallowich, Raymond L. Newbury, Robert V. Smith, and Barrie L. Wolf, Soil Conservation Service

BEAVER AND LAWRENCE COUNTIES are centrally located along the western border of Pennsylvania. They are bounded on the north by Mercer County, on the east by Butler and Allegheny Counties, on the south by Washington and Allegheny Counties, and on the west by Mahoning and Columbiana Counties, Ohio, and Hancock County, West Virginia.

The survey area consists of all of Beaver and Lawrence Counties. It is 520,960 acres, or 814 square miles. Beaver County, the southern part, makes up 55 percent of the survey area. The 45 percent in the northern part of the survey area is Lawrence County.

Most of Lawrence County and the northwest corner of Beaver County consist of undulating and rolling uplands, many poorly drained lowlands, rounded hills, and some steep ridges near the major streams. The southeast corner of Lawrence County and most of Beaver County are dominantly rolling and hilly uplands and many narrow, steep-sided valleys. Here, the level and undulating areas are mainly on the broad ridgetops and in river valleys.

Approximately 44 percent of the land area in Beaver and Lawrence Counties is woodland, 34 percent is farmland, ar.d 22 percent is used for urban housing, industry, commerce, mining, and community serving purposes (*4, 5*).

General nature of the survey area

In 1681, William Penn received the royal charter of "Penn's Woods" from King Charles II of England. At that time the area that is now Beaver and Lawrence Counties was part of the hunting grounds of the Iroquois Indians. The headquarters of the Iroquois Nation consisted of the Indian villages grouped about the present sites of New Castle, Mahoningtown, Edinburg, and West Pittsburgh (*6*).

At the time of the invasion of the French and the establishment of Fort Duquesne at the site of what is now Pittsburgh, the Iroquois were replaced by the Delaware Indians. Fort Duquesne was later controlled by the English and renamed Fort Pitt. Missionaries, trappers, hunters, and explorers moved into the area. Small trading posts developed along the shores of the Ohio and Beaver Rivers. There was little settlement, however, until after the late 1700's.

In 1784, the area was purchased from the Indians. A year later it was set aside to be subdivided into tracts known as "donation" lands to be given to Revolutionary War veterans for their services.

Most of the permanent settlement did not begin until 1793. By 1800, settlements had developed along the rivers and major streams. Steady growth occurred in the area thereafter. The largest early settlements are now known as New Castle, Rochester, New Brighton, and Beaver.

In 1800, Beaver and Mercer Counties were formed from parts of Allegheny and Washington Counties. In 1849, Lawrence County was created from parts of Beaver and Mercer Counties, thus forming the counties as they are today.

In 1970, according to the U.S. Bureau of the Census, the population of Beaver County was 208,418 and that of Lawrence County was 107,374. The total population of the survey area was 315,792. The population of Beaver County is about 77 percent urban, and that of Lawrence County is about 53 percent urban. Between 1960 and 1970, the population of Beaver County in-

creased less than 1 percent and the population of Lawrence County decreased by 5 percent. Most of this loss occurred as people moved out of the county from the New Castle area.

Industry

Early industry developed rapidly in Beaver and Lawrence Counties. The transportation of necessities from the east was expensive and irregular. The forests provided fuel, lumber, tannin, and charcoal. Natural deposits of coal, limestone, iron ore, clay, and sand were available as raw materials. The soils were suitable for wheat, corn, rye, flax, and grass. Livestock provided food, leather, and wool. The rivers and large streams produced power to operate the mills and provided the means of transporting products between the growing communities. Products were shipped up the Ohio River to the rapidly developing town of Pittsburgh.

The earliest industries were flour mills, sawmills, iron works, textile mills, tanneries, and ceramic works. The first flour mills were operating after 1790. The iron industry had its beginnings in the early 1800's at what are now New Castle and Beaver Falls.

Since its early development, industry has remained concentrated in the Ohio and Beaver River valley areas.

Today, Beaver County ranks among the top 15 counties in Pennsylvania in industry (*4*). Lawrence County ranks twenty-ninth (*5*). The survey area makes up an integral part of the greater Pittsburgh metropolitan area, internationally known as the steel center of the world.

The major metal industry is dominant. It includes blast furnaces, coke ovens, steel works, and rolling mills. The fabricated metal products industry is second in importance, and machinery is third. Other industries produce stone, clay, glass, concrete, food, lumber, leather, and chemical products.

Mineral resources

Bruce A. Benton, geologist, Soil Conservation Service, helped prepare this section.

The economy of the survey area has been greatly influenced by the mineral industry. Coal, limestone, clay, gas, crude oil, sand, and gravel are the dominant minerals extracted at the present time.

Most of the area is underlain by bituminous coal that has been deep mined. Now most of the coal in the area is extracted by strip mining. The principal productive veins are the Lower Freeport, Middle Kittanning, Lower Kittanning, and Brookville coalbeds.

Lawrence County is one of the most important limestone producing areas in Pennsylvania. Vanport Limestone is the most abundant limestone in the area. It is also the most extensively worked because of its uniformity, thickness, and ease with which it can be mined. Shallow outcrops were obtained in the past, but the more recent stripping requires the removal of as much as 80 feet of overburden. The limestone is mined largely in the Bessemer, Hillsville, and New Castle areas. It is used mainly in the production of cement. It is also used as agricultural lime, white lime, and crushed stone.

Clay, interbedded with shale and limestone, underlies most coalbeds. Clay and shale are used in making face and paving brick, tile, pottery, chinaware, and sanitary ware and in lining ladles and furnaces for use in steel mills.

Sand and gravel are obtained mainly from glacial outwash deposits, such as kames, kame terraces, and eskers. Terraces in the Ohio and Beaver River Valleys are also a source. Screening and washing is usually required. Sand and gravel are used in the ready-mix concrete industry for road building and as fill material.

Oil and gas were discovered in the area in 1864. Production peaked between 1920 and 1930, but most activity ceased by 1950. Scattered producing wells still occur throughout the survey area, dominantly in the southern part. In 1975, Beaver County ranked 15th among the 18 crude petroleum producing counties in Pennsylvania.

Sandstone for use as a construction material is available throughout the survey area. In past years, some was obtained for curbstone and building stone. At the present time, very little sandstone is quarried.

Buhrstone iron ore occurs directly above the Vanport Limestone. It was strip mined prior to 1890 and was used in local iron furnaces. Most of the ore, limonite, is not of commercial value today.

Physiography and geology

Bruce A. Benton, geologist, Soil Conservation Service, helped prepare this section.

About 300 million years ago, layers of sandy, silty, clayey, and limy sediment were laid down on this part of the continent in freshwater inland seas. Organic material accumulated during various stages of this deposition. The area was subsequently raised from sea level to or above its present elevation. The extreme pressure created during this uplifting, the weight of overlying sediment, and a long period of time consolidated these layers into sandstone, siltstone, shale, limestone, and coal. This area became what is known as the Allegheny Plateau in Pennsylvania.

Millions of years of additional minor uplifting and subsiding, geologic erosion, and stream cutting changed the nearly level surface of the plateau to highly dissected, rolling, and hilly relief. The survey area is part of this old plateau.

The southeast corner of Lawrence County and all of Beaver County except the northwestern part have the characteristic uneven topography. This part of the survey area has many narrow, steep-walled valleys. The ridgetops range from broad to very narrow and are undulating to rolling. The Ohio and Beaver Rivers have carved deep, broad valleys through the area.

Approximately 75,000 to 23,000 years ago, the northwestern part of Beaver County and all of Lawrence County except the southeast corner were covered by several major glaciers. These glaciers modified the surface features.

As the glaciers moved southward, they scoured and smoothed the hilltops and filled the many valleys. Vast quantities of clay, siltstone, sand, gravel, cobblestones, and boulders were pushed ahead of the glaciers or were incorporated into the advancing ice. Part of the material, trapped and overridden by the ice, became compacted till. The dominant soils are in the Ravenna-Canfield-Frenchtown, Canfield-Ravenna-Loudonville, and Udorthents-Canfield-Ravenna associations. See section "General soil map for broad land use planning." As the glaciers retreated or melted, water carried more material from the ice front and deposited it in layers or pockets of sorted material, known as outwash. The dominant soils are in the Conotton-Chili-Holly association. Sandy and gravelly outwash was deposited in the valleys and along valley walls. Silt and clay were deposited in glacial lakes. Soils in the Canadice-Frenchtown-Holly association formed in these areas.

The relief in the northern part of the survey area is smooth to hummocky with many low rounded hills and long ridges (fig. I). Scattered poorly drained depressions are typical throughout the area. The major stream valleys are smooth or undulating with many steep-sided ridges. The area is coated with glacial till, sandy and gravelly outwash, and clayey lacustrine material. These glacial deposits range in thickness from a thin mantle to more than 100 feet.

The bedrock underlying Beaver and Lawrence Counties is divided into four major groups based on the age of the rocks—the Pocono, Pottsville, Allegheny, and Conemaugh Groups. The rocks that make up these groups are in nearly level strata that dip slightly toward the southeast (*8*).

The oldest and least extensive rocks in the survey area are in the Pocono Group, which formed during the Mississippian period, 310 to 350 million years ago. They are massive, hard, gray sandstone and conglomerate exposed in the steep side slopes of the upper Shenango and Mahoning River Valleys. In glaciated areas, soils of the Conotton-Chili-Holly association are dominant.

The Pottsville and Allegheny Groups and the Conemaugh Formation formed during the Pennsylvanian period, 280 to 310 million years ago. The Pottsville Group is the oldest of this period. It underlies glacial

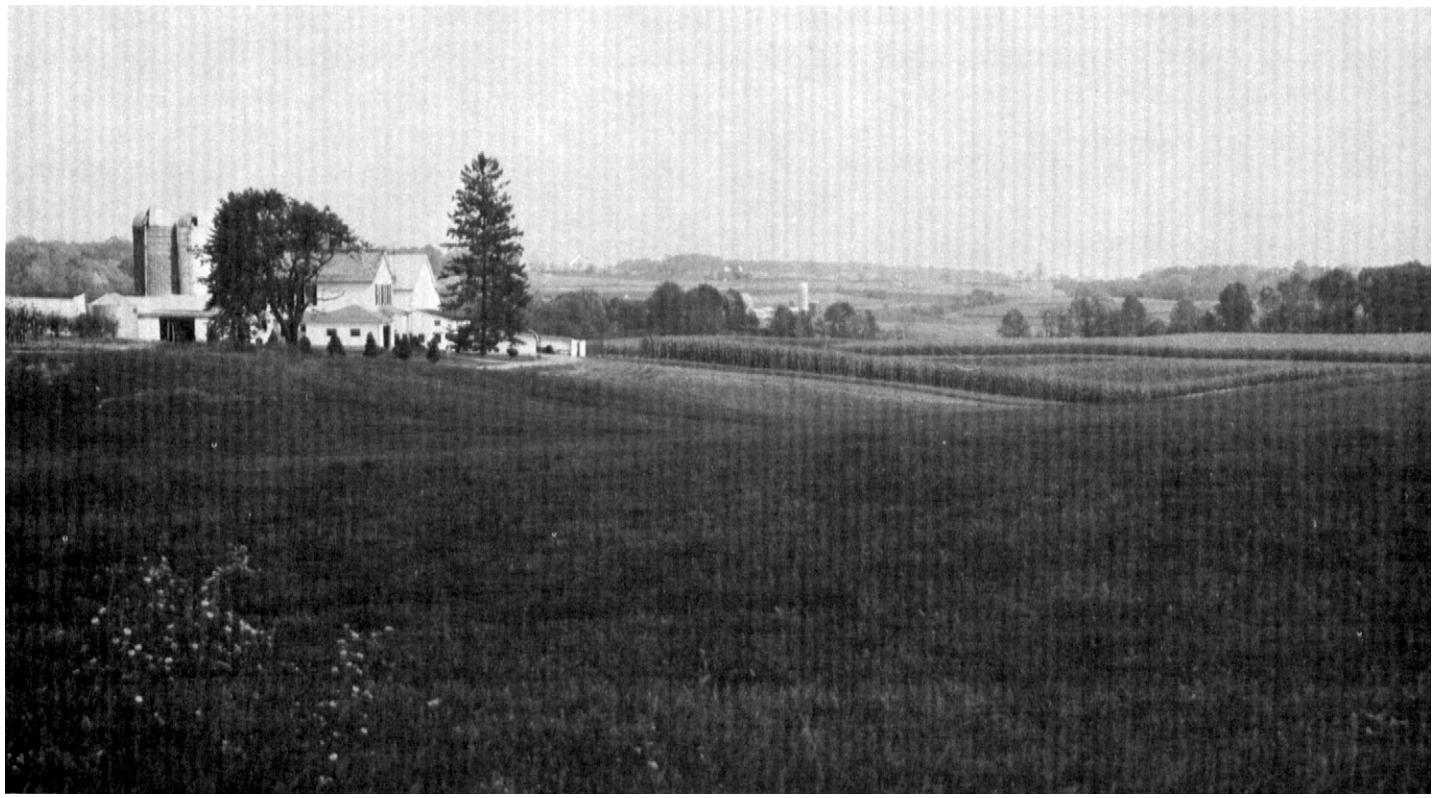


Figure 1.—Typical landscape in the glaciated part of Lawrence County. Canfield and Ravenna soils are dominant. Sloping Conotton soils are near the buildings.

deposits at the northwest corner, throughout the Neshannock Valley, in the lower Chenango and Mahoning Valleys, and in the upper Beaver River Valley. It is exposed in the steep valley walls along Slippery Rock Creek (fig. 2) and the lower Beaver River. The Pottsville Group consists predominantly of sandstone and conglomerate interbedded with thin strata of shale, siltstone, and coal. Soils of the Conotton-Chili-Holly association in glaciated areas and the Urban land-Monongahela-Tyler association in residual areas are dominant.

The Allegheny Group is extensive. It underlies most of Lawrence County and the northern part of Beaver County. It is also exposed in the Ohio River Valley. It consists of cyclic sequences of sandstone, siltstone, shale, limestone, and coal. Most of the commercially available coal and limestone is in this group. Soils of the Conotton-Chili-Holly and Urban land-Monongahela-Tyler associations are dominant.

The youngest rocks are in the Conemaugh Formation, which is at the surface throughout most of the southern third of the survey area. This formation consists of recurring sequences of red and gray shale and siltstone and

Figure 2.—Slippery Rock Creek Gorge in McConnell's Mill State Park. Weikert-Rock outcrop complex, 25 to 80 percent slopes is dominant.

thin strata of limestone and coal. Massive sandstone is at the base. The major soils in these areas are in the Gilpin-Wharton-Weikert, Gilpin-Upshur-Weikert, and Gilpin-Guernsey-Culleoka associations.

Most of the soils in the northern part of the survey area formed in the glacial deposits overlying bedrock. Many physical and chemical properties of the soils were inherited from this glacial material. The soils throughout the rest of the survey area formed dominantly in material weathered from bedrock. These soils have many properties derived from the parent rock.

Climate

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

Winters are cold and snowy at high elevations in Beaver and Lawrence Counties. In valleys it is also frequently cold, but intermittent thaws preclude a long-lasting snow cover. Summers are fairly warm on mountain slopes and very warm with occasional very hot days in the valleys. Rainfall is evenly distributed throughout the year, but it is appreciably heavier on the windward, west-facing slopes than in the valleys. Normal annual precipitation is adequate for all crops, although summer temperature and growing season length, particularly at higher elevations, may be inadequate.

Table 1 gives data on temperature and precipitation for the survey area as recorded at New Castle in the period 1951 to 1977. 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 30 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at New Castle on January 29, 1963, is -23 degrees. In summer the average temperature is 70 degrees, and the average daily maximum temperature is 80 degrees. The highest recorded temperature, which occurred at New Castle on September 2, 1953, is 100 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 (40 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 38 inches. Of this, 22 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 3.70 inches at New Castle on October 16, 1954. Thunderstorms occur on about 36 days each year, and most occur in summer. Heavy rains, which occur at any time of the year, and severe thunderstorms in summer sometimes cause flash flooding, particularly in narrow valleys.

Average seasonal snowfall is 38 inches. The greatest snow depth at any one time during the period of record was 19 inches. On an average of 24 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in winter.

How this survey was made

Soil scientists made this survey to learn what soils are in the survey area, where they are, and how they can be used. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and the kinds of rock. They dug many holes to study soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material, which has been changed very little by leaching or by plant roots.

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs.

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of some soils are taken for laboratory measurements and for engineering tests. All soils are field tested to determine their characteristics. Interpretations of those characteristics may be modified during the survey. Data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined management are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it can be used by farmers, woodland managers, engineers, planners, developers and builders, home buyers, and others.

General soil map for broad land use planning

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

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

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

The general soil map at the back of this publication does not match the general soil maps of adjacent counties. Differences in the maps have resulted from the differences in soil patterns, recent advances in soil classification, and legend design.

Descriptions of map units

Dominantly deep soils formed in glacial material

The five associations in this group make up about 44 percent of the total land area of Beaver and Lawrence Counties. These associations are in the northwestern part of Beaver County and throughout all but the southeast corner of Lawrence County. The soils formed mainly in glacial till and outwash and in alluvium derived from those materials. In a few areas they formed in glacial lake sediment. The soils are dominantly nearly level to moderately steep.

The largest farming areas in the survey area are in these associations. Many ridges and lowlands are wooded or idle. The city of New Castle and surrounding urban areas in Lawrence County are in these associations.

The potential is good to poor for farmland. It is good to fair for woodland and for wildlife habitat. It is good to poor for nonfarm uses. The major limitations are seasonal wetness, rapid or slow permeability, flooding, low available water capacity, and slope.

1. Ravenna-Canfield-Frenchtown association

Nearly level to moderately steep, deep, moderately well drained to poorly drained soils; formed in glacial till

This association occupies smooth to rolling uplands and associated depressions and drainageways in Lawrence County (fig. 3).

This association makes up about 14 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Ravenna soils, 25 percent Canfield soils, 10 percent Frenchtown soils, and about 25 percent soils of minor extent.

Ravenna soils are somewhat poorly drained. They have a fragipan and, for long periods during wet seasons, a high water table. They are dominantly nearly level and gently sloping.

Canfield soils are moderately well drained. They have a fragipan and, during wet seasons, a high water table. They are gently sloping to moderately steep.

Frenchtown soils are poorly drained. They have a fragipan and during much of the year, a high water table. In wet seasons and after intensive rainfall, depressions and minor drainageways are ponded. Frenchtown soils are nearly level and gently sloping.

Soils of minor extent in depressions are the poorly drained Canadice soils. The poorly drained Holly soils and the very poorly drained Sloan soils are on flood plains. Soils on uplands are the well drained Wooster, Chili, and Conotton soils. Urban land occupies large areas in the vicinity of New Castle. A few scattered areas of Udorthents are at sites of coal strip mining.

Most areas of this association are farmed. Beef and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Artificial drainage is usually needed. Some previously farmed land is idle and is reverting to brushland and woodland. Many ridges and poorly drained areas are wooded. Urban development is rapidly increasing in the vicinity of New Castle and other population centers and along major roads.

The potential is fair to good for farmland. It is good for woodland and for wildlife habitat. It is fair to poor for most nonfarm uses. The major limitations are seasonal wetness, slow permeability, and slope.

2. Canfield-Ravenna-Loudonville association

Nearly level to very steep, moderately deep and deep, well drained to somewhat poorly drained soils; formed in glacial till

This association occupies smooth to hilly uplands and associated drainageways (fig. 4). It is in the northwestern part of Beaver County and in areas throughout Lawrence County.

This association makes up about 12 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Canfield soils, 25 percent Ravenna soils, 15 percent Loudonville soils, and about 20 percent soils of minor extent.

Canfield soils are moderately well drained. They have a fragipan and, during wet seasons, a high water table. They are gently sloping to moderately steep.

Ravenna soils are somewhat poorly drained. They have a fragipan and, for long periods during wet seasons, a high water table. They are nearly level to sloping.

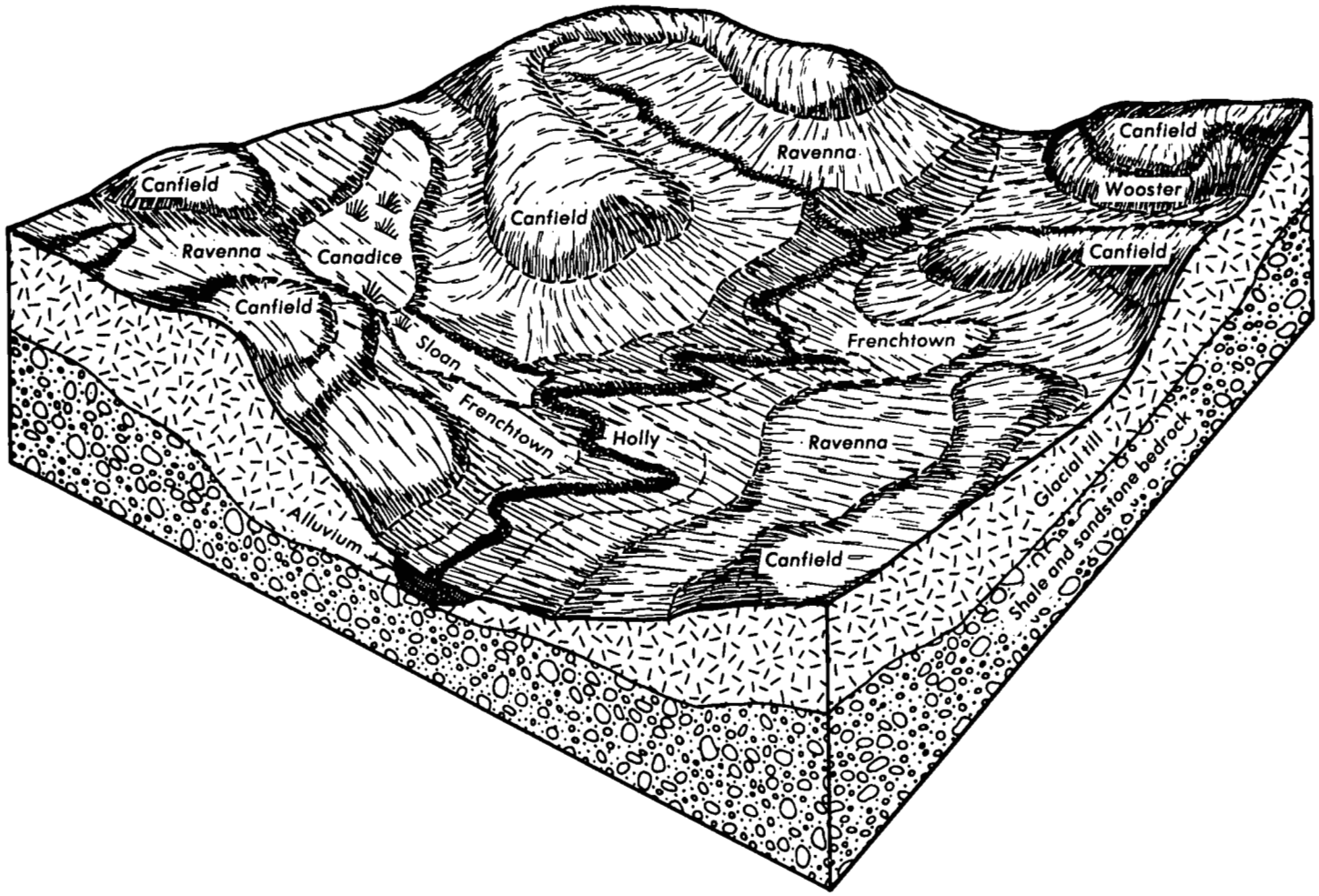


Figure 3.—Pattern of soils and parent material in Ravenna-Canfield-Frenchtown association.

Loudonville soils are moderately deep and well drained. They are 20 to 40 inches thick over bedrock. They are gently sloping to very steep.

Soils of minor extent on uplands are the deep, well drained Wooster and Chili soils, the well drained and somewhat excessively drained Conotton soils, and the moderately well drained Braceville soils. The poorly drained Frenchtown soils are in depressions. The well drained Chagrin soils, the moderately well drained Lobdell soils, and the poorly drained Holly soils are on flood plains. Urban land occupies a few large areas in the vicinity of New Castle. Udorthents are sparsely scattered throughout the association at sites of coal strip mining.

Most areas of this association are farmed. Beef, grain, and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Artificial drainage is commonly needed in the wetter soils. Some previously farmed areas are idle and are reverting to brushland and woodland. Some ridges, steep hillsides, and low wet areas are wooded. In the vicinity of New Castle, New Wilmington, and Mount Jackson and along the major roads, urban development is rapidily increasing.

The potential is good for farmland, woodland, and wildlife habitat. It is fair to poor for most nonfarm uses. The major limitations are seasonal wetness, slow permeability, depth to bedrock, and slope.

3. Conotton-Chili-Holly association

Nearly level to very steep, deep, somewhat excessively drained, well drained, and poorly drained soils; formed in glacial outwash and alluvium

This association occupies undulating to hilly uplands and adjacent flood plains. It occurs along North Fork Little Beaver Creek in Beaver County and as scattered

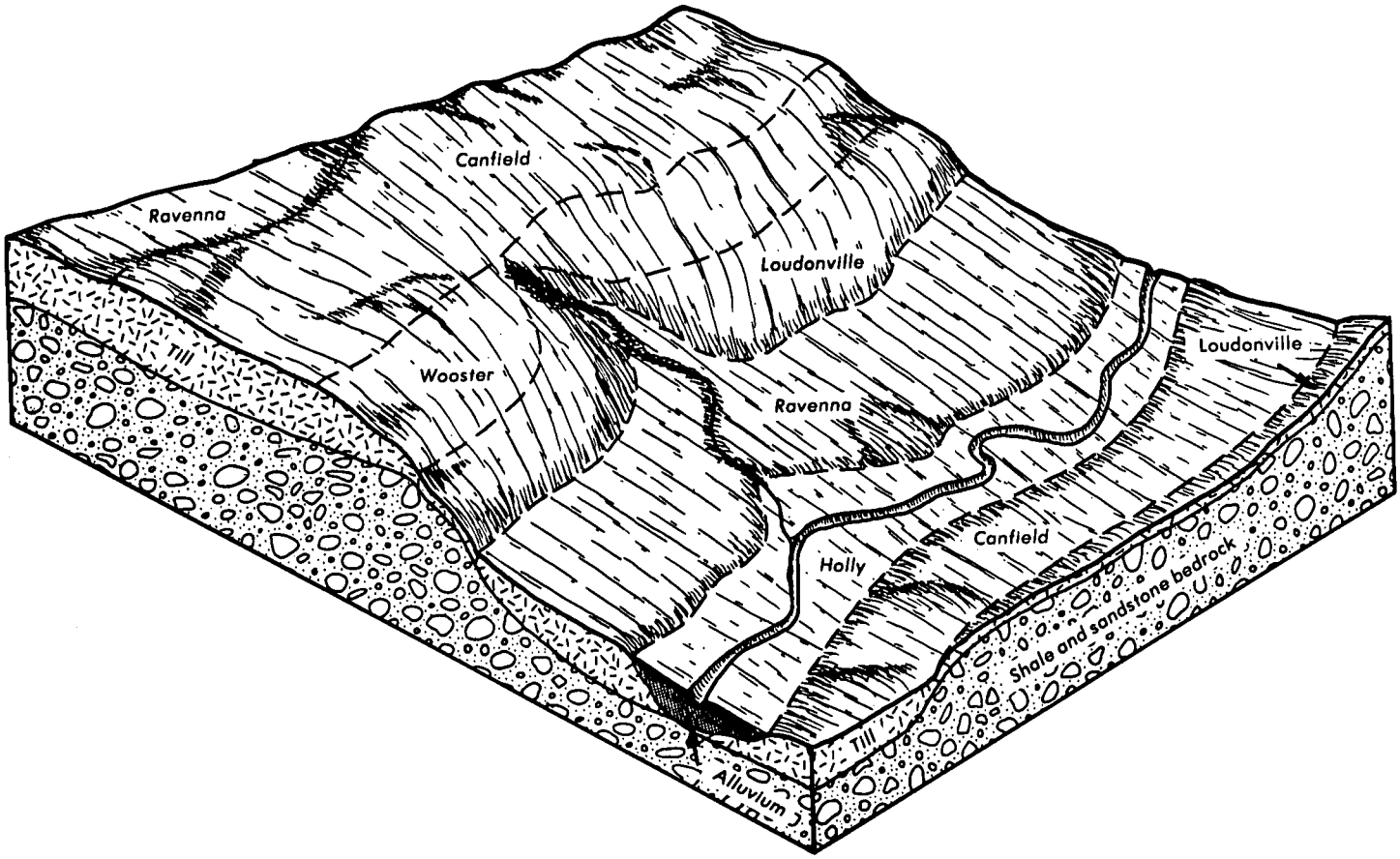


Figure 4.—Pattern of soils and parent material in Canfield-Ravenna-Loudonville association.

areas throughout Lawrence County. The major areas in Lawrence County are along the Beaver, Mahoning, and Shenango Rivers and Neshannock and Slippery Rock Creeks.

This association makes up about 10 percent of the total land area of Beaver and Lawrence Counties. It is about 25 percent Conotton soils, 10 percent Chili soils, 5 percent Holly soils, and about 60 percent soils of minor extent.

Conotton soils are on outwash plains, kames, eskers, and terraces. They are deep and well drained and somewhat excessively drained. They are sandy and gravelly and are droughty during dry periods. They are dominantly gently sloping to very steep.

Chili soils are on outwash plains, kames, and terraces. They are deep and well drained. They are underlain by sand and gravel. They are gently sloping and sloping.

Holly soils are on flood plains. They are poorly drained, are frequently flooded, and have a high water table during much of the year. They are nearly level.

Soils of minor extent on uplands are the well drained Wooster and Loudonville soils, the moderately well drained Braceville and Canfield soils, and the somewhat poorly drained Ravenna soils. The poorly drained Frenchtown soils are in depressions. The very poorly drained Sloan soils are on flood plains. A few extensive areas of the well drained Chagrin and moderately well drained Lobdell soils are on flood plains along the Beaver, Shenango, and Mahoning Rivers. The well drained Gilpin and Weikert soils are on a few scattered hillsides. Arents, in areas of cut and fill, and Urban land occupy large areas in the vicinity of New Castle. Dumps occur along the Beaver River. Sand and gravel pits are sparsely scattered throughout the association.

Many areas of this association are farmed. Beef and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Yields on Conotton soils are reduced in dry years because of low available water. Some previously farmed areas of the association are idle and are reverting to brushland and woodland. Many ridges, steep hillsides, and low wet areas are wooded. The association is a potential source of sand and gravel. Urban development is increasing in

the vicinity of New Castle, West Pittsburgh, Wampum, Chewton, Edinburg, and other small towns.

The potential is fair to good for farmland. It is good for woodland and for wildlife habitat. It is good to poor for most nonfarm uses. The major limitations are slope, low available water capacity, rapid permeability, flooding, and seasonal wetness.

4. Canadice-Frenchtown-Holly association

Nearly level and gently sloping, deep, poorly drained soils; formed in glacial lake sediment, glacial till, and alluvium

This association occupies smooth lowlands and hummocky areas along minor drainageways. It occurs in one area in the northwest corner of Beaver County and one area in the northeastern part of Lawrence County.

This association makes up about 1 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Canadice soils, 10 percent Frenchtown soils, 10 percent Holly soils, and about 40 percent soils of minor extent.

Canadice soils are poorly drained. They have a clayey subsoil and a high water table most of the year. Surface drainage is slow. Ponding and minor flooding are common in wet seasons and following periods of heavy rainfall. These soils are nearly level.

Frenchtown soils are poorly drained. They have a fragipan and, during much of the year, a high water table. Surface drainage is slow. In wet seasons and following periods of intensive rainfall, ponding occurs in depressions. These soils are nearly level or gently sloping.

Holly soils are poorly drained and are on flood plains. They have a high water table during much of the year and are frequently flooded. They are nearly level.

Soils of minor extent are the very poorly drained, frequently flooded Sloan soils, the somewhat poorly drained Ravenna soils, and the somewhat poorly drained and poorly drained Rexford soils. Small, scattered mounds and ridges of Conotton, Braceville, and Canfield soils are also included.

Most areas of this association are woodland, brushland, and marshland. A few areas of cropland and pasture are throughout the association. Some areas of Frenchtown, Ravenna, Rexford, and Holly soils can be farmed if they are drained.

The potential is poor for farmland. It is fair for woodland and for wildlife habitat. It is poor for most nonfarm uses. The major limitations are wetness, slow permeability, and frequent flooding.

5. Udorthents-Canfield-Ravenna association

Nearly level to very steep, deep, excessively drained to somewhat poorly drained soils; formed in material from strip mines and in glacial till

This association occupies hummocky and hilly areas and smooth to rolling uplands and associated drainageways. It occurs in the northwestern part of Beaver County and as scattered areas throughout Lawrence County.

This association makes up about 7 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Udorthents, 20 percent Canfield soils, 15 percent Ravenna soils, and about 25 percent soils of minor extent.

Udorthents are moderately well drained to excessively drained. They formed in a mixture of soil material and bedrock during strip mining of coal and limestone. They are nearly level to very steep.

Canfield soils are moderately well drained. They have a fragipan and, during wet seasons, a high water table. They are gently sloping to moderately steep.

Ravenna soils are somewhat poorly drained. They have a fragipan and, for long periods during wet seasons, a high water table. They are nearly level to sloping.

The soils of minor extent on uplands are the deep, well drained Wooster soils, the moderately deep, well drained Gilpin and Loudonville soils, and the shallow, well drained Weikert soils. The poorly drained Frenchtown soils are in depressions. The poorly drained Holly soils are on flood plains. A few small, scattered areas of Hazleton, Wharton, Cavode, Ernest, and Tilsit soils are also included. Urban land and Arents occur in the vicinity of Bessemer and West Pittsburgh.

Most areas of this association are idle land interspersed with woodland and farmland. Dairy farming is the major farm enterprise. Corn, small grain, hay, and pasture are the major crops. Artificial drainage is commonly needed on Canfield, Ravenna, and Frenchtown soils. The major part of Udorthents is barren or is sparsely covered with native grasses, briers, and weeds (figs. 5 and 6). A few areas have been planted to trees, mostly conifers.

The potential is fair to poor for farmland. It is fair for woodland and for wildlife habitat. It is poor for most nonfarm uses. The major limitations are slope, seasonal wetness, small stones, slow permeability, and low available water capacity.

Shallow to deep soils formed in dominantly residual material

The five associations in this group make up about 56 percent of the total land area of Beaver and Lawrence Counties. These associations are in the southeast corner of Lawrence County and throughout all but the northwestern part of Beaver County. The soils on uplands formed in material from shale, siltstone, and sandstone bedrock. The soils on flood plains and terraces formed in alluvium derived mainly from those materials. In some areas alluvium that originated in glaciated areas is included. The soils are dominantly gently sloping to very steep.

Most of the hillsides, steep drainageways, and narrow ridges are wooded or are idle. Farmland is in scattered areas on the broad ridgetops. The urban areas in Beaver

Figure 5.—Lake stocked for fishing. It was constructed in an area of Udorthents, strip mine, moderately steep.

County and Ellwood City and Ellport in Lawrence County are in soils of these associations.

The potential is good to poor for farmland. It is good to fair for woodland and for wildlife habitat. It is fair to poor for most nonfarm uses. The major limitations are slope, shallowness over bedrock, seasonal wetness, slow permeability, flooding, clayey soil material, and the hazard of slips and landslides.

6. Urban land-Monongahela-Tyler association

Urban land and nearly level to sloping, deep, moderately well drained and somewhat poorly drained soils; formed in old alluvium

This association occupies smooth to rolling terraces and flood plains and some adjacent uplands. In Beaver County it occurs along the Beaver and Ohio Rivers and Raccoon, Brush, and Connoquenessing Creeks and includes most major urban and industrial areas. In Lawrence County it is along the Beaver River and Slippery Rock Creek in the vicinity of Ellwood City and Ellport.

This association makes up about 10 percent of the total land area of Beaver and Lawrence Counties. It is about 20 percent Urban land, 14 percent Monongahela soils, 5 percent Tyler soils, and about 61 percent soils of minor extent.

Urban land is occupied by buildings and structures or is covered by asphalt, concrete, and other impervious surfaces. It is dominantly nearly level to moderately steep.

Monongahela soils are moderately well drained. They have a fragipan and, during wet seasons, a high water table. They are nearly level to sloping.

Tyler soils are somewhat poorly drained. They have a fragipan and, for long periods during wet seasons, a high water table. They are nearly level and gently sloping.

Soils of minor extent are the well drained Allegheny, Conotton, and Chili soils on terraces, the poorly drained Purdy soils in depressions, and the well drained Pope, moderately well drained Philo, and poorly drained Atkins soils on flood plains. Gilpin, Weikert, Upshur, Wharton, Cavode, and Ernest soils are on uplands. Arents, Dumps, and Udorthents are along the Beaver and Ohio Rivers. Arents consist of areas that have been cut, filled, and otherwise disturbed. Dumps are areas of industrial

Figure 6.—Typical area of sparsely vegetated Udorthents, strip mine, gently sloping.

waste. Udorthents formed in material from coal strip mines.

Most of this association is urban or industrial areas interspersed with woodland, cropland, pasture, and idle land. The smaller areas along Raccoon, Brush, and Connoquenessing Creeks are dominantly woodland, idle land, and farmland. Beef and dairy farming are the major farm enterprises. Corn, hay, and pasture are the major crops. Some fruit, vegetables, and nursery plantings are also grown. Many previously farmed areas are idle and are reverting to woodland.

The potential is fair to poor for farmland. It is fair to good for woodland and for wildlife habitat. It is fair to poor for most nonfarm uses. The major limitations are seasonal wetness, slow permeability, and flooding.

7. Gilpin-Wharton-Weikert association

Nearly level to very steep, shallow to deep, well drained and moderately well drained soils; formed in residual material weathered from acid shale, siltstone, and sandstone

This association is on undulating, broad and narrow ridgetops, side slopes, and hillsides of highly dissected uplands (fig. 7). It is in the southeast corner of Lawrence County and occupies a major part of the northern two-thirds of Beaver County.

This association makes up about 24 percent of the total land area of Beaver and Lawrence Counties. It is about 35 percent Gilpin soils, 15 percent Wharton soils, 10 percent Weikert soils, and about 40 percent soils of minor extent.

Gilpin soils are moderately deep and well drained. They are 20 to 40 inches thick over acid shale and siltstone. They are gently sloping to very steep.

Wharton soils are deep and moderately well drained. They have a high water table during wet seasons. They are dominantly nearly level to sloping.

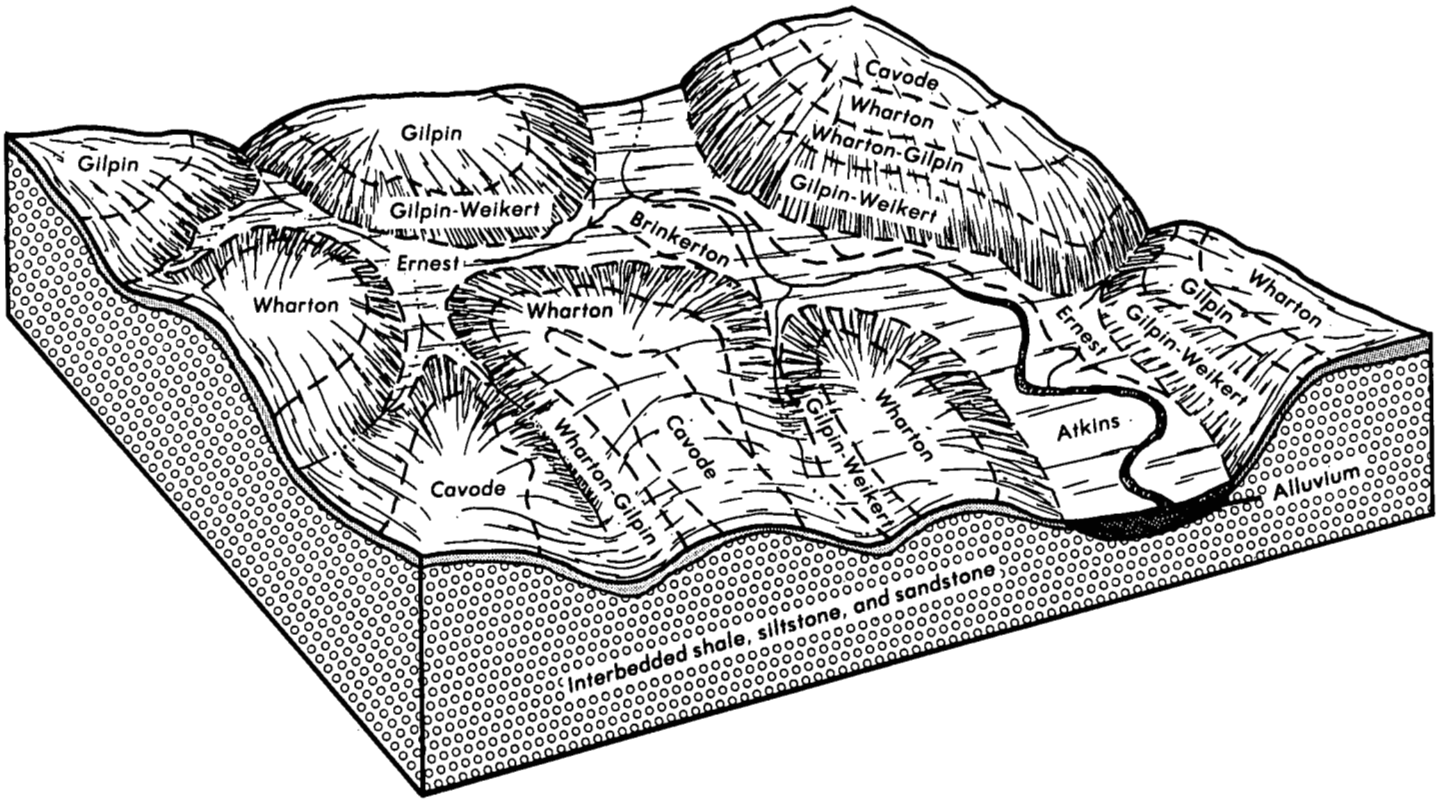


Figure 7.—Pattern of soils and parent material in Gilpin-Wharton-Weikert association.

Weikert soils are shallow and well drained. They are 10 to 20 inches thick over acid shale, siltstone, and sandstone. Areas of these soils are usually intermixed with areas of Gilpin soils. Weikert soils are gently sloping to very steep.

Soils of minor extent on uplands are the deep, somewhat poorly drained Cavode soils; the moderately well drained Tilsit and Ernest soils; and the well drained Clymer soils. The poorly drained Brinkerton soils are in depressions. The moderately well drained Philo soils and the poorly drained Atkins soils are on flood plains. Scattered areas of Hazleton, Culleoka, Guernsey, and Upshur soils are on ridges. Urban land occurs near the Beaver and Ohio Rivers. Udorthents are at sites of strip mining.

Most areas on ridgetops in this association are used for urban and suburban development, farmland, and woodland. Most hillsides and steep drainageways are wooded. Beef, grain, and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Artificial drainage is usually needed in Wharton, Cavode, Tilsit, and Ernest soils. Many previously farmed areas are idle and are reverting to woodland. Many ridgetop areas are undergoing rapid urban development.

The potential is good for farmland, woodland, and wildlife habitat. It is fair to poor for most nonfarm uses. The major limitations are seasonal wetness, slow permeability, depth to bedrock, and slope.

8. Gilpin-Upshur-Weikert association

Gently sloping to very steep, shallow to deep, well drained soils; formed in residual material from acid shale, siltstone, sandstone, and nonacid red shale

This association occupies undulating and rolling ridges and hillsides of dissected uplands (fig. 8). It is in the southern half of Beaver County.

This association makes up about 10 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Gilpin soils, 10 percent Upshur soils, 10 percent Weikert soils, and about 40 percent soils of minor extent.

Gilpin soils are moderately deep and well drained. They are 20 to 40 inches thick over acid shale and siltstone. They are gently sloping to very steep.

Upshur soils are deep and well drained. They have a clayey, reddish subsoil. Slips and landslides are common. These soils occur in areas intermixed with

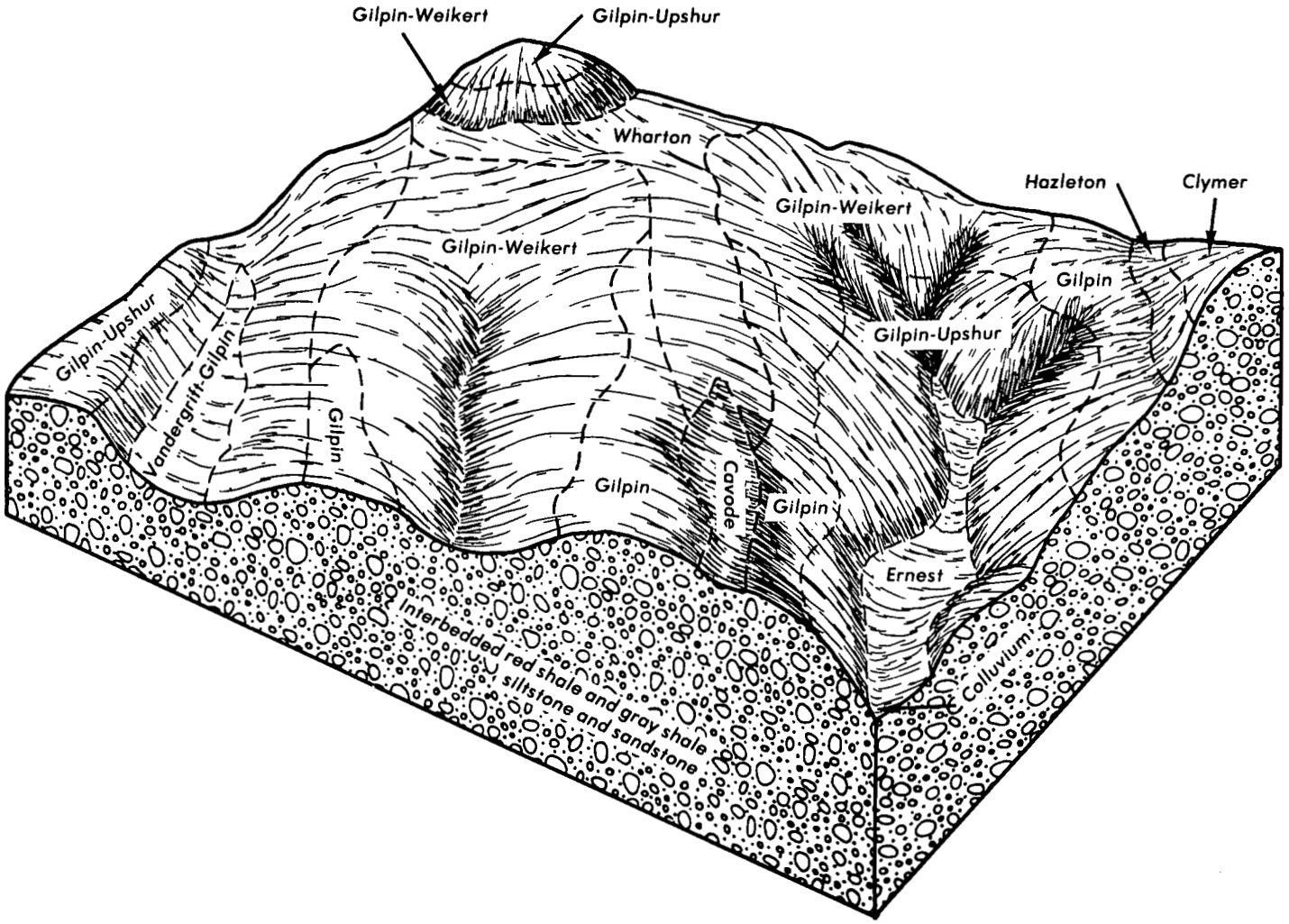


Figure 8.—Pattern of soils and parent material in Gilpin-Upshur-Weikert association.

areas of Gilpin soils. Upshur soils are gently sloping to very steep.

Weikert soils are shallow and well drained. They are 10 to 20 inches thick over acid shale, siltstone, and sandstone. Areas of these soils are usually intermixed with areas of Gilpin soils. Weikert soils are dominantly sloping to very steep.

Soils of minor extent are the well drained Clymer, Hazleton, and Culleoka soils; the moderately well drained Wharton, Tilsit, and Guernsey soils; the somewhat poorly drained Cavode soils; and the moderately well drained and somewhat poorly drained Vandergrift soils. The moderately well drained Philo soils and the poorly drained Atkins soils are on flood plains. Scattered areas of Urban land are near the Ohio River.

Most areas on ridgetops in this association are urban and suburban development, woodland, and idle land. Scattered areas of farmland occur throughout the association. Hillsides and steep drainageways are mostly wooded.

The potential is fair to poor for farmland. It is good for woodland and for wildlife habitat. It is poor for most nonfarm uses. The major limitations are slope, depth to bedrock, clayey soil material, and the hazard of slips and landslides.

9. Gilpin-Guernsey-Culleoka association

Gently sloping to very steep, moderately deep and deep, well drained and moderately well drained soils; formed in residual material from acid and nonacid shale, siltstone, and sandstone

This association occupies undulating and rolling, broad and narrow ridgetops, side slopes, and hillsides of highly dissected uplands (fig. 9). It is in the southwestern part of Beaver County.

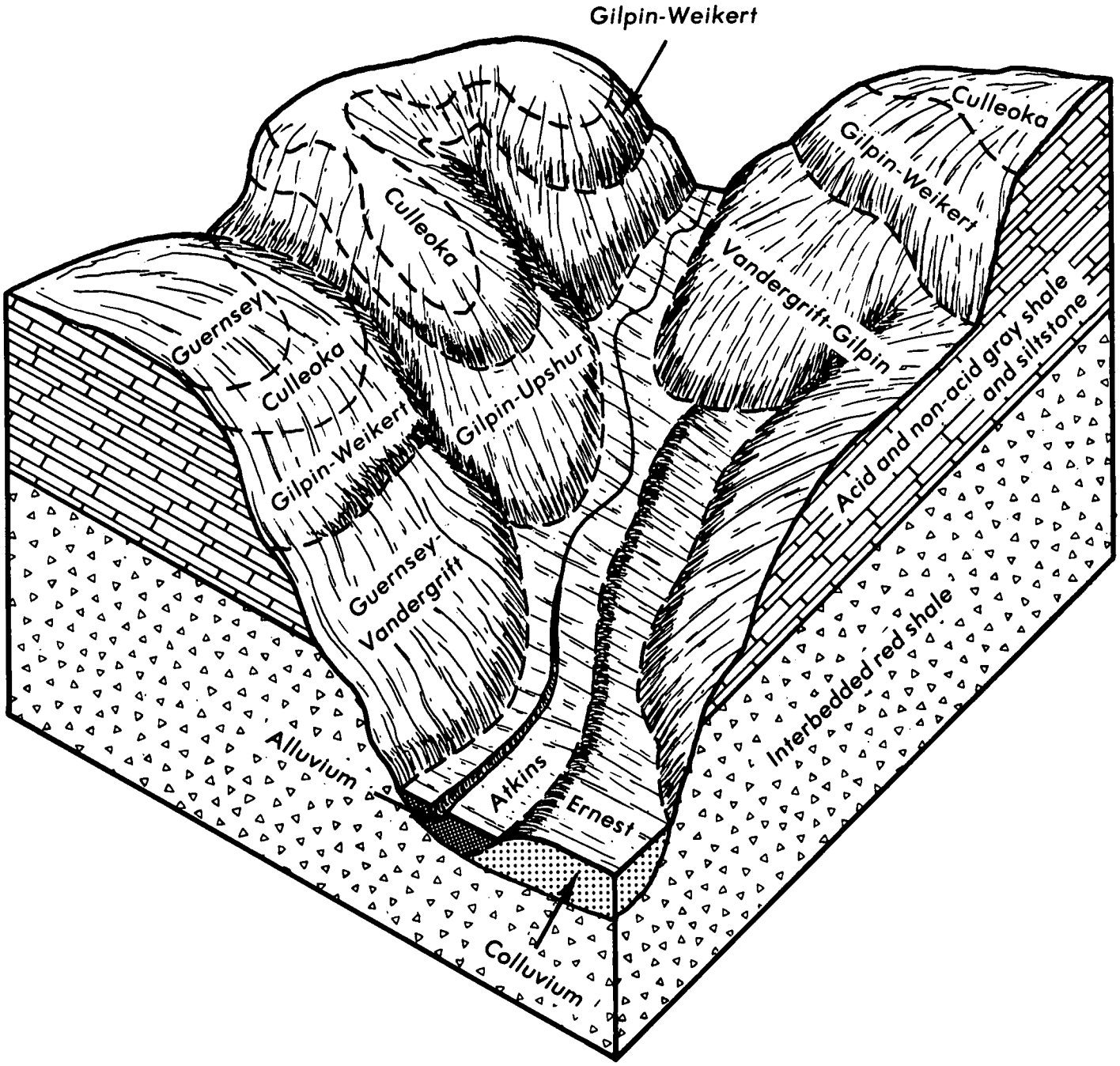


Figure 9.—Pattern of soils and parent material in Gilpin-Guernsey-Culleoka association.

This association makes up about 6 percent of the total land area of Beaver and Lawrence Counties. It is about 30 percent Gilpin soils, 20 percent Guernsey soils, 10 percent Culleoka soils, and 40 percent soils of minor extent.

Gilpin soils are moderately deep and well drained. They are 20 to 40 inches thick over acid shale, siltstone, and sandstone. They are gently sloping to very steep.

Guernsey soils are deep and moderately well drained. They have a clayey subsoil and, during wet seasons, a

high water table. Slips and landslides are common. Guernsey soils are gently sloping to moderately steep.

Culleoka soils are moderately deep and well drained. They are 20 to 40 inches thick over acid and nonacid shale and siltstone. They are gently sloping to moderately steep.

Dominant soils of minor extent are the well drained Upshur and Weikert soils and the moderately well drained to somewhat poorly drained Vandergrift soils. Other soils on uplands are the well drained Clymer and Hazleton soils; the moderately well drained Wharton, Tilsit, and Ernest soils; and the somewhat poorly drained Cavode soils. The poorly drained Atkins soils are on most flood plains.

Most areas on ridgetops in this association are farmland and woodland. Beef and dairy farming are the major farm enterprises. Corn, small grain, hay, and pasture are the major crops. Many previously farmed areas are idle and are reverting to brushland and woodland. Most hillsides and steep drainageways are wooded. Most of Raccoon State Park is in the association. Many homes and suburban developments are along the major roads.

The potential is fair to good for farmland. It is good for woodland and for wildlife habitat. It is poor for most nonfarm uses. The major limitations are depth to bedrock, slope, seasonal wetness, clayey soil material, and the hazard of slips or landslides.

10. Gilpin-Weikert association

Gently sloping to very steep, shallow and moderately deep, well drained soils; formed in residual material from acid shale, siltstone, and sandstone

This association occupies ridges and hills in highly dissected uplands (fig. 10). It is in the west central part of Beaver County.

This association makes up about 6 percent of the total land area of Beaver and Lawrence Counties. It is about 40 percent Gilpin soils, 20 percent Weikert soils, and 40 percent soils of minor extent.

Gilpin soils are moderately deep and well drained. They are 20 to 40 inches thick over acid shale, siltstone, and sandstone. They are gently sloping to very steep.

Weikert soils are shallow and well drained. They are 10 to 20 inches thick over acid shale, siltstone, and sandstone. Areas of these soils are usually intermixed with areas of Gilpin soils. Weikert soils are gently sloping to very steep.

Soils of minor extent on uplands are the deep, well drained Clymer, Hazleton, and Upshur soils; the moderately deep, well drained Culleoka soils; the moderately well drained Wharton, Guernsey, and Tilsit soils; and the somewhat poorly drained Cavode soils. The moderately well drained Ernest soils are on benches and in drainageways. The poorly drained Atkins soils are on most flood plains. Areas of Rock outcrop are common. They occur with the steep and very steep Weikert soils. A few areas of Udorthents are at the sites of coal strip mining.

Most areas of this association are wooded or are idle. Scattered areas of farmland are on the broad ridgetops. Many previously farmed areas are idle and are reverting to brushland and woodland. Many homes and suburban developments are along the major roads.

The potential is fair to poor for farmland. It is good for woodland and for wildlife habitat. It is poor for most nonfarm uses. The major limitations are depth to bedrock and steep slopes.

Soil maps for detailed planning

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Canfield silt loam, 3 to 8 percent slopes, is one of several phases in the Canfield series.

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Gilpin-Weikert complex, 3 to 8 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some

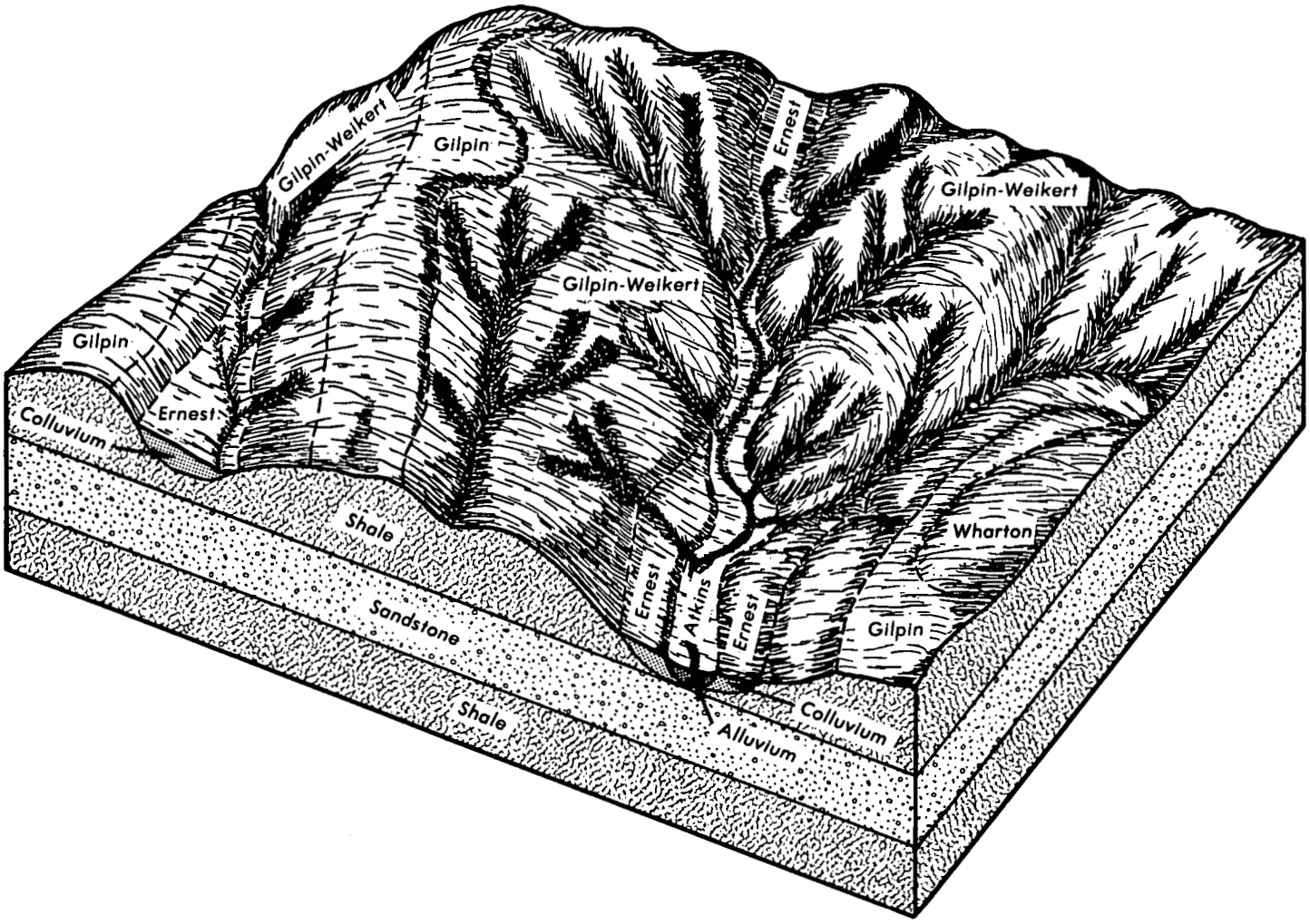


Figure 10.—Pattern of soils and parent material in Gilpin-Weikert association.

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

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

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

Soil descriptions

AgB—Allegheny silt loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on high stream terraces along major waterways in Beaver County. Slopes are smooth or convex and are generally 100 to 600 feet long. Areas are irregular in shape and range from 3 to 150 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 44 inches. The upper 6 inches is yellowish brown, friable silt loam; the next 17 inches is strong brown, friable silt loam; and the lower 14 inches is brown, friable gravelly clay loam and very gravelly sandy loam. The substratum to a depth of 60 inches is brown, very friable very gravelly sandy loam.

Included with this soil in mapping are a few small areas of nearly level and sloping Allegheny soils and

similar soils that contain less sand and gravel in the lower part of the subsoil and substratum. Small scattered areas of Monongahela, Tyler, Pope, Philo, and Purdy soils are also included.

Permeability is moderate, and available water capacity is high. Runoff is medium. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most of the acreage is cropland. Small areas are pasture, woodland, and urban developments.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Stripcropping, minimum tillage, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, but only a small acreage is wooded. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Limitations are few for most nonfarm uses. If this soil is used for waste disposal, however, groundwater contamination is possible because of the gravelly substratum.

The capability subclass is IIe. The woodland symbol is 2o.

AgC—Allegheny silt loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on high stream terraces along major waterways in Beaver County. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 44 inches. The upper 6 inches is yellowish brown, friable silt loam; the next 17 inches is strong brown, friable silt loam; and the lower 14 inches is brown, friable gravelly clay loam and very gravelly sandy loam. The substratum to a depth of 60 inches is brown, very friable very gravelly sandy loam.

Included with this soil in mapping are a few small areas of gently sloping and moderately steep Allegheny soils and similar soils that contain less sand and gravel in the lower part of the subsoil and in the substratum. Small scattered areas of Monongahela, Ernest, Tyler, Clymer, and Chili soils are also included.

Permeability is moderate, and available water capacity is high. Runoff is medium to rapid. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most of the acreage is cropland and woodland or is idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of the pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and a moderate acreage is wooded. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Slope is a limitation for some nonfarm uses, for example, waste disposal. Ground water contamination is possible because of the gravelly substratum.

The capability subclass is IIIe. The woodland symbol is 2o.

At—Atkins silt loam. This nearly level, deep, poorly drained soil is on flood plains mainly in Beaver County. Areas are ordinarily long and narrow and range from 3 to 30 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 6 inches thick. The subsoil extends to a depth of about 32 inches. The upper 18 inches is mottled dark gray and olive gray, friable silt loam; and the lower 8 inches is mottled light olive gray, friable heavy loam. The substratum to a depth of 60 inches is mottled light brownish gray, friable, stratified silt loam, loam, sandy loam, and gravelly sandy loam.

Included with this soil in mapping are small areas of gently sloping Atkins soils and similar soils that are not so gray above 20 inches. Also included are areas of Philo, Pope, Purdy, Canadice, Tyler, and Holly soils. In a few small areas, soils with a very dark surface layer up to 24 inches thick are included.

Permeability is slow to moderate, and available water capacity is high. In unlimed areas, this soil is strongly acid or very strongly acid throughout. The high water table is within 12 inches of the surface most of the year. Runoff is slow and ponding often occurs. Flooding occurs frequently (fig. 11). Roots are restricted by the high water table.

Most areas are pasture and woodland or are idle.

Adequately drained, this soil can be used for cropland. Excess water delays plowing and causes it to warm slowly in spring. Crops may be damaged by flood water following intensive rainfall. Excess surface water can sometimes be drained by keeping natural drainageways open. Surface drains, where outlets are available, can be used to improve drainage.

This soil is fairly well suited to pasture. Grazing of pasture when wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

Figure 11.—Atkins silt loam is poorly drained and frequently flooded.

This soil is well suited to moisture-tolerant trees. About one fourth the area is wooded. Potential productivity is very high, but roots are restricted by the high water table. Use of equipment is restricted for a good part of the year because of the high water table and flooding. Machine planting in large areas is practical during dry periods.

The high water table and flooding are limitations for nonfarm uses. This soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 1w.

BcB—Braceville loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on outwash plains, kames, and terraces in glaciated areas. Slopes are smooth and concave, or in a few places convex, and are generally 50 to 400 feet long. Areas are irregular in shape and range from 2 to more than 50 acres.

Typically this soil has a brown loam surface layer about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 12 inches is yellowish brown, friable loam, and the lower 18 inches is mottled yellowish brown, very firm and firm gravelly loam and gravelly sandy loam. The substratum to a depth of 46 inches is yellowish brown, firm to friable sandy loam and loamy sand and to 60 inches is stratified sand and gravel.

Included with this soil in mapping are small areas of nearly level and sloping Braceville soils, similar soils that do not have a fragipan, and soils with a silt loam, sandy loam, and gravelly surface layer. A few scattered areas of Chili, Conotton, Wooster, Canfield, Rexford, Ravenna, Frenchtown, and Canadice soils are also included.

Permeability is moderately slow and slow, and available water capacity is low to moderate. Runoff is medium. This soil has a fragipan at a depth of 15 to 30 inches. The seasonal high water table is 18 to 36 inches below

the surface for long periods during wet seasons. Roots are restricted by the fragipan and seasonal high water table. In unlimed areas, this soil is very strongly acid to medium acid above the fragipan and strongly acid to slightly acid in the pan and substratum.

Most of the acreage is cropland and pasture. A few small areas are wooded or idle.

The hazard of erosion is moderate if this soil is used for cultivated crops. Minimum tillage, cover crops, grass and legumes in the cropping system, stripcropping, diversions, and grassed waterways reduce runoff and help to control erosion. Subsurface drains are needed to remove excess water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are the major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted briefly during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

Moderately slow and slow permeability and a seasonal high water table are limitations for many nonfarm uses. They are serious limitations for onsite disposal of waste. The seasonal high water table is a potential hazard for buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements.

The capability subclass is IIw. The woodland symbol is 2o.

BcC—Braceville loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on outwash plains, kames, and terraces in glaciated areas. Slopes are smooth, concave, or convex and are generally 50 to 400 feet long. Areas are long and narrow and range from 2 to 20 acres or more.

Typically this soil has a brown loam surface layer about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 12 inches is yellowish brown, friable loam; and the lower 18 inches is mottled yellowish brown, very firm and firm gravelly loam and gravelly sandy loam. The substratum to a depth of 46 inches is yellowish brown, firm to friable sandy loam and loamy sand and to 60 inches is stratified sand and gravel.

Included with this soil in mapping are small areas of gently sloping and moderately steep Braceville soils, similar soils that do not have a fragipan, and soils that have a silt loam, sandy loam, and gravelly surface layer. A few scattered areas of Chili, Conotton, Wooster, Canfield, Rexford, Ravenna, and Canadice soils are also included.

Permeability is moderately slow and slow, and available water capacity is low to moderate. Runoff is medium to rapid. This soil has a fragipan at a depth of 15 to 30 inches. The seasonal high water table is at 18 to 36 inches for long periods during wet seasons. Roots are restricted by the fragipan and seasonal high water table. In unlimed areas, this soil is very strongly acid to medium acid above the fragipan and strongly acid to slightly acid in the pan and substratum.

Most of the acreage is cropland or pasture. A few areas are wooded or idle.

The hazard or erosion is severe if this soil is used for cultivated crops. Minimum tillage, cover crops, grass and legumes in the cropping system, stripcropping, grassed waterways, and diversions where the topography is suitable reduce runoff and help to control erosion. Subsurface drains may be needed to remove excess water and provide for timely tillage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are the major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted briefly during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

This soil is limited for many nonfarm uses because of slope, moderately slow and slow permeability, and a seasonal high water table. These limitations are severe for onsite disposal of waste. The seasonal high water table is a potential hazard for buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements.

The capability subclass is IIIe. The woodland symbol is 2o.

BkA—Brinkerton silt loam, 0 to 3 percent slopes. This nearly level, deep, poorly drained soil is on low-lying flats and in depressions in residual uplands. Slopes are smooth or concave and are about 100 to 600 feet long. Areas are irregular in shape or long and narrow and range from 2 to 20 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 20 inches is mottled gray, light brownish gray, and grayish brown, friable silt loam; and the lower 21 inches is mottled light brownish gray, very firm and brittle silt loam and silty clay loam. The substratum to a depth of 60 inches is mottled gray, firm shaly silty clay loam.

Included with this soil in mapping are small areas of gently sloping Brinkerton soils and similar soils that contain more coarse fragments throughout. Small scattered areas of Ernest, Cavode, Tilsit, Wharton, Tyler, Purdy, and Atkins soils are also included.

Permeability is slow, and available water capacity is moderate. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and subsoil and strongly acid to slightly acid in the substratum. The high water table is within 6 inches of the surface most of the year. Runoff is slow, and ponding is common during wet seasons. Roots are restricted by the high water table and the fragipan.

Most areas are pasture and woodland or are idle.

Excess water delays plowing and causes this soil to warm slowly in spring. Crops can be damaged by the high water table and ponded water following intensive rainfall. Excess surface water can be removed by keeping natural drainageways open or by constructing surface drains. Subsurface drains, where outlets are available, can be used to improve internal drainage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the high water table and the fragipan. Use of equipment is restricted for a large part of the year because of the high water table. Machine planting in large areas is usually practical during dry periods.

The high water table and slow permeability are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and for construction of buildings, streets, and roads. This soil has some potential for wildlife habitat and recreation.

The capability subclass is IVw. The woodland symbol is 2w.

BkB—Brinkerton silt loam, 3 to 8 percent slopes. This gently sloping, deep, poorly drained soil is on benches and low-lying areas in residual uplands. Slopes are smooth or concave and are about 100 to 600 feet long. Areas are irregular in shape or long and narrow and range from 3 to 30 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 20 inches is mottled, gray, light brownish gray, and grayish brown, friable silt loam and heavy silt loam. The lower 21 inches is mottled light brownish gray, very firm and brittle heavy silt loam and light silty clay loam. The substratum to a depth of 60 inches is mottled gray, firm shaly silty clay loam.

Included with this soil is mapping are small areas of nearly level and sloping Brinkerton soils and similar soils that contain more coarse fragments throughout. Small areas of Gilpin, Cavode, Ernest, Tilsit, Wharton, Tyler, Purdy, and Atkins soils are also included.

Permeability is slow, and available water capacity is moderate. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and subsoil and strongly acid to slightly acid in the substratum. The high water table is within 6 inches of the surface most of the year. Runoff is slow or medium. Roots are restricted by the high water table and the fragipan.

Most areas are pasture and woodland or are idle.

The hazard of erosion is moderate if this soil is used for cultivated crops. Excess water delays plowing and causes the soil to warm slowly in spring. Crops may be damaged by the high water table following intensive rainfall. Excess surface water can be removed by using diversions and grassed waterways. Subsurface drains, where outlets are available, can be used to improve internal drainage. Stripcropping, minimum tillage, cover crops, crop residue, and grass and legumes in the cropping system reduce runoff and help to control erosion.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the high water table and the fragipan. Use of equipment is restricted for part of the year because of the high water table. Machine planting in large areas is practical during dry periods.

The high water table and slow permeability are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and for construction of buildings, streets, and roads. This soil has some potential for wildlife habitat and recreation.

The capability subclass is IVw. The woodland symbol is 2w.

BkC—Brinkerton silt loam, 8 to 15 percent slopes. This sloping, deep, poorly drained soil is on foot slopes and benches in residual uplands. Slopes are smooth or concave and are about 100 to 600 feet long. Areas are irregular in shape or long and narrow and range from 2 to 30 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 20 inches is mottled gray, light brownish gray, and grayish brown, friable silt loam and heavy silt loam; and the lower 21 inches is mottled light brownish gray, very firm and brittle heavy silt loam and light silty clay loam. The substratum to a depth of 60 inches is mottled gray, firm shaly silty clay loam.

Included with this soil in mapping are small areas of gently sloping Brinkerton soils and similar soils that contain more coarse fragments throughout. Small areas of Gilpin, Cavode, Tyler, Ernest, and Wharton soils are also included.

Permeability is slow, and available water capacity is moderate. In unlimed areas, this soil is very strongly acid

to medium acid in the surface layer and subsoil and strongly acid to slightly acid in the substratum. The high water table is within 6 inches of the surface most of the year. Runoff is rapid. Roots are restricted by the high water table and the fragipan.

Most areas are pasture and woodland or are idle. The hazard of erosion is severe if this soil is used for cultivated crops. Excess water delays plowing and causes this soil to warm slowly in spring. Crops can be damaged by the high water table following intensive rainfall. Contour stripcropping, grassed waterways, minimum tillage, crop residue, and grass and legumes in the cropping system reduce runoff and help to control erosion. Subsurface drains, where outlets are available, can be used to improve internal drainage.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the high water table and the fragipan. Use of equipment is restricted for part of the year because of wetness. Machine planting in large areas is usually practical.

The slope, high water table, and slow permeability are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. This soil has some potential for wildlife habitat and recreation.

The capability subclass is IVw. The woodland symbol is 2w.

Ca—Canadice silt loam. This nearly level, deep, poorly drained soil is on low-lying flats and in depressions in glaciated uplands and along stream valleys. Areas are nearly circular or irregular in shape and range from 1 to 50 acres.

Typically this soil has a very dark gray silt loam surface layer about 8 inches thick and a dark gray silty clay loam subsurface layer 3 inches thick. The subsoil extends to a depth of 42 inches. It is mottled gray and dark gray, silty clay, friable in the upper 5 inches, firm in the next 6 inches, and very firm below. The substratum to a depth of 68 inches is dark gray and gray, very firm silty clay.

Included with this soil in mapping are a few small areas of gently sloping Canadice soils and similar soils that are not so gray in the upper 24 inches, similar soils with a black surface layer up to 24 inches thick, similar soils that have a silt loam or loam subsoil and similar soils that are underlain by sandy or gravelly material at 24 to 40 inches. Also included are small scattered areas of muck, Holly, Sloan, Frenchtown, Rexford, and Ravenna soils.

Permeability is very slow, and available water capacity is high. In unlimed areas, the soil is very strongly acid to slightly acid in the surface layer, strongly acid to neutral in the upper part of the subsoil, slightly acid to mildly alkaline in the lower part of the subsoil, and neutral to moderately alkaline in the substratum. The high water table is within 12 inches of the surface most of the year. Runoff is slow, and ponding is common during wet seasons. Frequent, brief flooding occurs if these soils are in stream valleys. Roots are restricted by the high water table and the firm clayey subsoil.

Most areas are idle. The plant life is sedges, grasses, and alders. A few areas are woodland and pasture.

Some areas of this soil, if properly drained, can be used for cropland. Excess water delays plowing and causes the soil to warm slowly in spring. Crops are frequently damaged by the high water table and ponding following intensive rainfall. Excess surface water can sometimes be removed by keeping natural drainageways open. Surface drains, where outlets are available, can be used to improve drainage.

This soil is fairly well suited to poorly suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs. Drainage can be improved by keeping natural drainageways open and by constructing surface drains where outlets are available.

This soil is poorly suited to all but the most moisture-tolerant trees. A small part of the area is wooded. Roots are restricted by the high water table and the very slowly permeable clayey subsoil. Use of equipment is restricted for most of the year because of wetness. Machine planting in large areas with surface drainage is sometimes possible.

The very slow permeability, high water table, slow surface drainage, and clayey soil material are severe limitations for nonfarm uses. This soil is suited to wildlife habitat.

The capability subclass is IVw. The woodland symbol is 5w.

CdB—Canfield silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on broad ridgetops in glaciated uplands (fig. 12). Slopes are smooth, concave, or convex and are generally 200 to 800 feet long. Areas are irregular in shape and range from 3 to more than 150 acres.

Typically this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is yellowish brown, friable silt loam that is mottled in the lower part; and the lower 29 inches is mottled brown and dark yellowish brown, very firm and brittle silt loam and gravelly loam. The substratum to a depth of 60 inches is mottled dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are small areas of nearly level and sloping Canfield soils and similar soils that contain more sand throughout the profile. Also in-

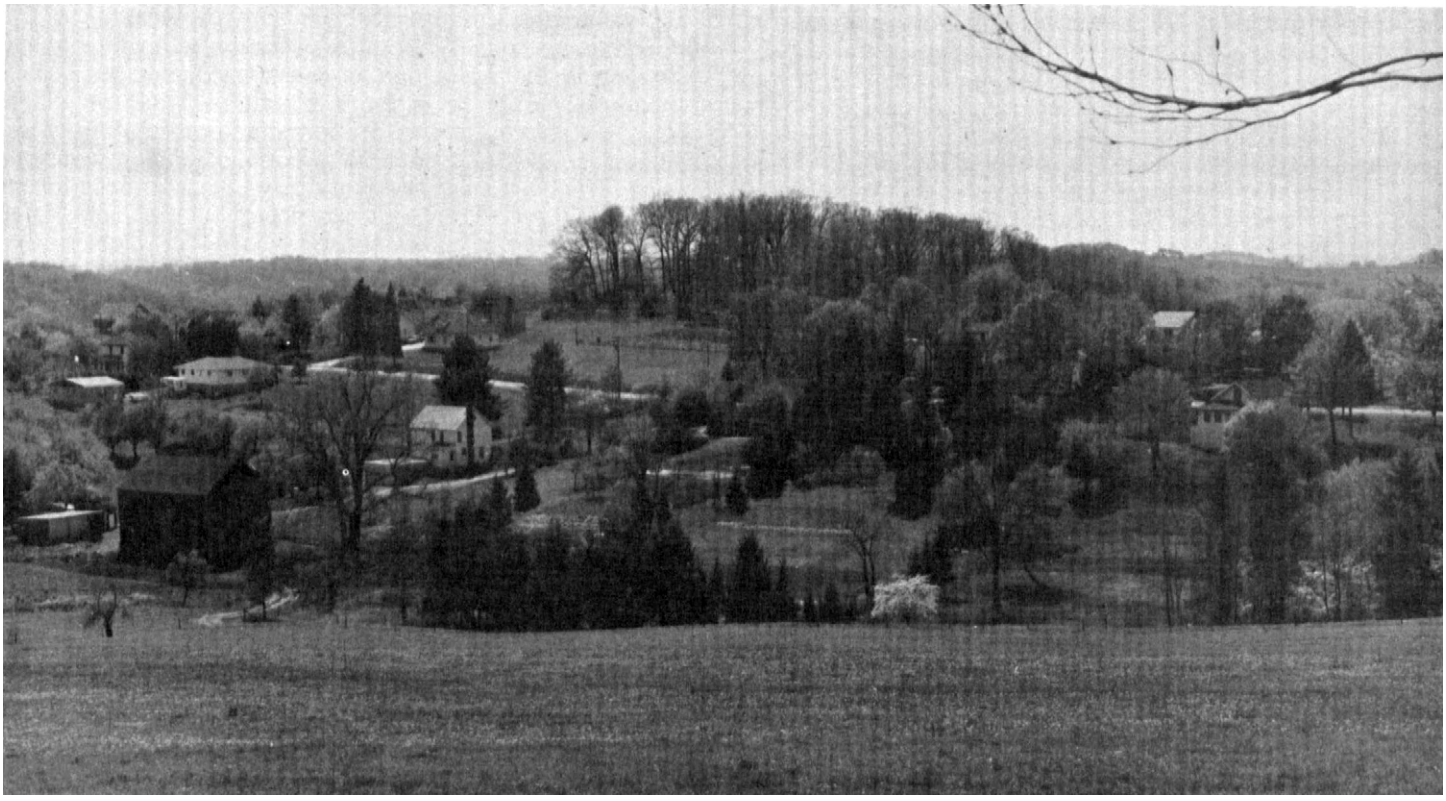


Figure 12.—Typical landscape of Canfield silt loam on the broad ridgetop in the foreground. Frenchtown and Ravenna soils are in the depression, and Loudonville soil is on the steep ridges in the background.

cluded are small areas of Ravenna, Rexford, Braceville, Frenchtown, Chili, Conotton, and Canadice soils and a few small scattered areas of Wharton, Cavode, and Gilpin soils, particularly in the transitional areas between glaciated and residual uplands.

Permeability is slow, and available water capacity is moderate. Runoff is medium. This soil has a fragipan at a depth of 15 to 30 inches. The seasonal high water table is at 18 to 36 inches for long periods during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is very strongly acid or strongly acid in the surface layer and the upper part of the subsoil and medium acid to neutral in the lower part of the subsoil and in the substratum.

Most of the acreage is cropland and pasture. A few areas are wooded or idle.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Diversions and subsurface drains are needed to remove excess water and to provide for timely tillage. Incorporating crop residue into the surface layer maintains organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when this soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted for short periods during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The slow permeability and seasonal high water table are limitations for many nonfarm uses. These limitations are severe for onsite disposal of waste. The seasonal high water table is a potential hazard for buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements.

The capability subclass is IIe. The woodland symbol is 1o.

CdC—Canfield silt loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on

ridges and side slopes in glaciated uplands. Slopes are smooth, concave, or convex and are generally 100 to 600 feet long. Areas are irregular in shape or long and narrow and range from 2 to 100 acres or more.

Typically this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is yellowish brown, friable silt loam that is mottled in the lower part; and the lower 29 inches is mottled brown and dark yellowish brown, very firm and brittle silt loam and gravelly loam. The substratum to a depth of 60 inches is mottled dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are small areas of gently sloping and moderately steep Canfield soils and similar soils that contain more sand throughout the profile. Also included are small areas of Ravenna, Braceville, Wooster, Loudonville, and Conotton soils and a few small scattered areas of Wharton, Gilpin, Cavode, and Weikert soils, particularly in the transitional areas between glaciated and residual uplands.

Permeability is slow, and available water capacity is moderate. Runoff is medium to rapid. This soil has a fragipan at a depth of 15 to 30 inches. The seasonal high water table is 18 to 36 inches below the surface during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is very strongly acid to strongly acid in the upper part of the solum and medium acid to neutral in the lower part of the subsoil and in the substratum.

Most of the acreage is cropland, pasture, and woodland. A few areas are idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Diversions and subsurface drains are needed to remove excess water and provide for timely tillage. Incorporating crop residue into the surface layer maintains organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when this soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted for short periods during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The slope, slow permeability, and seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste. The seasonal high water table is a potential hazard for buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If this soil is disturbed for construction, management measures will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 1o.

CdD—Canfield silt loam, 15 to 25 percent slopes. This moderately steep, deep, moderately well drained soil is on hills and side slopes in glaciated uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are long and narrow and range from 2 to 20 acres or more.

Typically this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is yellowish brown, friable silt loam that is mottled in the lower part; and the lower 29 inches is mottled brown and dark yellowish brown, very firm and brittle silt loam and gravelly loam. The substratum to a depth of 60 inches is mottled dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are small areas of sloping and steep Canfield soils and similar soils that contain more sand throughout the profile. Also included are small areas of Conotton, Ravenna, Braceville, Wooster, and Loudonville soils and a few scattered areas of Wharton, Gilpin, and Weikert soils, particularly in the transitional areas between glaciated and residual uplands.

Permeability is slow, and available water capacity is moderate. Runoff is rapid. This soil has a fragipan at a depth of 15 to 30 inches. The seasonal high water table is 18 to 36 inches below the surface during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is very strongly acid to slightly acid in the upper part of the solum and medium acid to neutral in the lower part of the subsoil and in the substratum.

Most areas are woodland and pasture or are idle. Some of the acreage is cropland.

The hazard of erosion is very severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Subsurface drains remove excess water from seeps and springs and provide for timely tillage. Incorporating crop residue into the surface layer maintains organic matter content and increases water infiltration.

This soil is fairly well to well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment is restricted by slope for short periods during wet seasons because of the seasonal high water table. Machine planting is usually possible in the larger areas.

The moderately steep slopes, slow permeability, and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, measures will be needed to control erosion and sediment.

The capability subclass is IVe. The woodland symbol is 1r.

CeA—Cavode silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad ridgetops in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 10 inches is mottled dark yellowish brown, friable silty clay loam; and the lower 28 inches is mottled grayish brown and dark gray, firm and friable silty clay and silty clay loam. The substratum to a depth of 50 inches is dark gray, firm very shaly silty clay loam. Shale is at a depth of about 50 inches.

Included with this soil in mapping are small areas of gently sloping Cavode soils and similar soils that contain more coarse fragments in the subsoil. Small scattered areas of Gilpin, Wharton, Ernest, Brinkerton, and Tilsit soils are also included.

Permeability is slow, and available water capacity is moderate to high. In unlimed areas, this soil is strongly acid or very strongly acid throughout. The seasonal high water table is 6 to 18 inches below the surface a good part of the year. Runoff is slow. Roots are restricted by the seasonal high water table.

Most of the acreage is cropland and pasture.

Excess water delays plowing and causes this soil to warm slowly in spring. Crops can be damaged by the seasonal high water table and ponded water after intensive rainfall. Excess surface water can be removed by keeping natural drainageways open. Surface drains and subsurface drains, where outlets are available, can be used to improve drainage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the seasonal high water table. Use of equipment is restricted for part of the year because of the seasonal high water table. Machine planting in large areas is usually practical.

The seasonal high water table and slow permeability are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is suited to wildlife habitat, undeveloped recreation areas, and other open spaces maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 2w.

CeB—Cavode silt loam, 3 to 8 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on broad ridgetops and in depressions in residual uplands. Slopes are concave or smooth and are generally 200 to 600 feet long. Areas are irregular in shape and range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 10 inches is mottled dark yellowish brown, friable silty clay loam; and the lower 28 inches is mottled grayish brown and dark gray, firm and friable silty clay and silty clay loam. The substratum to a depth of 50 inches is dark gray, firm very shaly silty clay loam. Shale is at a depth of about 50 inches.

Included with this soil in mapping are small areas of nearly level and sloping Cavode soils and similar soils that contain more coarse fragments in the subsoil. Small scattered areas of Gilpin, Wharton, Ernest, Brinkerton, and Tilsit soils are also included.

Permeability is slow, and available water capacity is moderate to high. In unlimed areas, this soil is strongly acid to very strongly acid throughout. The seasonal high water table is 6 to 18 inches below the surface for a good part of the year. Runoff is medium. Roots are restricted by the seasonal high water table.

Most of the acreage is cropland and pasture.

The hazard of erosion is moderate if this soil is used for cultivated crops. Excess water delays plowing and causes the soil to warm slowly in spring. Stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and control erosion (fig. 13). Excess surface water can be removed by keeping natural drainageways open. Subsurface drains, where outlets are available, can improve internal drainage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the seasonal high water table. Use of equipment is restricted for part of the year because of the seasonal high water table. Machine planting in large areas is usually practical.

The seasonal high water table and slow permeability are limitations for most nonfarm uses. These limitations

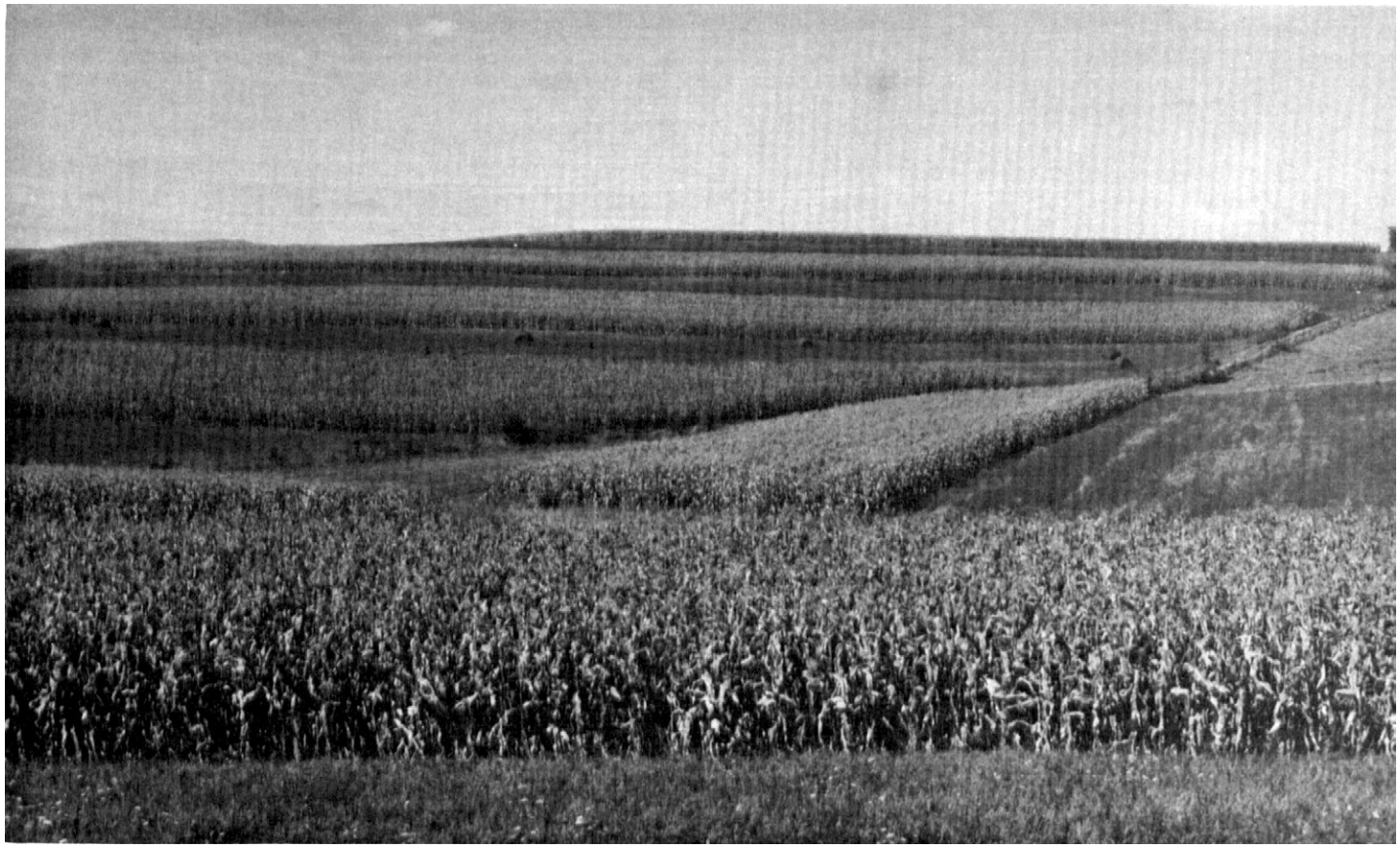


Figure 13.—Stripcropping on Cavode silt loam, 3 to 8 percent slopes. The hay strip in the foreground is on Ernest silt loam, 3 to 8 percent slopes. Wharton silt loam, 8 to 15 percent slopes, and Gilpin silt loam, 8 to 15 percent slopes are on the hillside in the background.

are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, measures are needed to reduce wetness and to control runoff and sediment. In suburban areas, this soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 2w.

CeC—Cavode silt loam, 8 to 15 percent slopes. This sloping, deep, somewhat poorly drained soil is on side slopes and benches in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape or long and narrow and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 10 inches is mottled dark yellowish brown, friable silty clay loam; and the lower 28 inches is mottled grayish brown and dark gray, firm and friable silty clay and silty clay loam. The substratum to a depth of 50 inches is dark gray, firm very shaly silty clay loam. Shale bedrock is at a depth of about 50 inches.

Included with this soil in mapping are small areas of gently sloping and moderately steep Cavode soils and similar soils that contain more coarse fragments in the subsoil. Small scattered areas of Gilpin, Wharton, Ernest, Brinkerton, and Tilsit soils are also included.

Permeability is slow, and available water capacity is moderate to high. In unlimed areas, this soil is strongly acid to very strongly acid throughout. The seasonal high water table is 6 to 18 inches below the surface for a good part of the year. Runoff is medium to rapid. Roots are restricted by the seasonal high water table.

Most of the acreage is pasture and cropland.

The hazard of erosion is severe if this soil is used for cultivated crops. Excess water delays plowing and causes the soil to warm slowly in spring. Contour stripcropping, diversions, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system will reduce runoff and help to control erosion. Subsurface drains can be used to improve internal

drainage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Some of the area is wooded. Roots are restricted by the seasonal high water table. Use of equipment is restricted for part of the year because of the seasonal high water table. Machine planting in large areas is usually practical.

The seasonal high water table, slow permeability, and slope are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, measures are needed to reduce wetness and to control runoff and sediment. In suburban areas the soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIe. The woodland symbol is 2w.

CeD—Cavode silt loam, 15 to 25 percent slopes. This moderately steep, deep, somewhat poorly drained soil is on hillsides and side slopes in dissected residual uplands. Slopes are smooth, concave, or convex and are generally 200 to 600 feet long. Areas are long and narrow and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 10 inches is mottled dark yellowish brown, friable silty clay loam, and the lower 28 inches is mottled grayish brown and dark gray, firm and friable silty clay and silty clay loam. The substratum to a depth of 50 inches is dark gray, firm very shaly silty clay loam. Shale bedrock is at a depth of about 50 inches.

Included with this soil in mapping are small areas of sloping and steep Cavode soils and similar soils that contain more coarse fragments in the subsoil. Small scattered areas of Guernsey, Wharton, Ernest, Brinkerton, Gilpin, and Weikert soils are also included.

Permeability is slow, and available water capacity is moderate to high. In unlimed areas, this soil is strongly acid to very strongly acid throughout. The seasonal high water table is 6 to 18 inches below the surface part of the year. Runoff is rapid. Roots are restricted by the seasonal high water table.

Most areas are woodland and pasture or are idle.

The hazard of erosion is very severe if this soil is used for cultivated crops. Contour stripcropping, minimum tillage, cover crops, grass and legumes in the cropping system most of the time, diversions, and grassed waterways reduce runoff and help to control erosion. Excess water delays plowing and causes this soil to warm slowly in spring. Subsurface drains can be used to improve internal drainage. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is fairly well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Most of the area is wooded. Roots are restricted by the seasonal high water table. Use of equipment is restricted because of slopes and the seasonal high water table. Machine planting in large areas is usually possible.

The moderately steep slopes, seasonal high water table, and slow permeability are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, measures are needed to reduce wetness, control runoff, and increase the stability of cuts and fills. In suburban areas this soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IVe. The woodland symbol is 2r.

Cg—Chagrin silt loam. This nearly level, deep, well drained soil is on flood plains in glaciated areas. Areas are long and narrow. Most range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 12 inches thick. The subsoil extends to a depth of 43 inches. The upper 19 inches is yellowish brown, friable heavy loam; and the lower 12 inches is dark yellowish brown, friable heavy sandy loam and loam. The substratum to a depth of 65 inches is dark yellowish brown, very friable sandy loam.

Included with this soil in mapping are a few areas of Chagrin soils that are rarely flooded and similar soils that contain more sand and gravel. Small scattered areas of Lobdell, Pope, Philo, and Holly soils are also included.

Permeability is moderate, and available water capacity is high. Runoff is slow. This soil is subject to occasional flooding. In unlimed areas, it is medium acid to neutral throughout.

Most of the acreage is cropland. Small areas are pasture and woodland.

The hazard of erosion is slight if this soil is used for cultivated crops. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. Crops respond well to fertilization and good management.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are

the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is very high. Management problems are few. Machine planting is practical in large areas.

The hazard of flooding is a limitation for many nonfarm uses. It is a severe limitation for onsite disposal of waste and the construction of buildings. Suburban areas are suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability class is I. The woodland symbol is 1o.

ChB—Chili silt loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on glacial outwash plains, kames, and terraces. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape and range from 2 to 20 acres.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of about 52 inches. The upper 6 inches is yellowish brown, friable silt loam; the next 24 inches is yellowish brown and brown, friable gravelly loam; and the lower 14 inches is brown, very friable very gravelly sandy loam. The substratum to a depth of 60 inches is brown, loose stratified loamy sand and gravelly loamy sand.

Included with this soil in mapping are a few small areas of nearly level and sloping Chili soils, similar soils with a silt loam texture to a depth of 30 inches, and similar soils with more sand and gravel in the upper part of the solum. Small scattered areas of Conotton, Braceville, Rexford, Wooster, and Canfield soils are also included.

Permeability is moderately rapid, and available water capacity is moderate. Runoff is slow or medium. In unlimed areas, this soil is very strongly acid to slightly acid in the upper part of the solum and strongly acid to slightly acid in the lower part to 40 inches.

Most of the acreage is cropland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, but only a small acreage is wooded. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Limitations are few for nonfarm uses. Ground water contamination because of rapid permeability in the gravelly substratum is a potential hazard for onsite disposal of waste.

The capability subclass is IIe. The woodland symbol is 2o.

ChC—Chili silt loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on glacial outwash plains, kames, and terraces. Slopes are smooth or convex and are generally 100 to 300 feet long. Areas are irregular in shape or long and narrow and range from 2 to 20 acres.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of about 52 inches. The upper 6 inches is yellowish brown, friable silt loam; the next 24 inches is yellowish brown and brown, friable gravelly loam; and the lower 14 inches is brown, very friable very gravelly sandy loam. The substratum to a depth of 60 inches is brown, loose stratified loamy sand and gravelly loamy sand (fig. 14).

Included with this soil in mapping are a few small areas of gently sloping and moderately steep Chili soils, similar soils with a silt loam texture to a depth of 30 inches, and similar soils with more sand and gravel in the upper part of the surface layer and in the subsoil. Small scattered areas of Conotton, Braceville, Wooster, and Canfield soils are also included.

Permeability is moderately rapid, and available water capacity is moderate. Runoff is medium to rapid. In unlimed areas, this soil is very strongly acid to slightly acid in the surface layer and upper part of the subsoil and strongly acid to slightly acid in the lower part to a depth of 40 inches.

Most of the acreage is cropland. Small areas are woodland or pasture.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Slope is a limitation for some nonfarm uses, for example onsite disposal of waste. Ground water contamination is possible because of rapid permeability in the gravelly substratum.

The capability subclass is IIIe. The woodland symbol is 2o.

CmB—Clymer loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on broad ridgetops in residual uplands. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape and range from 2 to 50 acres.

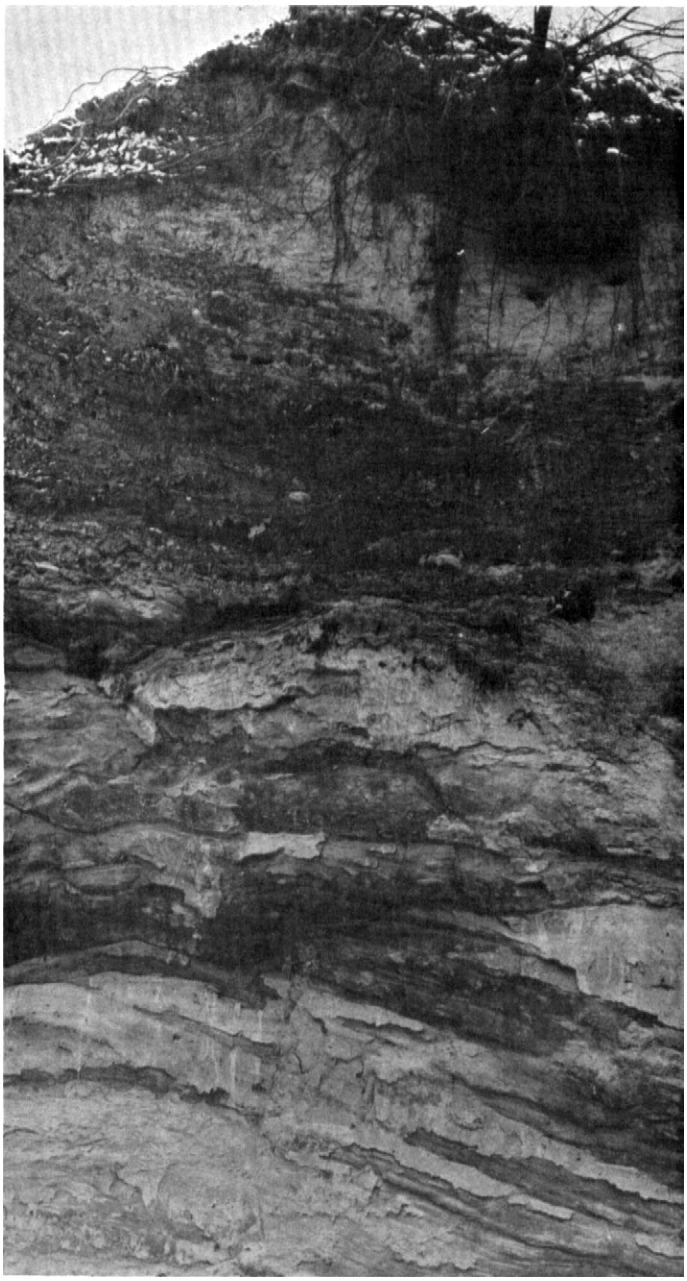


Figure 14.—Pit in glacial outwash has exposed this profile of Chili silt loam, 8 to 15 percent slopes. The substratum is stratified sands and gravel.

Typically this soil has a dark brown loam surface layer about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 5 inches is yellowish brown, friable loam; the next 20 inches is strong brown and yellowish brown, friable clay loam and channery sandy clay loam; and the lower 5 inches is yellowish brown, very friable channery sandy loam. The substratum to a depth of 70 inches is yellowish brown, very friable very channery sandy loam. Weathered sandstone bedrock is at a depth of about 70 inches.

Included with this soil is mapping are a few small areas of nearly level and sloping Clymer soils and similar soils that contain less sand throughout the solum. Small scattered areas of Hazleton, Gilpin, Weikert, Wharton, Culleoka, Tilsit, and Upshur soils are also included.

Permeability is moderate, and available water capacity is moderate to high. Runoff is medium. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most of the acreage is cropland. Small areas are pasture, woodland, and urban developments.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and part of it is wooded. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Limitations are few for most nonfarm uses. Depth to bedrock is a limitation for onsite disposal of waste and construction of buildings with basements.

Capability subclass is IIe. The woodland symbol is 2o.

CmC—Clymer loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on side slopes in dissected residual uplands. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape and range from 2 to 50 acres.

Typically this soil has a dark brown loam surface layer about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 5 inches is yellowish brown, friable loam; the next 20 inches is strong brown and yellowish brown, friable clay loam and channery sandy clay loam; and the lower 5 inches is yellowish brown, very friable channery sandy loam. The substratum to a depth of 70 inches is yellowish brown, very friable very channery sandy loam. Weathered sandstone bedrock is at a depth of about 70 inches.

Included with this soil in mapping are a few small areas of gently sloping and moderately steep Clymer soils and similar soils that contain less sand in the surface layer and subsoil. Small scattered areas of Hazleton, Gilpin, Weikert, Wharton, Tilsit, Ernest, Culleoka, and Upshur soils are also included.

Permeability is moderate, and available water capacity is moderate to high. Runoff is medium to rapid. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most of the acreage is cropland. Some areas are pasture, woodland, or urban developments.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and a moderate acreage is wooded. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

Slope and depth to bedrock are limitations for some nonfarm uses. They are limitations for onsite disposal of waste and construction of buildings with basements.

The capability subclass is IIIe. The woodland symbol is 2o.

CmD—Clymer loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on hillsides in dissected residual uplands. Slopes are smooth or convex and are generally 100 to 300 feet long. Areas are long and narrow and range from 2 to 20 acres.

Typically this soil has a dark brown loam surface layer about 8 inches thick. The subsoil extends to a depth of 38 inches. The upper 5 inches is yellowish brown, friable loam; the next 20 inches is strong brown and yellowish brown, friable clay loam and channery sandy clay loam; and the lower 5 inches is yellowish brown, very friable channery sandy loam. The substratum to a depth of 70 inches is yellowish brown very friable very channery sandy loam. Weathered sandstone is at a depth of about 70 inches.

Included with this soil in mapping are a few small areas of sloping and steep Clymer soils and similar soils that contain less sand in the surface layer and subsoil. Small scattered areas of Hazleton, Gilpin, Weikert, Culleoka, Ernest, Wharton, and Upshur soils are also included.

Permeability is moderate, and available water capacity is moderate to high. Runoff is rapid. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most areas are wooded. Some of the acreage is pasture or cropland.

The hazard of erosion is very severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, grassed waterways, cover crops, crop residue, and hay in the cropping system reduce runoff and help to control erosion.

This soil is fairly well suited to well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and a large acreage is wooded. Potential productivity is high. Slope is a management problem. Machine planting is possible in large areas.

The moderately steep slopes are limitations for most nonfarm uses. Moderately steep slopes and depth to bedrock are limitations for onsite disposal of waste and construction of buildings, streets, and roads.

The capability subclass is IVe. The woodland symbol is 2r.

CoB—Conotton gravelly loam, 3 to 8 percent slopes. This gently sloping, deep, well drained and somewhat excessively drained soil is on outwash plains, kames, and terraces in glaciated areas. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape and are mainly 2 to 20 acres.

Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown very friable very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand.

Included with this soil in mapping are a few small areas of nearly level and sloping Conotton soils, soils that contain less clay in the surface layer and subsoil, and soils with a very gravelly surface layer. Small scattered areas of Chili, Braceville, Rexford, Canadice, Wooster, Canfield, and Ravenna soils are also included.

Permeability is rapid, and available water capacity is moderate to low. Runoff is medium. The surface layer is more than 15 percent gravel. In unlimed areas, the soil is very strongly acid and strongly acid in the surface layer and upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum.

Most of the acreage is cropland. Small areas are pasture and woodland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management, but they may be damaged by the low available water during periods of low rainfall. Stripcropping, minimum tillage, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, but only a small acreage is wooded. Productivity is moderately high. Loss of

seedlings is the major management problem. Machine planting is practical in large areas.

The gravelly surface and slope are limitations for nonfarm uses. If this soil is used for onsite disposal of waste, ground water contamination is possible because of rapid permeability in the gravelly substratum.

The capability subclass is IIIs. The woodland symbol is 3f.

CoC—Conotton gravelly loam, 8 to 15 percent slopes. This sloping, deep, well drained and somewhat excessively drained soil is on outwash plains, kames, and terraces in glaciated areas. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape to long and narrow and are mainly 2 to 20 acres.

Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown very friable and very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand.

Included with this soil in mapping are a few small areas of gently sloping and moderately steep Conotton soils, similar soils that contain less clay in the surface layer and subsoil, and soils with a very gravelly surface layer. Small scattered areas of Chili, Wooster, Braceville, Canfield, Ravenna, and Rexford soils are also included.

Permeability is rapid, and available water capacity is low. Runoff is medium to rapid. The surface layer is more than 15 percent gravel. In unlimed areas, the soil is very strongly acid and strongly acid in the surface layer and upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum.

Most of the acreage is cropland, pasture, and woodland or is idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management, but they may be damaged by low available water during periods of low rainfall. Contour stripcropping, minimum tillage, diversions, and grassed waterways help to control erosion. Growing cover crops, utilizing crop residue and including hay in the cropping system maintain the organic matter content and good tilth. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is moderately high. Seedling mortality is the main management problem. Machine planting is practical in large areas.

The gravelly surface and slope are limitations for nonfarm uses. If this soil is used for onsite disposal of waste, ground water contamination is possible because of rapid permeability in the gravelly substratum.

The capability subclass is IVe. The woodland symbol is 3f.

CoD—Conotton gravelly loam, 15 to 25 percent slopes. This moderately steep, deep, well drained and somewhat excessively drained soil is on kames, terraces, and eskers in glaciated areas. Slopes are convex and are generally 100 to 300 feet long. Areas are long and narrow. Most range from 2 to 20 acres.

Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown, very friable very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand.

Included with this soil in mapping are a few small areas of sloping, steep, and very steep Conotton soils, similar soils that contain less clay in the solum, and soils with a very gravelly surface layer. Small scattered areas of Chili, Wooster, Loudonville, Canfield, and Braceville soils are also included.

Permeability is rapid, and available water capacity is low. Runoff is rapid. The surface layer is more than 15 percent gravel. In unlimed areas, the soil is very strongly acid and strongly acid in the surface layer and in the upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum.

Most areas are wooded or idle. Some of the acreage is cropland and pasture.

This soil can be used for cropland with adequate management practices. If it is used for cultivated crops, it has a very severe hazard of erosion. Crops can be damaged by the low available water during periods of low rainfall. Contour stripcropping, minimum tillage, grassed waterways, cover crops, crop residue, and hay in the cropping system reduce runoff and help to control erosion. The gravelly surface may interfere with the seeding of small grain.

This soil is fairly well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is moderately high. The seedling mortality and equipment limitations are the major management problems. Machine planting is usually possible in large areas.

The moderately steep slopes are limitations for nonfarm uses, for example, onsite disposal of waste. Ground water contamination is possible because of the gravelly substratum.

The capability subclass is VIe. The woodland symbol is 3f.

CoF—Conotton gravelly loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained and somewhat excessively drained soil is on kames, eskers, and side slopes in glacial areas. Slopes are smooth or convex and are generally 100 to 300 feet long. Areas are long and narrow. Most range from 2 to 30 acres.

Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown, very friable very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand.

Included with this soil in mapping are a few small areas of sloping and moderately steep Conotton soils, similar soils that contain less clay in the solum, and soils with a very gravelly surface layer. Small scattered areas of Loudonville, Wooster, Hazleton, Gilpin, and Weikert soils are also included.

Permeability is rapid, and available water capacity is low. Runoff is rapid or very rapid. The surface layer is more than 15 percent gravel. In unlimed areas, this soil is very strongly acid and strongly acid in the surface layer and upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum.

Most areas are wooded or idle. Some of the acreage is pasture.

This soil is too steep to be used for cropland, and it is generally poorly suited to pasture.

This soil is fairly well suited to trees. Productivity is moderately high. Major management problems are related to steep slopes.

Steep and very steep slopes are limitations for nonfarm uses. In suburban areas, this soil can be used for wildlife habitat, some undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is VIIe. The woodland symbol is 3f.

CuB—Culleoka silt loam, 3 to 8 percent slopes. This gently sloping, moderately deep, well drained soil is on ridgetops in residual uplands. Slopes are smooth or convex. Most are 100 to 400 feet long. Areas are irregular in shape or long and narrow and range from 5 to 100 acres.

Typically this soil has a dark yellowish brown silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and light silty clay loam. The substratum to a depth of 32 inches is yellowish brown, firm shaly light silty clay loam. Weathered shale and siltstone are at a depth of 32 inches.

Included in mapping are small areas of nearly level and sloping Culleoka soils, similar soils that contain more coarse fragments throughout the surface layer and subsoil, and similar soils that are deeper to bedrock. Also included are small areas of Guernsey, Gilpin, Vandergrift, Upshur, Clymer, Hazleton, Tilsit, and Wharton soils.

Permeability is moderate, and available water capacity is moderate to high. In unlimed areas, this soil is medium acid or strongly acid in the surface layer and subsoil and strongly acid to slightly acid in the substratum. Runoff is medium. Roots are restricted by the bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland and woodland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Erosion will result in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are stripcropping, minimum tillage, cover crops, and grass and legumes in the cropping system. Where the topography is suitable, contour stripcropping can be used. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

This soil is well suited to trees, and a moderate acreage is wooded. Potential productivity is high, but roots are restricted by bedrock. Removing undesirable species increases production. Machine planting in large areas is generally practical.

Moderate depth to bedrock is a limitation for some nonfarm uses. It is a limitation for onsite disposal of waste and in excavating for buildings. If the soil is disturbed in construction, management practices may be needed to control erosion and sediment.

The capability subclass is IIe. The woodland symbol is 2o.

CuC—Culleoka silt loam, 8 to 15 percent slopes. This sloping, moderately deep, well drained soil is on ridgetops and side slopes in dissected residual uplands. Slopes are smooth or convex and are about 100 to 400 feet long. Areas are irregular in shape or long and narrow and range from 4 to 50 acres.

Typically this soil has a dark yellowish brown silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and light silty clay loam. The substratum to a depth of 32 inches is yellowish brown, firm shaly light silty clay loam. Weathered siltstone and shale are at a depth of 32 inches.

Included in mapping are small areas of gently sloping and moderately steep Culleoka soils, similar soils that contain more coarse fragments in the surface layer and subsoil, and similar soils that are deeper to bedrock. Also included are small areas of Guernsey, Gilpin, Vandergrift, Upshur, Clymer, Hazleton, Tilsit, and Wharton soils.

Permeability is moderate, and available water capacity is moderate to high. In unlimed areas, this soil is medium

acid or strongly acid in the surface layer and subsoil and slightly acid to strongly acid in the substratum. Runoff is medium to rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland and woodland.

The hazard of erosion is severe if this soil is used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

This soil is well suited to trees, and a considerable acreage is wooded. Potential productivity is high, but roots may be restricted by bedrock. Removing undesirable species increases production. Machine planting in large areas is generally practical.

Slope and moderate depth to bedrock are limitations for most nonfarm uses. They are limitations for onsite disposal of waste and excavating for buildings. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 2o.

CuD—Culleoka silt loam, 15 to 25 percent slopes. This moderately steep, moderately deep, well drained soil is on hillsides and side slopes in dissected residual uplands. Slopes are smooth or convex and are about 100 to 300 feet long. Most areas are long and narrow and range from 3 to 30 acres.

Typically this soil has a dark yellowish brown silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and light silty clay loam. The substratum to a depth of 32 inches is yellowish brown, firm shaly light silty clay loam. Weathered siltstone and shale are at a depth of 32 inches.

Included in mapping are small areas of sloping and steep Culleoka soils, similar soils that contain more coarse fragments throughout the surface layer and subsoil, and similar soils that are deeper to bedrock. Also included are small areas of Gilpin, Vandergrift, Upshur, Weikert, Clymer, Hazleton, and Tilsit soils.

Permeability is moderate, and available water capacity is moderate to high. In unlimed areas, this soil is medium acid or strongly acid in the surface layer and subsoil, and slightly acid to strongly acid in the substratum. Runoff is rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most areas are wooded.

This soil can be used for cropland with adequate management practices. If it is used for cultivated crops, the hazard of erosion is very severe. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are contour stripcropping, grassed waterways, cover crops, and grass and legumes in the cropping system. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is fairly well suited to well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

This soil is well suited to trees, and a large acreage is wooded. Potential productivity is high, but roots may be restricted by bedrock. Removing undesirable species increases production. Machine planting is generally limited because of slope.

The moderately steep slopes and moderate depth to bedrock are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IVe. The woodland symbol is 2r.

Du—Dumps. Dumps are mainly near industrial developments along major waterways. Small scattered areas are in other parts of the survey area. Slopes range from nearly level to very steep and are smooth or convex. Areas are irregular in shape or long and narrow and range from 2 to 200 acres.

Dumps consist mostly of waste material from steel, chemical, and other industries (fig. 15). Some accumulations are smooth. Some are uneven. Some consist of piles. In places they are mixed with rock fragments and soil material.

Included in mapping are small areas of Pope, Philo, Atkins, Lobdell, Holly, Ernest, Brinkerton, Tyler, Purdy, and Canadice soils. Also included are bedrock escarpments and a few areas of sanitary landfill, Urban land, and Arents. Included soils make up about 20 percent of the map unit.

Permeability, available water capacity, runoff, internal drainage, reaction, and depth to bedrock are variable. Depressions are frequently ponded.

Most areas are barren. A few are sparsely vegetated with grasses and brush. Industrial developments have been built on a small part of this area.

Most of this area is too toxic to support vegetation. A careful onsite investigation is needed to determine the potentials and limitations for any proposed use.

Dumps are not assigned to interpretive groupings.

ErB—Ernest silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on foot slopes, benches, and depressions in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape to long and narrow and range from 3 to 30 acres or more.

Figure 15.—Typical area of Dumps near the Ohio River. It consists dominantly of waste material from steel and related industries.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 4 inches is yellowish brown, friable silt loam; the next 12 inches is yellowish brown, friable heavy silt loam and light silty clay loam that is mottled in the lower 7 inches; and the lower 20 inches is mottled strong brown, very firm and brittle heavy silt loam. The substratum to a depth of 60 inches is mottled yellowish brown, firm heavy silt loam.

Included with this soil in mapping are small areas of nearly level and sloping Ernest soils and similar soils that contain more sand or more coarse fragments throughout. A few scattered areas of Wharton, Cavode, Brinkerton, Tilsit, Gilpin, Guernsey, and Vandergrift soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is medium. The seasonal high water table is 18 to 30 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is strongly acid or very strongly acid throughout. Roots are restricted by the fragipan at a depth of 20 to 30 inches.

Most of the acreage is cropland or pasture.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Diversions and subsurface drains are needed to remove excess water and provide for timely tillage.

This soil is well suited to pasture. Overgrazing and grazing when wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted briefly during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The moderately slow and slow permeability and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements.

The capability subclass is IIe. The woodland symbol is 2o.

ErC—Ernest silt loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on foot slopes and benches in residual uplands. Slopes are

smooth or concave and are generally 100 to 600 feet long. Areas are irregular in shape to long and narrow and range from 3 to 30 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 4 inches is yellowish brown, friable silt loam; the next 12 inches is yellowish brown, friable heavy silt loam and light silty clay loam that is mottled in the lower 7 inches; and the lower 20 inches is mottled strong brown, very firm and brittle heavy silt loam. The substratum to a depth of 60 inches is mottled yellowish brown, firm heavy silt loam.

Included with this soil in mapping are small areas of gently sloping and moderately steep Ernest soils and similar soils that contain more sand or more coarse fragments throughout. A few scattered areas of Wharton, Cavode, Brinkerton, Tilsit, Gilpin, Guernsey, Hazleton, and Vandergrift soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is medium to rapid. The seasonal high water table is 18 to 30 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is strongly acid or very strongly acid throughout. Roots are restricted by the fragipan at a depth of 20 to 30 inches.

Most of the acreage is cropland, woodland, and pasture.

The hazard of erosion is severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, diversions, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Subsurface drains are needed to help remove excess ground water and provide for timely tillage.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted briefly during wet seasons because of the seasonal high water table. Erosion may be a problem when the soil is disturbed. Machine planting is practical in the larger areas.

The moderately slow and slow permeability and seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If the soil is disturbed for construction, practices will be needed to reduce runoff and sediment.

The capability subclass is IIIe. The woodland symbol is 2r.

ErD—Ernest silt loam, 15 to 25 percent slopes. This moderately steep, deep, moderately well drained soil is on benches and foot slopes in residual uplands. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are long and narrow and range from 3 to 20 acres or more.

Typically, this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 4 inches is yellowish brown, friable silt loam; the next 12 inches is yellowish brown, friable heavy silt loam and light silty clay loam that is mottled in the lower 7 inches; and the lower 20 inches is mottled strong brown, very firm and brittle heavy silt loam. The substratum to a depth of 60 inches is mottled yellowish brown, firm heavy silt loam.

Included with this soil in mapping are small areas of sloping and steep Ernest soils and similar soils that contain more sand or more coarse fragments throughout. A few scattered areas of Wharton, Cavode, Gilpin, Weikert, Guernsey, Vandergrift, and Hazleton soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is rapid. The seasonal high water table is 18 to 36 inches below the surface during wet seasons. In unlimed areas, this soil is strongly acid or very strongly acid throughout. Roots are restricted by the fragipan at a depth of 20 to 30 inches.

Most areas are woodland and pasture or are idle.

This soil can be used for cropland with adequate management practices. If it is used for cultivated crops, the hazard of erosion is very severe. Contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system are measures that reduce runoff and help to control erosion. Subsurface drains remove excess water from seeps and wet weather springs and provide for timely tillage.

This soil is fairly well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees, and a considerable acreage is wooded. Removing undesirable species increases production. Use of equipment is restricted by slope. Machine planting is usually possible in the larger areas.

The moderately steep slopes, moderately slow and slow permeability, and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste, and the construction of buildings, streets, and roads. If this soil is disturbed for construction, practices will be needed to reduce runoff and sediment.

The capability subclass is IVe. The woodland symbol is 2r.

EsD—Ernest very stony silt loam, 8 to 25 percent slopes. This sloping to moderately steep, deep, moderately well drained, very stony soil is on foot slopes and benches in residual uplands. Slopes are smooth, convex, or concave and are generally 100 to 600 feet long. Areas are irregular in shape to long and narrow and range from 3 to 50 acres or more.

In woodland, this soil typically has a very dark grayish brown silt loam surface layer about 2 inches thick. The subsurface layer is yellowish brown, very friable silt loam about 6 inches thick. The subsoil extends to a depth of 44 inches. The upper 4 inches is yellowish brown, friable silt loam; the next 12 inches is yellowish brown, friable heavy silt loam and light silty clay loam that is mottled in the lower 7 inches; and the lower 20 inches is mottled strong brown, very firm and brittle heavy silt loam. The substratum to a depth of 60 inches is mottled yellowish brown, firm heavy silt loam.

Included with this soil in mapping are small areas of gently sloping and steep very stony Ernest soils, similar soils that contain more sand and coarse fragments throughout, and soils that are not stony. A few scattered areas of Weikert, Gilpin, Hazleton, Wharton, Cavode, Vandergrift, Upshur, Guernsey, and Brinkerton soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is medium to rapid. The seasonal high water table is 18 to 36 inches below the surface during wet seasons. In unlimed areas, this soil is strongly acid or very strongly acid throughout. About 3 to 15 percent of the surface is covered with stones that range from 1 foot to 4 feet or more in diameter. Roots are restricted by the fragipan at a depth of 20 to 30 inches.

Most areas are wooded. A few small areas are pasture.

This soil is too stony to be used for cropland, and it is generally poorly suited to pasture. It is too stony for common management practices of renovation, liming, fertilizing, and mowing. Pastures are usually areas cleared of trees that have revegetated in native grasses.

This soil is well suited to trees. A large acreage is wooded. Removing undesirable species increases production. Use of equipment is restricted by the slope.

This soil has limitations for nonfarm uses because it is very stony, sloping to moderately steep, has a seasonal high water table, and has a moderately slow and slow permeability. In suburban areas, it is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in trees, shrubs, or grass.

The capability subclass is VIs. The woodland symbol is 2r.

FnA—Frenchtown silt loam, 0 to 3 percent slopes. This nearly level, deep, poorly drained soil is on flats and in depressions in glaciated uplands. Slopes are smooth and are about 200 to 600 feet long. Areas are irregular in shape and range from 2 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 10 inches is mottled light brownish gray, friable and firm silt loam and light silty clay loam; and the lower 26 inches is mottled brown and grayish brown, very firm and brittle silt loam. The substratum to a depth of 60 inches is mottled grayish brown, firm silt loam.

Included with this soil in mapping are small areas of gently sloping Frenchtown soils and similar soils that contain more sand in the subsoil and substratum. Small scattered areas of Canadice, Holly, Sloan, Ravenna, and Rexford soils are also included.

Permeability is slow and very slow, and available water capacity is moderate. In unlimed areas, this soil is very strongly acid to medium acid in the upper part of the solum, slightly acid to strongly acid in the lower part, and medium acid to mildly alkaline in the substratum. The high water table is within 12 inches of the surface most of the year. Runoff is slow and ponding is common during wet seasons. Frequent, brief flooding occurs in depressions in minor drainageways. Roots are restricted by the high water table and the fragipan at a depth of 16 to 32 inches.

Most areas are woodland and pasture.

This soil can be used for cropland if it is properly drained. If it is used for cultivated crops, excess water delays plowing and causes it to warm slowly in spring. Crops can be damaged by ponded water following intensive rainfall. Excess surface water can be removed by keeping natural drainageways open and by constructing surface drains. Subsurface drains, where outlets are available, improve internal drainage.

This soil is fairly well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Natural drainageways should be kept open. Covered drains, where outlets are available, and open drains reduce wetness. Rotation of pasture and restricted grazing during wet periods are the chief management needs.

This soil is well suited to moisture-tolerant trees. Part of the area is wooded. Potential productivity is very high, but roots are restricted by the high water table and the fragipan. Use of equipment is restricted for most of the year because of the high water table. Machine planting in large areas is practical where the soil is drained.

The high water table and slow and very slow permeability are limitations for most nonfarm uses. These limitations are serious for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil can be used for wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, trees, or shrubs.

The capability subclass is IIIw. The woodland symbol is 1w.

FnB—Frenchtown silt loam, 3 to 8 percent slopes. This gently sloping, deep, poorly drained soil is on broad

low-lying glaciated uplands. The slopes are smooth or concave and are about 100 to 600 feet long. Areas are irregular in shape and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 10 inches is mottled light brownish gray, friable and firm silt loam and light silty clay loam; and the lower 26 inches is mottled brown and grayish brown, very firm and brittle silt loam. The substratum to a depth of 60 inches is mottled grayish brown, firm silt loam.

Included with this soil in mapping are small areas of nearly level and sloping Frenchtown soils and similar soils that contain more sand in the subsoil and substratum. Small scattered areas of Ravenna, Rexford, Canfield, Canadice, and Holly soils are also included.

Permeability is slow and very slow, and available water capacity is moderate. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil, slightly acid to strongly acid in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum. The high water table is within 12 inches of the surface most of the year. Runoff is slow to medium. Roots are restricted by the high water table and by the fragipan at a depth of 16 to 32 inches.

Most areas are woodland and pasture.

Adequately drained, this soil can be used for cropland. If it is used for cultivated crops, the hazard of erosion is moderate. Excess water delays plowing and causes the soil to warm slowly in spring. Surface drains, and subsurface drains where outlets are available, improve drainage. Graded or contour stripcropping, minimum tillage, cover crops, and grass and legumes in the cropping system help to control erosion and improve tilth.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Covered drains, where outlets are available, reduce wetness. Rotation of pasture and restricted grazing during wet periods are the chief management needs.

This soil is well suited to moisture-tolerant trees. Part of the area is wooded. Potential productivity is very high, but roots are restricted by the high water table and the fragipan. Use of equipment is restricted part of the year because of the high water table. Machine planting in large areas is usually practical during dry periods.

The high water table and slow and very slow permeability are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil can be used for wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, trees, or shrubs.

The capability subclass is IIIw. The woodland symbol is 1w.

GnB—Gilpin silt loam, 3 to 8 percent slopes. This gently sloping, moderately deep, well drained soil is on ridges in residual uplands. Slopes are smooth or convex and are 200 to 500 feet long. Areas are usually irregular in shape and range from 3 to 30 acres.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are small areas of nearly level and sloping Gilpin soils and similar soils that contain more coarse fragments in the surface layer and subsoil, have fewer coarse fragments in the surface layer and upper part of the subsoil, or are deeper than 40 inches to bedrock. Also included are small areas of Weikert, Clymer, Hazleton, Culleoka, Wharton, Tilsit, and Canfield soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is strongly acid to extremely acid throughout. Runoff is medium. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland, pasture, and woodland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping systems. Where the topography is suitable, contour stripcropping should be used. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and some of the area is wooded. Potential productivity is high, but roots may be restricted by bedrock. Removing undesirable species increases production. Machine planting in large areas is generally practical.

Shallowness over bedrock is a limitation for some nonfarm uses, for example, onsite disposal of waste and excavating for buildings with basements. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIe. The woodland symbol is 2o.

GnC—Gilpin silt loam, 8 to 15 percent slopes. This sloping, moderately deep, well drained soil is on ridges and side slopes in residual uplands (fig. 16). Slopes are smooth or convex and are about 150 to 500 feet long. Most areas are irregular in shape or long and narrow and range from 4 to 50 acres.

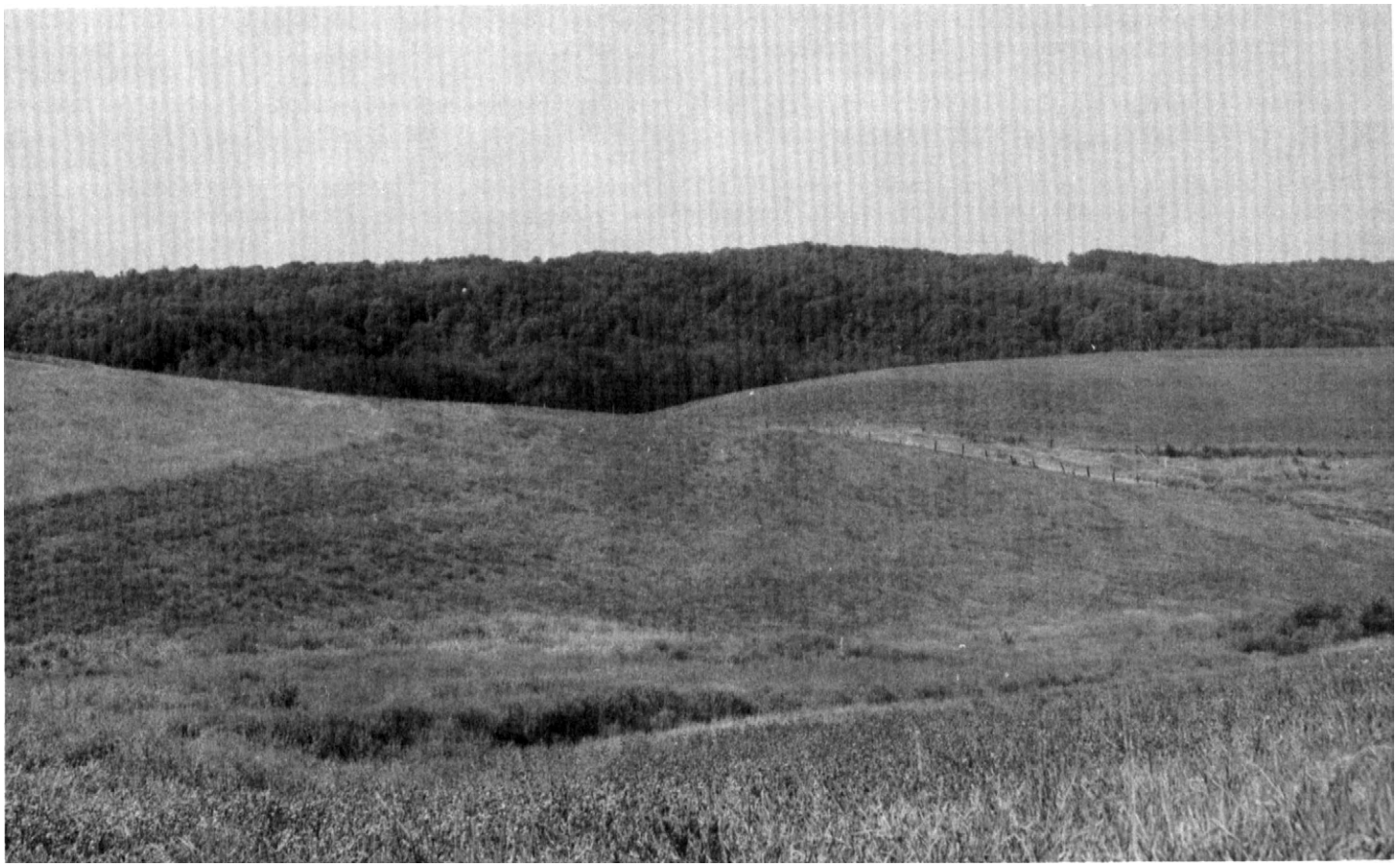


Figure 16.—Typical landscape of Gilpin silt loam, 8 to 15 percent slopes and 15 to 25 percent slopes. Ernest silt loam, 8 to 15 percent slopes, is in the left foreground and drainageway. Woodland in the background is on Gilpin-Weikert complex, 25 to 70 percent slopes.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are small areas of gently sloping and moderately steep Gilpin soils and similar soils that contain more coarse fragments throughout the surface layer and subsoil and some that are deeper than 40 inches to bedrock. Also included are small areas of Weikert, Clymer, Hazleton, Culleoka, Wharton, Tilsit, Guernsey, Ernest, and Canfield soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is strongly acid to extremely acid throughout. Runoff is medium to rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland, pasture, and woodland.

The hazard of erosion is severe if this soil is used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Where the topography is suitable, diversions can be used to control runoff on long slopes. Incorporating some crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and much of it is wooded. Potential productivity is high, but roots may be restricted by bedrock. Removing undesirable species increases production. Machine planting in large areas is generally practical.

Slope and moderate depth to bedrock are limitations for some nonfarm uses, for example, onsite disposal of

waste and excavating for buildings with basements. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 2o.

GnD—Gilpin silt loam, 15 to 25 percent slopes. This moderately steep, moderately deep, well drained soil is on hillsides and side slopes in dissected residual uplands (fig. 16). Slopes are smooth or convex and are about 150 to 600 feet long. Most areas are long and narrow and range from 4 to 60 acres.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are small areas of sloping and steep Gilpin soils and similar soils that contain more coarse fragments throughout or are deeper than 40 inches to bedrock. Also included are small areas of Weikert, Hazleton, Wharton, Vandergrift, Upshur, and Canfield soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas this soil is strongly acid to extremely acid throughout. Runoff is rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most areas are woodland.

This soil can be used for cropland with adequate management practices. If it is used for cultivated crops, the hazard of erosion is very severe. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Incorporating some crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is fairly well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and a large acreage is wooded. Potential productivity is high, but roots may be restricted by bedrock. A management problem is equipment limitations because of slope. Removing undesirable species increases production. Machine planting in large areas is generally practical, but it is limited by slope.

The moderately steep slopes and moderate depth to bedrock are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IVe. The woodland symbol is 2r.

GpB—Gilpin-Upshur complex, 3 to 8 percent slopes. These gently sloping, moderately deep and deep, well drained soils are on ridges and benches in residual uplands. Slopes are smooth, convex, or concave and are generally 150 to 300 feet long. Areas are long and narrow and range from 2 to 20 acres. Gilpin and Upshur soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 60 percent of this complex. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

The Upshur soil makes up about 25 percent of this complex. Typically this soil has a reddish brown silty clay loam surface layer about 5 inches thick. The subsoil extends to a depth of 40 inches. It is dark reddish brown and dusky red, firm heavy silty clay and clay. The substratum to a depth of 60 inches is dusky red, firm very shaly silty clay.

Included with these soils in mapping are a few small areas of nearly level and sloping Gilpin and Upshur soils, soils that are similar to the Gilpin soil but contain more clay in the surface layer and subsoil, and soils that are similar to the Upshur soil but are mottled in the lower part of the surface layer and subsoil. Also included are small scattered areas of Weikert, Culleoka, Guernsey, Vandergrift, Cavode, and Wharton soils.

Permeability is moderate for the Gilpin soil, and available water capacity is moderate. Permeability is slow for the Upshur soil, and available water capacity is moderate. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout, and the Upshur soil is very strongly acid to medium acid in the upper 20 inches and very strongly acid to neutral below 20 inches. Runoff is medium to rapid on both soils. Roots may be restricted by shale bedrock at a depth of 20 to 40 inches in the Gilpin soil and by the firm clayey subsoil and substratum of the Upshur soil. The Upshur soil has a high shrink-swell potential, is unstable, and is subject to slips and landslides.

Most of the acreage is cropland and woodland.

The hazard of erosion is severe if these soils are used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and erosion are stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Where the topography is suitable, contour stripcropping should be used. Incorporating crop residue into the surface layer maintains organic matter content and reduces the tendency of the soils to clod and crust.

These soils are well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

These soils are well suited to trees, and a large acreage is woodland. Potential productivity is high for the Gilpin soil and moderately high for the Upshur soil. Roots may be restricted by the moderate depth to bedrock in the Gilpin soil and by the clayey subsoil and substratum in the Upshur soil. Removing undesirable species increases production. Low strength and the clayey texture are equipment limitations on Upshur soil. Machine planting in large areas is generally practical.

These soils are limited for most nonfarm uses. The Gilpin soil has bedrock at a depth of 20 to 40 inches. Upshur soil has a slowly permeable, clayey subsoil and substratum that have a high shrink-swell potential. The Upshur soil is unstable and subject to slips and landslides. These limitations are severe for onsite disposal of waste and for construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion and increase stability.

The capability subclass is IIIe. The woodland symbol is 2o for Gilpin soil and 3c for Upshur soil.

GpC—Gilpin-Upshur complex, 8 to 15 percent slopes. These sloping, moderately deep and deep, well drained soils are on ridges, side slopes, and benches in residual uplands. Slopes are smooth, convex, or concave and are 100 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres. Gilpin and Upshur soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 60 percent of this complex. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

The Upshur soil makes up about 25 percent of this complex. Typically this soil has a reddish brown silty clay loam surface layer about 5 inches thick. The subsoil extends to a depth of 40 inches. It is dark reddish brown and dusky red, firm heavy silty clay and clay. The substratum to a depth of 60 inches is dusky red, firm very shaly silty clay.

Included with these soils in mapping are a few small areas of gently sloping and moderately steep Gilpin and Upshur soils, soils similar to the Gilpin soils that contain more clay in the surface layer and subsoil, and soils similar to the Upshur soils that are mottled in the lower part of the subsoil. Also included are small scattered areas of Weikert, Culleoka, Vandergrift, Guernsey, Wharton, Cavode, and Ernest soils.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is slow in the Upshur soil, and available water capacity is moderate to high. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Upshur soil is very strongly acid to medium acid in the upper 20 inches and very strongly acid to neutral below 20 inches. Runoff is medium to rapid on both soils. Roots may be restricted by shale bedrock at a depth of 20 to 40 inches in the Gilpin soil and by the firm clayey subsoil and substratum in the Upshur soil. The Upshur soil has a high shrink-swell potential, is unstable, and subject to slips and landslides.

Most of the acreage is cropland and woodland.

The hazard of erosion is very severe if these soils are used for cultivated crops. Erosion will result in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Incorporating some crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soil to clod and crust.

These soils are well suited to pasture. Proper stocking to maintain key plant species and rotation of the pasture are the chief management needs.

These soils are well suited to trees, and a large acreage is wooded. Potential productivity is high for the Gilpin soil and moderately high for the Upshur soil. Roots may be restricted by bedrock in the Gilpin soil and by the clayey subsoil and substratum of the Upshur soil. Removing undesirable species will increase production. A management problem is the equipment limitation on Upshur soil because of the low strength and clayey texture. Machine planting in large areas is generally practical.

These soils have limitations for most nonfarm uses. The Gilpin soil has bedrock at a depth of 20 to 40 inches. The Upshur soil has a slowly permeable clayey subsoil and substratum that have a high shrink-swell potential. The Upshur soil is unstable and subject to slips and landslides. These limitations are severe for onsite disposal of waste and for construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion and increase stability.

The capability subclass is IVe. The woodland symbol is 2o for the Gilpin soil and 3c for the Upshur soil.

GpD—Gilpin-Upshur complex, 15 to 25 percent slopes. These moderately steep, moderately deep and deep, well drained soils are on hillsides and benches in residual uplands. Slopes are smooth, convex, or concave. Most are 100 to 400 feet long. Areas are long and narrow and range from 3 to 60 acres. Gilpin and Upshur soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 60 percent of this complex. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of

30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

The Upshur soil makes up about 25 percent of this complex. Typically this soil has a reddish brown silty clay loam surface layer about 5 inches thick. The subsoil extends to a depth of 40 inches. It is dark reddish brown and dusky red, firm heavy silty clay and clay. The substratum to a depth of 60 inches is dusky red, firm very shaly silty clay.

Included with these soils in mapping are a few small areas of sloping and steep Gilpin and Upshur soils, soils similar to the Gilpin soil that contain more clay in the surface layer and subsoil, and soils similar to the Upshur soil that are mottled in the lower part of the subsoil or have bedrock at a depth of less than 40 inches. Also included are small scattered areas of Weikert, Vandergrift, Culleoka, Guernsey, Wharton, Cavode, and Ernest soils.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is slow in the Upshur soil, and available water capacity is moderate to high. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Upshur soil is very strongly acid to medium acid in the upper 20 inches and very strongly acid to neutral below. Runoff is rapid on both soils. Roots may be restricted by shale bedrock at a depth of 20 to 40 inches in the Gilpin soil and by the firm clayey subsoil and substratum in the Upshur soil. The Upshur soil has a high shrink-swell potential. It is unstable and subject to slips and landslides.

Most areas are wooded or idle.

These soils are poorly suited to cultivated crops, but they are fairly well suited to grasses and legumes for permanent hay or pasture. If they are used for pasture, proper stocking to maintain key plant species and rotation of the pasture are the chief management needs.

These soils are well suited to trees, and a large acreage is wooded. Potential productivity is high for the Gilpin soil, and moderately high for Upshur soil. Roots are restricted by bedrock in the Gilpin soil and by the clayey subsoil and substratum in the Upshur soil. Removing undesirable species increases production. One management problem is the limited use of equipment for planting, managing, and harvesting because of the moderately steep slopes, low strength, and clayey texture.

These soils have limitations for nonfarm uses. The Gilpin soil is moderately steep and has bedrock at a depth of 20 to 40 inches. The Upshur soil is moderately steep and has a slowly permeable, clayey subsoil and substratum that have a high shrink-swell potential. It is unstable and subject to slips and landslides. These limitations are severe for onsite disposal of waste and for construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion and increase stability.

The capability subclass is VIe. The woodland symbol is 2r for the Gilpin soil and 3c for the Upshur soil.

GpF—Gilpin-Upshur complex, 25 to 60 percent slopes. These steep and very steep, moderately deep and deep, well drained soils are on hillsides in residual uplands. Slopes are smooth or convex. Most are 200 to 600 feet long. Areas are long and narrow and range from 5 to 100 acres. Gilpin and Upshur soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 60 percent of this complex. Typically this soil has a very dark grayish brown silt loam surface layer about 3 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

The Upshur soil makes up about 25 percent of this complex. Typically this soil has a very dark brown silty clay loam surface layer about 2 inches thick. The subsurface layer is reddish brown, friable silty clay loam about 3 inches thick. The subsoil extends to a depth of 40 inches. It is dark reddish brown and dusky red, firm silty clay and clay. The substratum to a depth of 60 inches is dusky red, firm very shaly silty clay.

Included with these soils in mapping are a few small areas of moderately steep Gilpin and Upshur soils, soils similar to the Gilpin soil that contain more clay in the surface layer and subsoil, and soils similar to the Upshur soil that are mottled in the lower part of the subsoil or have bedrock at a depth of less than 40 inches. Also included are small scattered areas of Weikert, Hazleton, Ernest, Vandergrift, and Wharton soils.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is slow in the Upshur soil, and available water capacity is moderate to high. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Upshur soil is very strongly acid to medium acid in the upper 20 inches and very strongly acid to neutral below. Runoff is rapid or very rapid in both soils. Roots are restricted by shale bedrock at a depth of 20 to 40 inches in the Gilpin soil and by the clayey subsoil and substratum in the Upshur soil. The Upshur soil has a high shrink-swell potential. It is unstable and subject to slips and landslides.

Most areas are wooded or idle.

These soils are unsuited to cropland and poorly suited to pasture because of the steep and very steep slopes, very severe hazard of erosion, and severe hazard of slips and landslides.

These soils are fairly well suited to well suited to woodland. Potential productivity is high for the Gilpin soil and moderately high for the Upshur soil. Roots are restricted by bedrock in the Gilpin soil and by the clayey subsoil and substratum of the Upshur soil. Removing undesirable species increases production. The steep and very steep slopes, severe hazard of erosion, and low strength are very serious equipment limitations for harvesting and mechanically planting trees.

These soils have serious limitations for nonfarm uses. The Gilpin soil is steep and very steep and has bedrock at a depth of 20 to 40 inches. The Upshur soil is steep and very steep and has a slowly permeable, clayey subsoil and substratum that have a high shrink-swell potential. It is unstable and subject to slips and landslides. These soils should not be disturbed for construction. In areas of suburban development they can be used for wildlife habitat, undeveloped recreation areas, and other open space uses maintained in trees, shrubs, or grass.

The capabilty subclass is VIIe. The woodland symbol is 2r for the Gilpin soil and 3c for Upshur soil.

GsB—Gilpin-Weikert complex, 3 to 8 percent slopes. These gently sloping, moderately deep and shallow, well drained soils are on ridges in residual uplands. Slopes are smooth or convex and are ordinarily 100 to 300 feet long. Areas are long and narrow or irregular in shape and range from 2 to 20 acres. Gilpin and Weikert soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 50 percent of this complex. Typically it has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

The Weikert soil makes up about 35 percent of this complex. Typically this soil has a dark brown shaly silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 15 inches. It is yellowish brown, friable shaly silt loam. The substratum to a depth of 18 inches is yellowish brown, firm very shaly silt loam. Fractured shale is at a depth of 18 inches.

Included with these soils in mapping are a few small areas of nearly level and sloping Gilpin and Weikert soils and small areas of Clymer, Hazleton, Culleoka, Ernest, Wharton, and Cavode soils.

Permeability is moderate for the Gilpin soil, and available water capacity is moderate. Permeability is moderately rapid for the Weikert soil, and available water capacity is very low. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout, and the Weikert soil is medium acid to very strongly acid. Runoff is medium on both soils. Roots are restricted by bedrock at a depth of 10 to 20 inches in the Weikert soil and at a depth of 20 to 40 inches in the Gilpin soil.

Most of the acreage is cropland, pasture, and woodland.

Available water capacity is moderate to very low. The hazard of erosion is severe if these soils are used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Where the topography is suitable, contour stripcropping can be used. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

These soils are fairly well suited to well suited to pasture. Proper stocking to maintain key plant species and rotation of the pasture are the chief management needs. Periodic application of nutrients are needed to maintain fertility. Shallow rooting, drought resistant grasses and legumes are best suited.

These soils are well suited to fairly well suited to trees, and some areas are wooded. Potential productivity is high for Gilpin soil and moderate for Weikert soil. Roots are restricted by the bedrock at a depth of 10 to 40 inches. Removing undesirable species increases production. One management problem is the loss of seedlings because of very low available water capacity in the Weikert soil. Machine planting in large areas is generally practical.

Shallowness over bedrock is the main limitation for some nonfarm uses. It is a limitation for onsite disposal of waste and excavating for buildings with basements. If these soils are disturbed for construction, management practices will be needed to control erosion.

The capability subclass is IIIe. The woodland symbol is 2o for the Gilpin soil and 4d for the Weikert soil.

GsC—Gilpin-Weikert complex, 8 to 15 percent slopes. These sloping, moderately deep and shallow, well drained soils are on ridges and side slopes in residual uplands. Slopes are smooth or convex. Most are 100 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres. Gilpin and Weikert soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 60 percent of this complex. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

The Weikert soil makes up about 25 percent of this complex (fig. 17). Typically this soil has a dark brown shaly silt loam surface layer about 7 inches thick. The subsoil extends to a depth of 15 inches. It is yellowish brown, friable shaly silt loam. The substratum to a depth of 18 inches is yellowish brown, firm very shaly silt loam. Fractured shale is at a depth of 18 inches.

Included with these soils in mapping are a few small areas of gently sloping and moderately steep Gilpin and Weikert soils. Small areas of Wharton, Ernest, Cavode, Clymer, Hazleton, and Culleoka soils are also included.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is moderately rapid in the Weikert soil, and available water capacity

Figure 17.—Profile of Weikert shaly silt loam, in an area of Gilpin-Weikert complex, 8 to 15 percent slopes. Shale bedrock is at a depth of about 15 inches.

is very low. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Weikert soil is medium acid to very strongly acid throughout. Runoff is medium to rapid on both soils. The roots are restricted by shale at a depth of 10 to 20 inches in the Weikert soil and at a depth of 20 to 40 inches in the Gilpin soil.

Most areas are pasture and woodland or are idle. The moderate to very low available water capacity and the very severe hazard of erosion need to be considered if these soils are used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

These soils are fairly well suited to well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility. Shallow rooting, drought resistant grasses and legumes are best suited.

These soils are well suited to fairly well suited to trees, and many areas are wooded. Potential productivity is high for the Gilpin soil and moderate for the Weikert soil. Roots are restricted by the bedrock at a depth of 10 to 40 inches. Removing undesirable species increases production. A management problem is the loss of seedlings because of very low available water capacity in the Weikert soil. Machine planting in large areas is generally practical.

The depth to bedrock and slope are limitations for many nonfarm uses, for example, onsite disposal of waste and excavating for buildings with basements. If these soils are disturbed for construction, management practices will be needed to control erosion.

The capability subclass is IVe. The woodland symbol is 2o for the Gilpin soil and 4d for the Weikert soil.

GsD—Gilpin-Weikert complex, 15 to 25 percent slopes. These moderately steep, moderately deep and shallow, well drained soils are on hillsides and side slopes in dissected residual uplands. Slopes are convex. Most are 100 to 400 feet long. Areas are long and narrow and range from 4 to 40 acres. Gilpin and Weikert soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 50 percent of this complex. Typically this soil has a very dark grayish brown silt loam surface layer about 3 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock are at a depth of 30 inches.

The Weikert soil makes up about 35 percent of this complex. Typically this soil has a very dark grayish brown shaly silt loam surface layer about 2 inches thick. The subsurface layer is yellowish brown, friable shaly silt loam about 5 inches thick. The subsoil extends to a depth of 15 inches. It is yellowish brown, friable shaly silt loam. The substratum to a depth of 18 inches is yellowish brown, firm very shaly silt loam. Fractured shale is at a depth of 18 inches.

Included with these soils in mapping are a few small areas of sloping and steep Gilpin and Weikert soils and scattered areas of Hazleton, Wharton, Ernest, and Culleoka soils. In small areas bedrock occurs at a depth of less than 10 inches or it outcrops on the surface.

Permeability is moderate in the Gilpin soil and available water capacity is moderate. Permeability is moderately rapid in the Weikert soil, and available water capacity is very low. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Weikert soil is medium acid to very strongly acid throughout. Runoff is rapid on both soils. Roots are restricted by bedrock at a depth of 10 to 20 inches in the Weikert soil and at a depth of 20 to 40 inches in the Gilpin soil.

Most areas are wooded or idle.

These soils are poorly suited to cropland because of the very severe erosion hazard, moderate to very low available water capacity, moderately steep slopes, and depth to bedrock. They are fairly well suited to shallow rooting, drought resistant grasses and legumes for permanent hay or pasture. If they are used for pasture, proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

These soils are well suited to fairly well suited to trees. A large acreage is woodland. Potential productivity is high for the Gilpin soil and moderate for the Weikert soil. Roots are restricted by the bedrock at 10 to 40 inches. Removing undesirable species will increase production. A management problem is the loss of seedlings because of very low available water capacity in the Weikert soil. Use of equipment for planting, managing, and harvesting is limited by the moderately steep slopes.

The moderately steep slopes and depth to bedrock are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion.

The capability subclass is VIe. The woodland symbol is 2r for the Gilpin soil and 4d for the Weikert soil.

GsF—Gilpin-Weikert complex, 25 to 70 percent slopes. These steep and very steep, moderately deep and shallow, well drained soils are on hillsides in dissected residual uplands. Slopes are convex or smooth and are usually 100 to 600 feet long. Areas are long and narrow and range from 5 to 100 acres. Gilpin and Weikert soils occur together in such intricate patterns that it was impractical to map them separately.

The Gilpin soil makes up about 45 percent of this complex. Typically this soil has a very dark grayish brown silt loam surface layer about 3 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

The Weikert soil makes up about 35 percent of this complex. Typically this soil has a very dark grayish brown shaly silt loam surface layer about 2 inches thick. The subsurface layer is yellowish brown, friable shaly silt loam about 5 inches thick. The subsoil extends to a depth of 15 inches. It is yellowish brown, friable shaly silt loam. The substratum to a depth of 18 inches is yellowish brown, firm very shaly silt loam. Fractured shale is at a depth of 18 inches.

Included with these soils in mapping are a few areas of Gilpin and Weikert soils with slopes of less than 25 percent or more than 70 percent and narrow escarpments. In some places the surface is channery or stony and small areas have bedrock at a depth of less than 10 inches, or outcrops are on the surface. Also included are scattered areas of Hazleton, Ernest, Culleoka, and Upshur soils.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is moderately rapid in the Weikert soil, and available water capacity is very low. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. The Weikert soil is medium acid to very strongly acid throughout. Runoff is very rapid on both soils. The roots are restricted by the bedrock at a depth of 10 to 20 inches in the Weikert soil and at a depth of 20 to 40 inches in the Gilpin soil.

Most areas are wooded.

These soils are unsuited to cropland, and they are generally poorly suited to pasture.

These soils are fairly well suited to well suited to trees. A large acreage is woodland. Potential productivity is high for the Gilpin soil and moderate for the Weikert soil. Roots are restricted by the bedrock at a depth of 10 to 40 inches. Removing undesirable species increases production. A management problem is the loss of seedlings because of very low available water capacity in the Weikert soil. The steep and very steep slopes are limitations for equipment when harvesting, managing, or planting trees.

The steep and very steep slopes and depth to bedrock are limitations for nonfarm uses. If these soils are disturbed for construction, management practices will be needed to control erosion.

The capability subclass is VIIe. The woodland symbol is 2r for the Gilpin soil and 4d for the Weikert soil.

GtB—Guernsey silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on ridges and hilltops in residual areas. Slopes are smooth or concave and are generally 100 to 500 feet long. Areas are irregular in shape or long and narrow and range from 3 to 30 acres or more.

Typically this soil has a very dark brown silt loam surface layer about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. The upper 9 inches is yellowish brown, friable and firm heavy silt loam; the next 10 inches is mottled light olive brown, firm silty clay

loam; and the lower 18 inches is mottled grayish brown, very firm heavy silty clay. The substratum to a depth of 60 inches is mottled yellowish brown, very firm heavy silty clay.

Included with this soil in mapping are small areas of nearly level and sloping Guernsey soils and similar soils that are not so clayey, contain more coarse fragments, and at places have bedrock at a depth of less than 40 inches. A few scattered areas of Culleoka, Gilpin, Upshur, Vandergrift, Tilsit, Wharton, and Cavode soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate to high. Runoff is medium to slow. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is very strongly acid to medium acid in the upper part of the solum and medium acid to mildly alkaline in the lower part of the solum and in the substratum. The clayey subsoil has a moderate shrink-swell potential. This soil is unstable and subject to slips and landslides.

Most of the acreage is woodland and cropland or is idle.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Diversions may be needed on long slopes to control runoff. Subsurface drains remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees, and a large acreage is in woodland. Potential productivity is high. Removing undesirable species increases production. Machine planting is practical in the larger areas. Use of equipment is restricted by the clayey texture.

The moderately slow to slow permeability, a seasonal high water table, and clayey, unstable soil material are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and excavating for buildings. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If disturbed for construction, this soil is unstable, erodes easily, and is subject to slips and landslides. Practices will be needed to control erosion and to increase stability.

The capability subclass is IIe. The woodland symbol is 2o.

GtC—Guernsey silt loam, 8 to 15 percent slopes. This gently sloping, deep, moderately well drained soil is on ridges and side slopes in residual uplands. Slopes are smooth or concave and are generally 100 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres or more.

Typically this soil has a very dark brown silt loam surface layer about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. The upper 9 inches is yellowish brown, friable and firm heavy silt loam; the next 10 inches is mottled light olive brown, firm silty clay loam; and the lower 18 inches is mottled grayish brown, very firm heavy silty clay. The substratum to a depth of 60 inches is mottled yellowish brown, very firm heavy silty clay.

Included with this soil in mapping are small areas of gently sloping and moderately steep Guernsey soils and similar soils that are not so clayey, contain more coarse fragments, and at places have bedrock at a depth of less than 40 inches. A few scattered areas of Culleoka, Gilpin, Vandergrift, Upshur, Wharton, Cavode, and Tilsit soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate to high. Runoff is medium to rapid. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is very strongly acid to medium acid in the upper part of the solum and medium acid to mildly alkaline in the lower part of the solum and in the substratum. The clayey subsoil has a moderate shrink-swell potential. This soil is unstable and subject to slips and landslides.

Most of the acreage is woodland and cropland or is idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system reduce runoff and help to control erosion. Diversions will help control runoff. Subsurface drains are needed to remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees, and a large acreage is woodland. Potential productivity is high. Removing undesirable species increases production. Use of equipment is restricted by the clayey texture. Machine planting is practical in the larger areas.

The moderately slow and slow permeability, a seasonal high water table, and clayey, unstable soil material are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and excavating for

buildings. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If disturbed for construction, this soil is unstable, erodes easily, and is subject to slips and landslides. Practices will be needed to control erosion and to increase stability.

The capability subclass is IIIe. The woodland symbol is 2o.

GvB—Guernsey-Vandergrift complex, 3 to 8 percent slopes. These gently sloping, deep, moderately well drained and somewhat poorly drained soils are on ridges and benches in residual uplands. Slopes are smooth or concave and are generally 100 to 400 feet long. Areas are long and narrow or irregular in shape and range from 2 to 30 acres. Guernsey and Vandergrift soils occur together in such intricate patterns that it was impractical to map them separately.

The Guernsey soil makes up about 60 percent of this complex. Typically this soil has a very dark brown silt loam surface layer about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. The upper 9 inches is yellowish brown, friable and firm heavy silt loam; the next 10 inches is mottled light olive brown, firm silty clay loam; and the lower 18 inches is mottled grayish brown, very firm, heavy silty clay. The substratum to a depth of 60 inches is mottled yellowish brown, very firm heavy silty clay.

The Vandergrift soil makes up about 25 percent of this complex. Typically this soil has a dark brown heavy silt loam surface layer about 2 inches thick. The subsurface layer is reddish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of 58 inches. It is dark reddish brown, reddish brown, and dusky red, firm silty clay loam and silty clay that is mottled in the lower 36 inches. The substratum to a depth of 71 inches is reddish brown, firm silty clay loam.

Included with these soils in mapping are a few small areas of nearly level and sloping Guernsey and Vandergrift soils. Small scattered areas of Culleoka, Upshur, Gilpin, Wharton, and Cavode soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate to high. In unlimed areas, the Guernsey soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The Vandergrift soil is very strongly acid to neutral in the surface layer and subsoil and strongly acid to mildly alkaline in the substratum. Runoff is medium. The seasonal high water table is at 18 to 36 inches in the Guernsey soil and 6 to 36 inches in the Vandergrift soil. The clayey subsoils have a moderate to high shrink-swell potential. These soils are unstable and are subject to slips and landslides.

Most of the acreage is woodland and cropland or is idle.

The hazard of erosion is moderate if these soils are used for cultivated crops. Wetness delays plowing and causes the soil to warm slowly in spring. Some of the measures used to reduce runoff and control erosion are stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping systems. Diversions may be needed on long slopes to control runoff. Subsurface drains remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

These soils are well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

These soils are well suited to trees, and a large acreage is woodland. Potential productivity is high. Roots may be restricted by the firm clayey subsoils. Removing undesirable species increases production. Use of equipment is restricted during wet seasons by the clayey texture and because of the seasonal high water table in the Vandergrift soil. Machine planting in large areas is generally practical.

The moderately slow and slow permeability, seasonal high water table, and clayey, unstable soil material are limitations for nonfarm uses. These limitations are serious for onsite disposal of waste and excavating for buildings. If disturbed for construction, these soils are unstable, erode easily, and are subject to slips and landslides. Practices will be needed to control erosion and to increase stability.

The capability subclass is IIe. The woodland symbol is 2o for the Guernsey soil and 2w for the Vandergrift soil.

GvC—Guernsey-Vandergrift complex, 8 to 15 percent slopes. These sloping, deep, moderately well drained and somewhat poorly drained soils are on hillsides and benches in residual uplands. Slopes are smooth or concave and are 100 to 400 feet long. Areas are generally long and narrow and range from 2 to 30 acres. Guernsey and Vandergrift soils occur together in such intricate patterns that it was impractical to map them separately.

The Guernsey soil makes up about 55 percent of this complex. Typically this soil has a very dark brown silt loam surface layer about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. The upper 9 inches is yellowish brown, friable and firm heavy silt loam; the next 10 inches is mottled, light olive brown, firm silty clay loam; and the lower 18 inches is mottled, grayish brown, very firm heavy silty clay. The substratum to a depth of 60 inches is mottled yellowish brown, very firm heavy silty clay.

The Vandergrift soil makes up about 30 percent of this complex. Typically this soil has a dark brown heavy silt

loam surface layer about 2 inches thick. The subsurface layer is reddish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of 58 inches. It is dark reddish brown, reddish brown, and dusky red, firm silty clay loam and silty clay that is mottled in the lower 36 inches. The substratum to a depth of 71 inches is reddish brown, firm silty clay loam.

Included with these soils in mapping are a few small areas of gently sloping and moderately steep Guernsey and Vandergrift soils. Small areas of Culleoka, Upshur, Gilpin, Wharton, and Cavode soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate to high. In unlimed areas, the Guernsey soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The Vandergrift soil is very strongly acid to neutral in the surface layer and subsoil and strongly acid to mildly alkaline in the substratum. Runoff is medium to rapid. The seasonal high water table is at depths of 18 to 36 inches in the Guernsey soil and 6 to 36 inches in the Vandergrift soil. The clayey subsoil has moderate to high shrink-swell potential. These soils are unstable and subject to slips and landslides.

Most areas are wooded or idle.

The hazard of erosion is severe if these soils are used for cultivated crops. Wetness delays plowing and causes these soils to warm slowly in spring. Some of the measures used to reduce runoff and help to control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Subsurface drains remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

These soils are well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

These soils are well suited to trees, and a large acreage is woodland. Potential productivity is high. Roots may be restricted by the firm clayey subsoil. Removing undesirable species increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table in the Vandergrift soil and by clayey texture. Machine planting in large areas is generally practical.

The slope, moderately slow and slow permeability, seasonal high water table, and clayey, unstable soil material are limitations for nonfarm uses. These limitations are serious for onsite disposal of waste and construction of buildings, streets, and roads. If disturbed for construction, these soils are unstable, erode easily, and are subject to slips and landslides. Practices will be needed to control erosion and to increase stability.

The capability subclass is IIIe. The woodland symbol is 2o for the Guernsey soil and 2w for the Vandergrift soil.

GvD—Guernsey-Vandergrift complex, 15 to 25 percent slopes. These moderately steep, deep, moderately well drained and somewhat poorly drained soils are on hillsides in residual uplands. Slopes are smooth or concave. Most are 100 to 400 feet long. Areas are generally long and narrow and range from 2 to 30 acres. The Guernsey and Vandergrift soils occur together in such intricate patterns that it was impractical to map them separately.

The Guernsey soil makes up about 50 percent of this complex. Typically this soil has a very dark brown silt loam surface layer about 2 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil extends to a depth of 44 inches. The upper 9 inches is yellowish brown, friable and firm heavy silt loam; the next 10 inches is mottled light olive brown, firm silty clay loam; and the lower 18 inches is mottled grayish brown, very firm heavy silty clay. The substratum to a depth of 60 inches is mottled yellowish brown, very firm heavy silty clay.

The Vandergrift soil makes up about 35 percent of this complex. Typically this soil has a dark brown heavy silt loam surface layer about 2 inches thick. The subsurface layer is reddish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of 58 inches. It is dark reddish brown, reddish brown, and dusky red, firm silty clay loam and silty clay that is mottled in the lower 36 inches. The substratum to a depth of 71 inches is reddish brown, firm silty clay loam.

Included with these soils in mapping are a few small areas of sloping and steep Guernsey and Vandergrift soils. Small areas of Culleoka, Upshur, Gilpin, Wharton, and Weikert soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate to high. In unlimed areas, the Guernsey soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil and medium acid to mildly alkaline in the lower part of the subsoil and in the substratum. The Vandergrift soil is very strongly acid to neutral in the solum and strongly acid to mildly alkaline in the substratum. Runoff is medium to rapid. The seasonal high water table is at 18 to 36 inches in the Guernsey soil and 6 to 36 inches in the Vandergrift soil. The clayey subsoil has moderate to high shrink-swell potential. These soils are unstable and subject to slips and landslides.

Most areas are wooded or idle.

These soils can be used for cropland with adequate management practices. Moderately steep slopes, seasonal wetness, and a very severe hazard of erosion are the major limitations. If these soils are used for cropland, some of the practices needed to reduce runoff and control erosion are contour stripcropping, grassed water-

ways, minimum tillage, cover crops, and grass and legumes in the cropping system. Subsurface drains reduce wetness caused by seeps and springs. Incorporating some crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

These soils are fairly well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

These soils are well suited to trees, and a large acreage is woodland. Potential productivity is high. Roots may be restricted by the firm clayey subsoil. Removing undesirable species increases production. Use of equipment for planting, maintaining, and harvesting trees is limited by the moderately steep slopes, the seasonal high water table in the Vandergrift soil, the hazard of erosion, and the clayey, unstable soil material.

The moderately steep slopes, moderately slow and slow permeability, seasonal high water table, and clayey, unstable soil material are the major limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildlings, streets, and roads. If disturbed for construction, these soils are very unstable, erode easily, and are subject to slips and landslides. Extensive measures will be needed to control erosion and sediment and to increase stability of the disturbed areas, cuts, and fills.

The capability subclass is IVe. The woodland symbol is 2r for the Guernsey soil and 2w for the Vandergrift soil.

HaB—Hazleton channery loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on ridgetops in residual uplands. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are irregular in shape or long and narrow and range from 3 to 50 acres.

Typically this soil has a dark brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of 32 inches. The upper 19 inches is yellowish brown, very friable channery sandy loam; and the lower 6 inches is yellowish brown, very friable very channery loamy sand. The substratum to a depth of 55 inches is yellowish brown, loose very channery loamy sand. Fractured sandstone is at a depth of about 55 inches.

Included with this soil in mapping are a few small areas of nearly level and sloping Hazleton soils and similar soils that contain fewer coarse fragments or have bedrock at a depth of less than 40 inches. Small scattered areas of Clymer, Gilpin, Weikert, Wharton, Cavode, Ernest, and Upshur soils are also included.

Permeability is moderately rapid and rapid, and available water capacity is moderate. Runoff is medium. This soil has 15 percent or more coarse fragments in the surface layer. In unlimed areas, it is strongly acid to extremely acid throughout.

Most of the acreage is cropland, pasture, and woodland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Stripcropping, minimum tillage, diversions, and grassed waterways are some measures that help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. The channery surface layer may interfere with the seeding of small grains and the mechanical harvesting of some crops such as potatoes.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and many areas are wooded. Potential productivity is moderately high. Management problems are few. Machine planting is practical in large areas.

This soil has few limitations for most nonfarm uses. Bedrock, when it occurs at depths of 3 1/2 to 6 feet, is a limitation for onsite disposal of waste and for construction of buildings with basements. Moderately rapid and rapid permeability and seepage are limitations if areas of this soil are used for sanitary landfill.

The capability subclass is IIe. The woodland symbol is 3o.

HaC—Hazleton channery loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on ridgetops and side slopes in residual uplands. Slopes are smooth or convex and are generally 100 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres.

Typically this soil has a dark brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of 32 inches. The upper 19 inches is yellowish brown, very friable, channery sandy loam; and the lower 6 inches is yellowish brown, very friable, very channery loamy sand. The substratum to a depth of 55 inches is yellowish brown, loose, very channery loamy sand. Fractured sandstone bedrock is at a depth of about 55 inches.

Included with this soil in mapping are a few small areas of gently sloping and moderately steep Hazleton soils and similar soils that contain fewer coarse fragments, have bedrock at a depth of less than 40 inches, are stony, or are mottled in the lower part of the subsoil. Small scattered areas of Clymer, Gilpin, Ernest, Wharton, Cavode, Upshur, and Weikert soils are also included.

Permeability is moderately rapid and rapid, and available water capacity is moderate. Runoff is medium to rapid. This soil has 15 percent or more coarse fragments in the surface layer. In unlimed areas, it is strongly acid to extremely acid throughout.

Most areas are wooded or idle. Some of the acreage is pasture and cropland.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, diversions, and grassed waterways are some measures that help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. The channery surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of the pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and many areas are wooded. Potential productivity is moderately high. Management problems are few. Machine planting is practical in large areas.

The slope and depth to bedrock when it occurs at a depth of 3 1/2 to 6 feet are limitations for some nonfarm uses. They are limitations for onsite disposal of waste and for the construction of buildings. Moderately rapid and rapid permeability and seepage are limitations if areas of this soil are used for sanitary landfill.

The capability subclass is IIIe. The woodland symbol is 3o.

HaD—Hazleton channery loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on hills and side slopes in dissected residual uplands. Slopes are smooth or convex and are generally 100 to 300 feet long. Areas are long and narrow and mainly range from 3 to 50 acres.

Typically this soil has a dark brown channery loam surface layer about 7 inches thick. The subsoil extends to a depth of 32 inches. The upper 19 inches is yellowish brown, very friable, channery sandy loam; and the lower 6 inches is yellowish brown, very friable, very channery loamy sand. The substratum to a depth of 55 inches is yellowish brown, loose very channery loamy sand. Fractured sandstone is at a depth of about 55 inches.

Included with this soil in mapping are a few small areas of stony, very stony, sloping, steep, and very steep Hazleton soils and similar soils that contain fewer coarse fragments throughout the profile or that have bedrock at a depth of less than 40 inches. Small scattered areas of Clymer, Gilpin, Weikert, Ernest, Wharton, Cavode, and Upshur soils are also included.

Permeability is moderately rapid and rapid, and available water capacity is moderate. Runoff is rapid. This soil has 15 percent or more coarse fragments in the surface layer. In unlimed areas, it is strongly acid to extremely acid throughout.

Most areas are wooded or idle. Some of the acreage is pasture or cropland.

This soil can be used for cropland with adequate management practices. Moderately steep slopes, very severe hazard of erosion, and moderate available water capacity are the major concerns. If this soil is used for cropland, contour stripcropping, minimum tillage, diversions, grassed waterways, cover crops, crop residue, and hay in the cropping system are practices that reduce runoff and help to control erosion. The channery surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is suited to pasture. Proper stocking rates to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and a large acreage is woodland. Potential productivity is moderately high. Slope is a management problem. Machine planting is possible in large areas.

Moderately steep slopes and depth to bedrock when it occurs at depths of 3 1/2 to 6 feet are limitations for nonfarm uses. They are serious limitations for onsite disposal of waste and for construction of buildings, streets, and roads. In suburban areas this soil is suited to undeveloped recreation areas, wildlife habitat, and other open space uses maintained in grass, shrubs, and trees.

The capability subclass is IVe. The woodland symbol is 3r.

Ho—Holly silt loam. This nearly level, deep, poorly drained soil is on flood plains in Lawrence County and in the northwestern part of Beaver County (fig. 18). Areas are generally long and narrow and range from 2 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsurface layer is dark gray silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches. It is mottled gray, olive gray, and grayish brown, firm silt loam and loam. The substratum to 63 inches is mottled gray and grayish brown, friable silt loam.

Included with this soil in mapping are a few small areas of similar soils that are not so gray to a depth of 15 inches. Small areas of Sloan, Lobdell, Chagrin, Atkins, Frenchtown, and Canadice soils are also included.

Permeability is moderate and moderately slow, and available water capacity is high. In unlimed areas, this soil is medium acid to neutral throughout. The high water table is within 6 inches of the surface most of the year. It is frequently flooded. Runoff is slow, and ponding is common in wet seasons. Roots are restricted by the high water table.

Most areas are pasture and woodland or are idle.

Adequately drained, this soil can be used for cropland. If it is used for cultivated crops, excess water delays plowing and causes the soil to warm slowly in spring. Crops may be damaged by flooding and ponding follow-

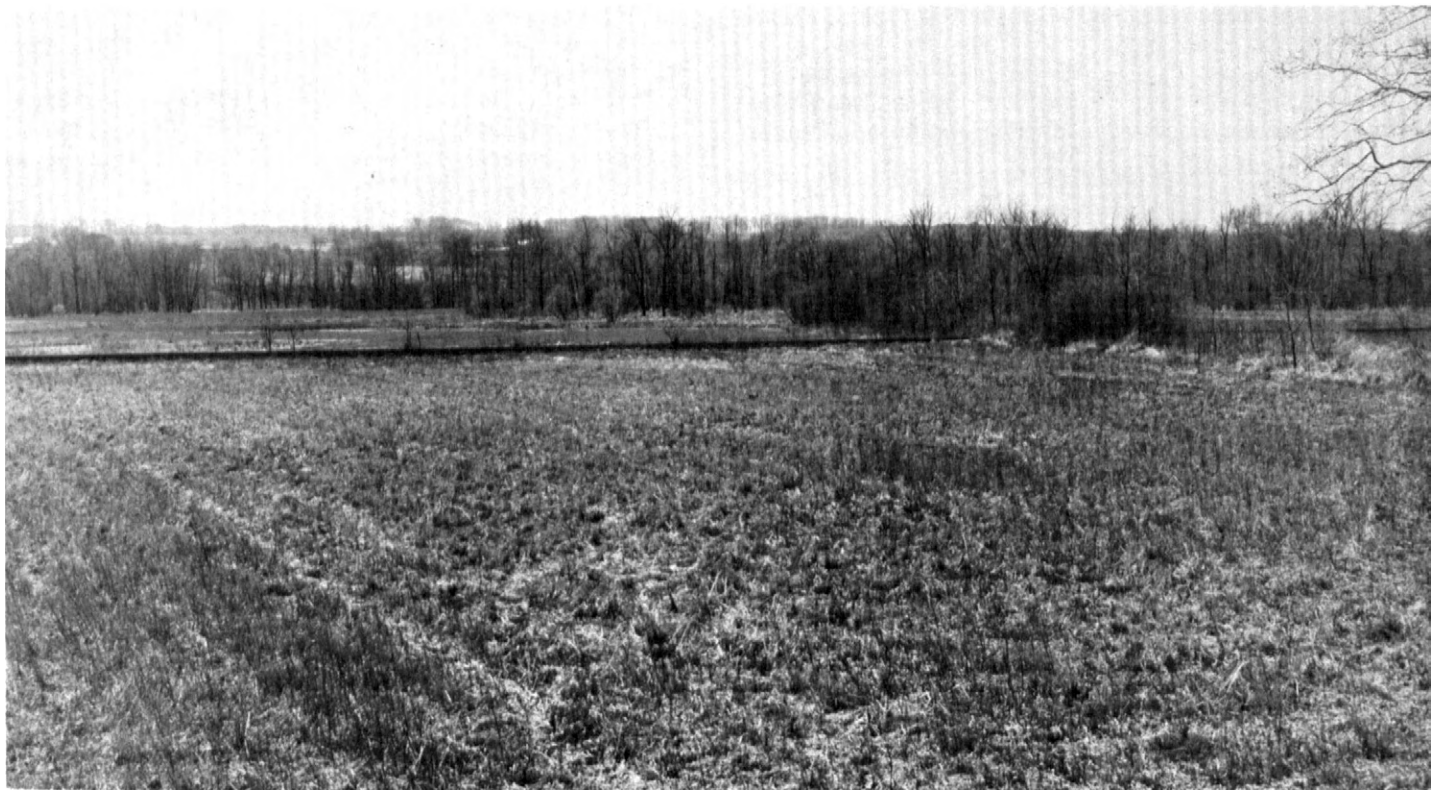


Figure 18.—Poorly drained Holly silt loam on a broad flood plain near the Shenango River. Wetland grasses and sedges are dominant in this hayfield.

ing intensive rainfall. Excess surface water can sometimes be removed by keeping natural drainageways open. Surface drains, where outlets are available, can be used to improve surface and internal drainage.

This soil is fairly well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to moisture-tolerant trees. Part of the area is woodland. Potential productivity is very high, but the root zone is restricted by the high water table. Use of equipment is restricted for a good portion of the year because of wetness. Machine planting in large areas is practical during dry periods.

The high water table and frequent flooding are limitations for most nonfarm uses. It is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 1w.

Lb—Lobdell silt loam. This nearly level, deep, moderately well drained soil is on flood plains in Lawrence County and in the northern part of Beaver County. Most areas are long and narrow and range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of about 39 inches. It is brown and dark grayish brown, friable silt loam that is mottled below a depth of 22 inches. The substratum to a depth of 60 inches is mottled olive gray and dark grayish brown, friable loam and fine sandy loam.

Included with this soil in mapping are small areas of similar soils that contain more sand and gravel to a depth of 40 inches. Small areas of Holly, Chagrin, Sloan, Braceville, Rexford, Pope, and Philo soils are also included.

Permeability is moderate, and available water capacity is high. In unlimed areas, this soil is strongly acid to neutral to a depth of 24 inches and medium acid to neutral below a depth of 24 inches. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Runoff is slow, and flooding is common. Roots are restricted by the seasonal high water table.

Most of the acreage is cropland and pasture.

Excess water delays plowing and causes this soil to warm slowly in spring. Crops can be damaged by flood-

ing following intensive rainfall. Subsurface drains, where outlets are available, reduce wetness and provide for timely tillage. Growing cover crops, including grass and legumes in the cropping system, and incorporating crop residue into the surface layer maintain the organic matter content and improve tilth.

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is very high, but roots may be restricted by the seasonal high water table. Use of equipment may be restricted for short periods because of flooding and the seasonal high water table. Machine planting in large areas is usually practical.

The seasonal high water table and flooding are limitations for most nonfarm uses. In suburban areas, the soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIw. The woodland symbol is 1o.

LoB—Loudonville gravelly silt loam, 3 to 8 percent slopes. This gently sloping, moderately deep, well drained soil is on ridges in glaciated uplands. Slopes are smooth and are 200 to 600 feet long. Most areas are irregular in shape and range from 2 to 20 acres.

Typically this soil has a dark brown gravelly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 17 inches is yellowish brown, friable gravelly silt loam and gravelly heavy loam; and the lower 11 inches is yellowish brown, friable shaly loam. Fractured siltstone and shale are at a depth of about 34 inches.

Included in mapping are small areas of nearly level and sloping Loudonville soils and similar soils that have bedrock at a depth of more than 40 inches or less than 20 inches or contain more coarse fragments throughout. Also included are a few small areas of Gilpin, Weikert, Hazleton, Wooster, Conotton, Canfield, and Wharton soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is medium acid to very strongly acid throughout. Runoff is medium. Roots may be restricted by bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Where the topography is suitable, contour stripcropping can be used. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, but only a small acreage is woodland. Potential productivity is high, but roots may be restricted by bedrock at a depth of 20 to 40 inches. Removing undesirable species increases production. Machine planting in large areas is generally practical.

The moderate depth to bedrock is a limitation for some nonfarm uses, for example, onsite disposal of waste and excavating for buildings with basements (fig. 19). If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIe. The woodland symbol is 2o.

LoC—Loudonville gravelly silt loam, 8 to 15 percent slopes. This sloping, moderately deep, well drained soil is on ridges and side slopes in glaciated uplands. Slopes are smooth or convex and are 200 to 600 feet long. Most areas are irregular in shape and range from 2 to 20 acres.

Typically this soil has a dark brown gravelly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 17 inches is yellowish brown, friable gravelly silt loam and gravelly heavy loam; and the lower 11 inches is yellowish brown, friable shaly loam. Fractured siltstone and shale are at a depth of about 34 inches.

Included in mapping are small areas of gently sloping and moderately steep Loudonville soils and similar soils that have bedrock at a depth of more than 40 inches or less than 20 inches or contain more coarse fragments throughout. Also included are a few small areas of Gilpin, Weikert, Hazleton, Wooster, Canfield, Conotton, and Wharton soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is medium acid to very strongly acid throughout. Runoff is medium to rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most of the acreage is cropland.

The hazard of erosion is severe if this soil is used for cultivated crops. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and control erosion are stripcropping, grassed waterways, diversions, minimum tillage, cover crops, and grass and legumes in the cropping systems. Where the topography is suitable, contour stripcropping should be used. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

Figure 19.—Depth to bedrock is a limitation when excavating for buildings with basements on Loudonville gravelly silt loam, 3 to 8 percent slopes.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and some areas are wooded. Potential productivity is high, but roots may be restricted by bedrock at a depth of 20 to 40 inches. Removing undesirable species increases production. Machine planting in large areas is generally practical.

The slope and moderate depth to bedrock are limitations for many nonfarm uses. They are limitations for onsite disposal of waste and excavating for buildings with basements. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capacity subclass is IIIe. The woodland symbol is 2o.

LoD—Loudonville gravelly silt loam, 15 to 25 percent slopes. This moderately steep, moderately deep, well drained soil is on hillsides in glaciated uplands. Slopes are smooth or convex and are 200 to 600 feet long. Most areas are long and narrow and range from 2 to 20 acres.

Typically this soil has a dark brown gravelly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 17 inches is yellowish brown, friable gravelly silt loam and gravelly heavy loam; and the lower 11 inches is yellowish brown, friable shaly loam. Fractured siltstone and shale are at a depth of about 34 inches.

Included in mapping are small areas of sloping and steep Loudonville soils and similar soils that have bedrock at a depth of more than 40 inches or less than 20 inches or contain more coarse fragments throughout. Also included are small areas of Gilpin, Wooster, Hazleton, Weikert, Conotton, Canfield, and Wharton soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is medium acid to very strongly acid throughout. Runoff is rapid. Roots may be restricted by bedrock at a depth of 20 to 40 inches.

Most areas are pasture and woodland or are idle.

This soil can be used for cropland with adequate management practices. If it is used for cultivated crops, the moderately steep slopes and the very severe hazard of erosion need to be considered. Erosion results in a shallower root zone and lower available water capacity for plants. Some of the measures used to reduce runoff and

control erosion are contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system. Incorporating some crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is fairly well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

This soil is well suited to trees and a large part is wooded. Potential productivity is high, but roots may be restricted by bedrock at a depth of 20 to 40 inches. Removing undesirable species increases production. Slope is a limitation for equipment used for planting, managing, and harvesting trees.

The moderately steep slopes and moderate depth to bedrock are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IVe. The woodland symbol is 2r.

LoF—Loudonville gravelly silt loam, 25 to 50 percent slopes. This steep and very steep, moderately deep, well drained soil is on hillsides in glaciated uplands. Slopes are smooth or convex and are 200 to 600 feet long. Most areas are long and narrow and range from 5 to 100 acres.

Typically this soil has a dark brown gravelly silt loam surface layer about 6 inches thick. The subsoil extends to a depth of 34 inches. The upper 17 inches is yellowish brown, friable gravelly silt loam and gravelly heavy loam; and the lower 11 inches is yellowish brown, friable shaly loam. Fractured siltstone and shale are at a depth of about 34 inches.

Included in mapping are small areas of moderately steep Loudonville soils and similar soils that have bedrock at a depth of less than 20 inches, contain more coarse fragments, or are stony. Also included are narrow escarpments, outcrops of bedrock, and small areas of Gilpin, Weikert, Hazleton, Wooster, and Conotton soils.

Permeability is moderate, and available water capacity is moderate. In unlimed areas, this soil is medium acid to very strongly acid throughout. Runoff is rapid. Roots may be restricted by the bedrock at a depth of 20 to 40 inches.

Most areas are wooded or idle.

This soil is too steep to be used for cropland, and it is poorly suited to pasture.

This soil is well suited to trees, and most areas are wooded. Potential productivity is high, but roots may be restricted by bedrock at a depth of 20 to 40 inches. The steep and very steep slopes are limitations for equipment when planting, managing, or harvesting trees.

The steep and very steep slopes and moderate depth to bedrock are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in trees, shrubs, or grass.

The capability subclass is VIe. The woodland symbol is 2r.

MoA—Monongahela silt loam, 0 to 3 percent slopes. This nearly level, deep, moderately well drained soil is on high broad stream terraces along major waterways. Slopes are smooth and are generally 200 to 400 feet long. Areas are irregular in shape and range from 2 to 20 acres or more.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 48 inches. The upper 15 inches is yellowish brown, firm heavy silt loam and light silty clay loam that is mottled in the lower 4 inches; and the lower 25 inches is mottled brown, very firm and brittle light clay loam. The substratum to a depth of 60 inches is mottled brown, firm light clay loam.

Included with this soil in mapping are small areas of gently sloping Monongahela soils and similar soils that contain more sand and gravel in the substratum or are less acid in the fragipan and substratum. A few scattered areas of Allegheny, Ernest, Tyler, Purdy, Tilsit, and Wharton soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is slow. This soil has a fragipan at a depth of 18 to 30 inches. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is strongly acid or very strongly acid throughout.

Most of the acreage is cropland. A few areas are woodland and urban developments.

Excess water delays plowing and causes the soil to warm slowly in spring. Minimum tillage, cover crops, grass and legumes in the cropping system, and utilizing crop residue maintain the organic matter content and improve tilth. Subsurface drains remove excess ground water and provide for timely tillage.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to trees. Removing undesirable species increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The moderately slow and slow permeability and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIw. The woodland symbol is 3w.

MoB—Monongahela silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on high stream terraces along major waterways. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 2 to 20 acres or more.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 48 inches. The upper 15 inches is yellowish brown, firm, heavy silt loam and light silty clay loam that is mottled in the lower 4 inches; and the lower 25 inches is mottled brown, very firm and brittle, light clay loam. The substratum to a depth of 60 inches is mottled brown, firm, light clay loam.

Included with this soil in mapping are small areas of nearly level and sloping Monongahela soils and similar soils that contain more sand and gravel in the substratum or are less acid in the fragipan and substratum. A few scattered areas of Allegheny, Chili, Ernest, Tyler, Purdy, Tilsit, Wharton, Canfield, and Braceville soils are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is medium. This soil has a fragipan at a depth of 18 to 30 inches. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is strongly acid or very strongly acid throughout.

Most of the acreage is cropland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system are measures that reduce runoff and help to control erosion. Subsurface drains remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees, and some areas are wooded. Removing undesirable species increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The moderately slow and slow permeability and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, management practices will be needed to reduce runoff and sediment.

The capability subclass is IIe. The woodland symbol is 3w.

MoC—Monongahela silt loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on high stream terraces along major waterways. Slopes are smooth, concave, or convex and are generally 200 to 400 feet long. Areas are long and narrow and range from 2 to 20 acres or more.

Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 48 inches. The upper 15 inches is yellowish brown, firm heavy silt loam and light silty clay loam that is mottled in the lower 4 inches; and the lower 25 inches is mottled brown, very firm and brittle light clay loam. The substratum to a depth of 60 inches is mottled brown, firm light clay loam.

Included with this soil in mapping are small areas of gently sloping and moderately steep Monongahela soils and similar soils that contain more sand and gravel in the substratum or are less acid in the fragipan and substratum. A few scattered areas of Allegheny, Chili, Conotton, Gilpin, Ernest, Loudonville, Canfield, and Wharton soils and narrow escarpments are also included.

Permeability is moderately slow and slow, and available water capacity is moderate. Runoff is medium to rapid. This soil has a fragipan at a depth of 18 to 30 inches. The seasonal high water table is 18 to 36 inches below the surface during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is strongly acid or very strongly acid throughout.

Most of the acreage is woodland, cropland, or pasture. A few areas are idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, diversions, minimum tillage, cover crops, and grass and legumes in the cropping system are practices that reduce runoff and control erosion. Subsurface drains remove excess ground water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees, and many areas are wooded. Removing undesirable species increases production. Use of equipment is restricted during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The slope, moderately slow and slow permeability, and seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 3w.

Ph—Philo silt loam. This deep, moderately well drained, nearly level soil is on flood plains mainly in Beaver County. Most areas are long and narrow and range from 3 to 50 acres.

Typically this soil has a dark brown silt loam surface layer about 12 inches thick. The subsoil extends to a depth of 31 inches. It is brown, friable silt loam that is mottled at 19 inches. The substratum to a depth of 60 inches is mottled light brownish gray, friable loam.

Included with this soil in mapping are small areas of Philo soils that are rarely flooded. Small scattered areas of Atkins, Lobdell, Pope, Chagrin, and Holly soils are also included.

Permeability is moderate and moderately slow, and available water capacity is moderate to high. In unlimed areas, this soil is very strongly acid to medium acid throughout. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Runoff is slow, and flooding is common. Roots are restricted by the seasonal high water table.

Most of the acreage is cropland or pasture.

The excess water may delay plowing and causes the soil to warm slowly in spring. Crops can be damaged by flooding following intensive rainfall. Subsurface drains, where outlets are available, reduce wetness and provide for timely tillage. Growing cover crops, including grass and legumes in the cropping system, and incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of the pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is very high, but roots may be restricted by the seasonal high water table. Use of equipment may be restricted briefly during wet periods because of the seasonal high water table and flooding. Machine planting in large areas is usually practical.

The seasonal high water table and flooding are limitations for most nonfarm uses. This soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIw. The woodland symbol is 1o.

Pn—Pits. Pits are scattered throughout Lawrence County and the northern part of Beaver County. Slopes range from nearly level to very steep and are complex and convex. Areas are circular to irregular in shape and range from 1 to 40 acres.

Pits consist of land that has been excavated to obtain mainly sand or gravel or both for fills, road subgrades, concrete, and other uses (fig. 14). It usually consists of a deep depression or escarpment surrounded by piles of overburden, rejected material, and sand and gravel. The original soils have been covered or their profile characteristics have been destroyed by mixing them with material from other soils, sand, gravel, and cobblestones.

Included in mapping are small areas of Chili, Conotton, Braceville, Canfield, Allegheny, Monongahela, and Hazleton soils. Also included are narrow fill, sand and gravel, and bedrock escarpments. Included areas make up about 10 percent of the map unit.

Permeability is moderately rapid to very rapid, and available water capacity is low or very low. Runoff is medium to very rapid. The soil material is neutral to very strongly acid. Depth to bedrock ranges from the surface to more than 30 feet.

Most of this area is barren or very sparsely vegetated with grasses, shrubs, and trees.

This area is generally too steep, gravelly, cobbly, or sandy to support vegetation. Onsite investigations are needed to determine limitations and potential.

Pits are not assigned to interpretive groupings.

Po—Pope silt loam. This nearly level, deep, well drained soil is on flood plains mainly in Beaver County. Areas are long and narrow and range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 11 inches thick. The subsoil extends to a depth of 41 inches. The upper 11 inches is dark yellowish brown and brown, friable silt loam; and the lower 19 inches is brown, friable and very friable sandy loam. The substratum to a depth of 60 inches is dark yellowish brown, loose loamy sand and very gravelly sandy loam.

Included with this soil in mapping are a few areas of Pope soils that are rarely flooded and small areas of Philo, Allegheny, Chagrin, Lobdell, Holly, and Atkins soils.

Permeability is moderate and moderately rapid, and available water capacity is moderate to high. Runoff is slow, and flooding is occasional or common. In unlimed areas, this soil is strongly acid to extremely acid throughout.

Most of the acreage is cropland, pasture, or woodland.

The hazard of erosion is slight if this soil is used for cropland. Crops respond well to fertilization and good management. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

The soil is well suited to trees. Potential productivity is high. Management problems are few. Machine planting is practical in large areas.

The hazard of flooding is a limitation for many nonfarm uses. In suburban areas this soil is suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, trees, or shrubs.

The capability class is I. The woodland symbol is 2o.

Pu—Purdy silt loam. This nearly level, deep, poorly drained soil is on broad terraces, low-lying flats, and in depressions in residual areas. Slopes are smooth or concave. Areas are irregular in shape and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 36 inches. It is mottled dark gray and gray, firm silty clay loam and silty clay. The substratum to a depth of 60 inches is mottled light gray, firm silty clay loam.

Included with this soil in mapping are small areas of gently sloping Purdy soils and similar soils that contain more sand and gravel to a depth of 48 inches or are less acid throughout. Also included are scattered areas of Tyler, Monongahela, Canadice, Atkins, and Brinkerton soils.

Permeability is slow and very slow, and available water capacity is high. In unlimed areas, this soil is very strongly acid or strongly acid throughout. The high water table is within 6 inches of the surface most of the year. Runoff is slow, and ponding occurs in depressions after periods of heavy rainfall. Roots are restricted by the high water table.

Most areas are woodland and pasture or are idle.

Adequately drained, this soil can be used for cropland. Excess water delays plowing and causes the soil to warm slowly in spring. Crops may be damaged by ponded water following intensive rainfall. Excess surface water can be removed by keeping natural drainageways open and by constructing surface drains. Subsurface drains, where outlets are available, can be used to improve internal drainage.

This soil is fairly well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is very high, but roots are restricted by the high water table. Use of equipment is restricted most of the year because of wetness. Machine planting in large areas is possible, but supplemental surface drainage may be needed.

The high water table, slow and very slow permeability, and clayey soil material are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, trees, or shrubs.

The capability subclass is IVw. The woodland symbol is 1w.

RaA—Ravenna silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad flats and in depressions in glaciated uplands. Slopes are smooth and are 200 to 600 feet long. Areas are irregular in shape and range from 3 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 12 inches is mottled grayish brown and pale brown, friable silt loam; and the lower 40 inches is mottled light olive brown and dark yellowish brown, very firm and brittle silt loam and loam. The substratum to a depth of 62 inches is mottled dark yellowish brown, firm loam.

Included with this soil in mapping are small areas of gently sloping Ravenna soils and similar soils that contain more sand in the subsoil and substratum. Small scattered areas of Canfield, Rexford, Frenchtown, Canadice, and Holly soils are also included.

Permeability is slow, and available water capacity is moderate. Runoff is slow. The seasonal high water table is 6 to 18 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is medium acid to extremely acid in the surface layer and upper part of the subsoil, very strongly acid to slightly acid in the lower part of the subsoil and slightly acid to mildly alkaline in the substratum. Roots are restricted by the seasonal high water table and by the fragipan at a depth of 14 to 30 inches.

Most areas are cropland and pasture.

Excess water delays plowing and causes the soil to warm slowly in spring. Crops may be damaged by ponded water following intensive rainfall. Excess surface water can be removed by keeping natural drainageways open. Surface drains and subsurface drains, where outlets are available, can be used to improve drainage.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the seasonal high water table and fragipan. Use of equipment is restricted for part of the year because of the seasonal high water table. Machine planting in large areas is practical.

The seasonal high water table and slow permeability are limitations for many nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements.

The capability subclass is IIw. The woodland symbol is 2w.

RaB—Ravenna silt loam, 3 to 8 percent slopes. This gently sloping, deep, somewhat poorly drained soil

is on broad ridgetops, benches, and depressions in glaciated uplands. Slopes are smooth or concave and are 200 to 600 feet long. Areas are irregular in shape and range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 12 inches is mottled grayish brown and pale brown, friable silt loam; and the lower 40 inches is mottled light olive brown and dark yellowish brown, very firm and brittle silt loam and loam. The substratum to a depth of 62 inches is mottled dark yellowish brown, firm loam.

Included with this soil in mapping are small areas of nearly level and sloping Ravenna soils and similar soils that contain more sand in the subsoil and more sand and gravel in the substratum. Small scattered areas of Canfield, Rexford, Frenchtown, Canadice, Holly, Conotton, and Braceville soils are also included.

Permeability is slow, and available water capacity is moderate. Runoff is medium to slow. The seasonal high water table is 6 to 18 inches below the surface for long periods during wet seasons. In unlimed areas, this soil is medium acid to extremely acid in the surface layer and upper part of the subsoil, very strongly acid to slightly acid in the lower part of the subsoil, and slightly acid to mildly alkaline in the substratum. Roots are restricted by the seasonal high water table and the fragipan at a depth of 14 to 30 inches.

Most areas are cropland and pasture.

The hazard of erosion is moderate if this soil is used for cultivated crops. Excess water delays plowing and causes the soil to warm slowly in spring. Stripcropping, grassed waterways, minimum tillage, cover crops, crop residue, and grass and legumes in the cropping system reduce runoff, help to control erosion, and improve tilth. Surface drains and subsurface drains, where outlets are available, can be used to improve surface and internal drainage (fig. 20).

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pas-

Figure 20.—Ravenna silt loam, 3 to 8 percent slopes. Subsurface drains have been installed in this field to remove excess ground water.

ture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the seasonal high water table and fragipan. Use of equipment is restricted part of the year because of the seasonal high water table. Machine planting in large areas is practical.

The seasonal high water table and slow permeability are limitations for many nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIw. The woodland symbol is 2w.

RaC—Ravenna silt loam, 8 to 15 percent slopes. This sloping, deep, somewhat poorly drained soil is on side slopes and benches in glaciated uplands. Slopes are convex or concave and are 100 to 600 feet long. Areas are irregular in shape to long and narrow and range from 2 to 20 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 60 inches. The upper 12 inches is mottled grayish brown and pale brown, friable silt loam; and the lower 40 inches is mottled light olive brown and dark yellowish brown, very firm and brittle silt loam and loam. The substratum to a depth of 62 inches is mottled dark yellowish brown, firm loam.

Included with this soil in mapping are small areas of gently sloping and moderately steep Ravenna soils and similar soils that contain more sand and gravel in the subsoil and substratum. Small scattered areas of Canfield, Braceville, Rexford, Frenchtown, Wooster, Chili, and Conotton soils are also included.

Permeability is slow, and available water capacity is moderate. Runoff is medium to rapid. The seasonal high water table is 6 to 18 inches below the surface during wet seasons. In unlimed areas, this soil is medium acid to extremely acid in the surface layer and upper part of the subsoil, very strongly acid to slightly acid in the lower part of the subsoil, and slightly acid to mildly alkaline in the substratum. Roots are restricted by the seasonal high water table and the fragipan at a depth of 14 to 30 inches.

Most of the acreage is cropland and pasture.

The hazard of erosion is severe if this soil is used for cultivated crops. Excess water delays plowing and causes this soil to warm slowly in spring. Contour stripcropping, grassed waterways, minimum tillage, cover crops, crop residue, and grass and legumes in the cropping system reduce runoff and help to control erosion. Subsurface drains, where outlets are available, can be used to improve drainage.

This soil is well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the seasonal high water table and the fragipan. Use of equipment is restricted part of the year because of the seasonal high water table. Machine planting in large areas is usually practical.

The slope, seasonal high water table, and slow permeability are limitations for nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with basements. Foundation drains with proper outlets should be used to prevent seepage of water into basements. If this soil is disturbed for construction, management practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 2w.

ReB—Rexford silt loam, 3 to 8 percent slopes. This gently sloping, deep, somewhat poorly drained and poorly drained soil is in depressions on glacial outwash plains and terraces. Slopes are smooth or concave and are generally 100 to 400 feet long. Areas are irregular in shape or long and narrow and range from 2 to 20 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 10 inches is mottled brown and grayish brown, friable loam and gravelly loam; and the lower 26 inches is mottled dark grayish brown, olive gray, and olive brown, firm and very firm and brittle loam, gravelly sandy loam, and sandy loam. The substratum to a depth of 60 inches is mottled olive brown, very friable very gravelly loamy sand.

Included with this soil in mapping are small areas of nearly level and sloping Rexford soils. A few scattered areas of Ravenna, Frenchtown, Canadice, Braceville, Canfield, Conotton, Holly, and Tyler soils are also included.

Permeability is slow, and available water capacity is moderate. Runoff is slow to medium. This soil has a fragipan at a depth of 15 to 24 inches. The seasonal high and high water table are within 18 inches of the surface for long periods during wet seasons. Roots are restricted by the fragipan and seasonal high and high water table. In unlimed areas, this soil is very strongly acid to medium acid above the fragipan and strongly acid to slightly acid in the fragipan and substratum.

Most of the acreage is cropland and pasture or is idle.

Excess water delays plowing and causes the soil to warm slowly in spring. The hazard of erosion is moder-

ate. Minimum tillage, cover crops, stripcropping, grassed waterways, and grass and legumes in the cropping system are measures that reduce runoff and help to control erosion. Subsurface drains are needed to remove excess water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment is restricted part of the year because of wetness. Machine planting is usually practical in the larger areas.

The slow permeability and seasonal high and high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and the other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 3w.

Sn—Sloan silt loam. This nearly level, deep, very poorly drained soil is on flood plains mainly in Lawrence County. Areas are long and narrow and range from 2 to 50 acres.

Typically this soil has a black, friable silt loam surface layer about 6 inches thick. The subsurface layers to 18 inches are black silt loam and light silty clay loam. The subsoil extends to a depth of 43 inches. It is mottled dark gray and gray, firm and friable silty clay loam and loam. The substratum to a depth of 60 inches is dark gray and gray, firm loam.

Included with this soil in mapping are small areas of soils similar to the Sloan soils that have an organic surface layer 12 to 24 inches thick and similar soils that are silty clay and clay in the subsoil or that contain more sand and gravel throughout. Also included are small areas of Holly, Frenchtown, Canadice, and Rexford soils and a few areas of muck.

Permeability is moderate, and available water capacity is high. In unlimed areas, this soil is slightly acid to mildly alkaline in the surface layer and upper part of the subsoil and neutral to moderately alkaline in the lower part of the subsoil and in the substratum. The high water table is within 6 inches of the surface most of the year. Runoff is slow, ponding is common, and flooding is frequent. Roots are restricted by the high water table.

Most areas are wooded or idle.

Adequately drained, this soil can be used for cropland. Excess water delays plowing and causes the soil to warm slowly in spring. Crops may be damaged by flooding and wetness after intensive rainfall. Excess surface water can be removed by keeping natural drainageways open and by constructing surface drains. Subsurface drains, where outlets are available, can be used to improve internal drainage.

Adequately drained, this soil is fairly well suited to pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

The soil is well suited to moisture-tolerant trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the high water table. Use of equipment is restricted most of the year because of the high water table.

The high water table and frequent flooding are limitations for nonfarm uses. In suburban areas this soil can be used for wildlife habitat and other space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 2w.

TsB—Tilsit silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on broad ridgetops in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 3 to 50 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 48 inches. The upper 13 inches is yellowish brown, friable silt loam; the next 18 inches is mottled yellowish brown and brown, very firm and brittle silt loam and heavy silt loam; and the lower 9 inches is mottled brown, firm light silty clay loam. The substratum to a depth of 60 inches is mottled brown, firm very shaly silty clay loam.

Included with this soil in mapping are small areas of nearly level and sloping Tilsit soils and similar soils that contain more coarse fragments throughout, have bedrock at a depth of less than 40 inches, are more sandy throughout, or are not as acid in the fragipan and substratum. Also included are small scattered areas of Gilpin, Clymer, Weikert, Culleoka, Wharton, Ernest, Guernsey, and Cavode soils.

Permeability is slow, and available water capacity is moderate. Runoff is slow to medium. This soil has a fragipan at a depth of 18 to 28 inches. The seasonal high water table is 18 to 30 inches below the surface for long periods during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is strongly acid or very strongly acid throughout.

Most of the acreage is cropland and pasture.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system are measures that reduce runoff

and help to control erosion. Subsurface drains help to improve drainage and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Machine planting is practical in the larger areas.

The slow permeability and seasonal high water table are limitations for many nonfarm uses. These are limitations for onsite disposal of waste and construction of buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If this soil is disturbed for construction, practices will be needed to control erosion and sediment.

The capability subclass is IIe. The woodland symbol is 3o.

TsC—Tilsit silt loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on ridgetops and side slopes in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape to long and narrow and range from 3 to 30 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 48 inches. The upper 13 inches is yellowish brown, friable silt loam; the next 18 inches is mottled yellowish brown and brown, very firm and brittle silt loam and heavy silt loam; and the lower 9 inches is mottled brown, firm light silty clay loam. The substratum to a depth of 60 inches is mottled brown, firm very shaly silty clay loam.

Included with this soil in mapping are small areas of gently sloping Tilsit soils and similar soils that contain more coarse fragments throughout, have bedrock at a depth of less than 40 inches, are more sandy throughout, or are not as acid in the fragipan and substratum. Also included are small scattered areas of Gilpin, Clymer, Weikert, Culleoka, Wharton, Ernest, Guernsey, and Cavode soils.

Permeability is slow, and available water capacity is moderate. Runoff is medium to rapid. This soil has a fragipan at a depth of 18 to 28 inches. The seasonal high water table is at 18 to 30 inches for long periods during wet seasons. Roots are restricted by the fragipan. In unlimed areas, this soil is strongly acid or very strongly acid throughout.

Most areas are pasture and woodland. Some of the acreage is cropland.

The hazard of erosion is severe if this soil is used for cultivated crops. Contour stripcropping, grassed waterways, minimum tillage, cover crops, and grass and legumes in the cropping system are measures that reduce runoff and help to control erosion. Subsurface drains help to improve drainage and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Machine planting is practical in the larger areas.

The slope, slow permeability, and seasonal high water table are limitations for most nonfarm uses. These are limitations for onsite disposal of waste and construction of buildings. If this soil is disturbed for construction, practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 3o.

TyA—Tyler silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on terraces. Slopes are smooth and are generally 200 to 400 feet long. Areas are irregular in shape and range from 5 to 100 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 48 inches. The upper 15 inches is mottled yellowish brown and pale brown, friable to firm silt loam and heavy silt loam; and the lower 24 inches is mottled brown, very firm and brittle silt loam and light clay loam. The substratum to a depth of 60 inches is mottled yellowish brown, stratified silt loam and loam.

Included with this soil in mapping are small areas of gently sloping Tyler soils and similar soils that contain more sand and gravel throughout or are less acid. A few scattered areas of Monongahela, Ernest, Purdy, Allegheny, and Brinkerton soils are also included.

Permeability is slow and very slow, and available water capacity is moderate. In unlimed areas, this soil is strongly acid to extremely acid in the surface layer and subsoil and medium acid to very strongly acid in the substratum. The seasonal high water table is 6 to 18 inches below the surface most of the year. Runoff is slow, and ponding occurs in depressions in wet seasons. Roots are restricted by the seasonal high water table and the fragipan.

Most areas are woodland and pasture or are idle.

Excess water delays plowing and causes the soil to warm slowly in spring. Crops can be damaged by ponded water following intensive rainfall. Excess surface water can be removed by keeping natural drainageways open and by constructing surface drains. Subsurface drains, where outlets are available, can be used to improve drainage.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Excess surface water can be removed by keeping natural drainageways open. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the seasonal high water table and the fragipan. Use of equipment is restricted part of the year because of the seasonal high water table. Machine planting in large drained areas is practical.

The seasonal high water table and slow and very slow permeability are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 2w.

TyB—Tyler silt loam, 3 to 8 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on terraces. Slopes are smooth or concave and are generally 200 to 400 feet long. Areas are irregular in shape and range from 5 to 50 acres.

Typically this soil has a dark grayish brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 48 inches. The upper 15 inches is mottled yellowish brown and pale brown, friable to firm silt loam and heavy silt loam. The lower 24 inches is mottled brown, very firm and brittle silt loam and light clay loam. The substratum to a depth of 60 inches is mottled yellowish brown, stratified silt loam and loam.

Included with this soil in mapping are small areas of nearly level and sloping Tyler soils and similar soils that contain more sand and gravel throughout or are less acid throughout. A few scattered areas of Monongahela, Ernest, Purdy, and Allegheny soils are also included.

Permeability is slow and very slow, and available water capacity is moderate. In unlimed areas, this soil is strongly acid to extremely acid in the surface layer and subsoil and medium acid to very strongly acid in the substratum. The seasonal high water table is 6 to 18 inches below the surface most of the year. Runoff is slow to medium. Roots are restricted by the seasonal high water table and the fragipan.

Most areas are woodland and pasture.

The hazard of erosion is moderate if this soil is used for cultivated crops. Stripcropping, minimum tillage, cover crops, and grass and legumes in the cropping system are measures that reduce runoff and help to control erosion. Wetness delays plowing and causes this soil to warm slowly in spring. Excess surface water can be removed by keeping natural drainageways open and by constructing surface drains. Subsurface drains, where outlets are available, can be used to improve drainage.

This soil is well suited to permanent pasture. Grazing when the soil is wet and overgrazing are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Part of the area is wooded. Potential productivity is high, but roots are restricted by the seasonal high water table and the fragipan. Use of equipment is restricted part of the year because of the seasonal high water table. Machine planting in large areas is usually practical.

The seasonal high water table and slow and very slow permeability are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. In suburban areas this soil is fairly well suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IIIw. The woodland symbol is 2w.

UAB—Udorthents, strip mine, gently sloping. These soils are dominantly very shaly or very channery loamy materials on ridgetops, side slopes, benches, low flats, and flood plains. They formed in areas where the original soils and bedrock were stripped away in order to remove the underlying coal or limestone or both. They occur as widely scattered areas throughout the counties. Areas are irregular in shape or long and narrow and range from 2 to 175 acres. Slopes are generally smooth or hummocky. The slope range is 0 to 8 percent.

Thickness of the fill material ranges from several feet to as much as 100 feet. The source of the fine earth is variable. In Beaver County it is largely Canfield, Ravenna, Gilpin, Wharton, Cavode, Ernest, Guernsey, Monongahela, Tyler, and Purdy soils. In Lawrence County the source is mostly Canfield, Wooster, Ravenna, Gilpin, Cavode, and Wharton soils. Coarse fragments ranging in size from small shale and gravel to stones make up about 30 to 95 percent of the material. They consist mainly of shale, siltstone, sandstone, and limestone and small quantities of coal, carbonaceous shale, pieces of roots, and parts of trees.

Included with these soils in mapping are small areas of moderately steep and steep Udorthents, areas of narrow fill, bedrock escarpments, and small swampy areas, generally on flood plains, that are too acid and wet to support vegetation. Small areas of Arents, Gilpin, Weikert, Loudonville, Wooster, Hazleton, Canfield, Ravenna, Wharton, and Cavode soils are also included.

Permeability is slow to very rapid, and available water capacity is moderate to very low. Runoff is rapid to very slow. Runoff or ground water ponds in low areas or in depressions. Flooding occurs in some places. The

hazard of erosion is slight to severe. Reaction ranges from extremely acid to moderately alkaline but is dominantly extremely acid to slightly acid.

Many areas of Udorthents have only a sparse cover of grasses, briers, aspen, and red maple (fig. 6). In places sweetclover and black locust are growing in the less acid areas. Some areas have been planted to trees, primarily conifers. A few areas have been backfilled and smoothed and seeded with grasses and legumes. Only a small acreage is used for cropland. Generally, the potential is poor for all uses.

The less stony areas of Udorthents can be smoothed and cropped under intensive management. The soils are fairly well suited to drought resistant grasses and legumes for permanent hay and pasture. Adequate lime and fertilizer are needed. Supplemental irrigation should be considered. Minimum tillage, cover crops, grasses and legumes in the cropping system, stripcropping, and crop residue incorporated into the surface layer reduce runoff and help to control erosion.

Nutrients, proper stocking, and pasture rotation to prevent overgrazing are needed if reclaimed areas are to be used for pasture.

Trees can be planted in most areas. Application of lime and fertilizer is generally needed. Removing undesirable plants conserves moisture and improves the stand. Machine planting is generally practical in larger less stony areas.

In most areas these soils are limited for nonfarm uses. A detailed onsite investigation is needed to determine the potential and limitations for any proposed use. In suburban areas, Udorthents can be used for wildlife habitat and some recreation.

Udorthents are not assigned to interpretive groupings.

UAD—Udorthents, strip mine, moderately steep. These soils are dominantly very shaly or very channery loamy materials on ridgetops, side slopes, benches, low flats, and flood plains. They formed in areas where the original soil and bedrock were stripped away in order to remove the underlying coal or limestone or both. They occur as widely scattered areas throughout the counties. Areas are irregular in shape or long and narrow and range from 2 to 200 acres. Slopes are complex and irregular or smooth. The slope range is 8 to 25 percent.

Thickness of the fill material ranges from several feet to as much as 100 feet. The source of the fine earth is variable. In Beaver County it is largely Canfield, Ravenna, Gilpin, Hazleton, Wharton, Cavode, Culleoka, Guernsey, Vandergrift, and Ernest soils. In Lawrence County the source is mainly Canfield, Wooster, Ravenna, Gilpin, Loudonville, Cavode, and Wharton soils. Coarse fragments ranging in size from small shale or gravel to stones make up 30 to 95 percent of the material. They consist mainly of shale, siltstone, sandstone, and limestone and small quantities of coal, carbonaceous shale, pieces of roots, and parts of trees.

Included with these soils in mapping are small areas of gently sloping and steep Udorthents, quarries, and bedrock escarpments. Small areas of Arents, Gilpin, Weikert, Hazleton, Loudonville, Wooster, Canfield, Ravenna, Wharton, and Cavode soils are also included.

Permeability is moderately slow to very rapid, and available water capacity is generally low or very low. Runoff is medium to very rapid. Runoff or ground water ponds in some depressions. The hazard of erosion is severe to very severe. Reaction ranges from extremely acid to moderately alkaline but is dominantly extremely acid to slightly acid.

Many areas of Udorthents have only a sparse cover of grasses, briers, aspen, and red maple. In places sweet clover and black locust are growing in the less acid areas. Some areas have been planted to trees, mainly confiers. A few areas have been backfilled and smoothed and seeded to grasses and legumes. Only a small acreage is used for cropland. Generally, the potential is poor for all uses.

The less stony areas of Udorthents can be smoothed and cropped under intensive management. The soils are suited to drought resistant grasses and legumes for permanent hay and pasture (fig. 21). Adequate lime and fertilizer are needed. Supplemental irrigation should be considered. Minimum tillage, diversions, cover crops, grasses and legumes in the cropping system, and stripcropping reduce runoff and help to control erosion.

Nutrients, proper stocking, and pasture rotation to prevent overgrazing are needed if reclaimed areas are to be used for pasture.

Trees can be planted in most areas. Areas with complex slopes should be regraded. Application of lime and fertilizer is generally needed. Removing undesirable plants conserves moisture and improves the stand. Machine planting is generally practical in the larger, smoothed areas that are not too channery or stony.

In most areas these soils are seriously limited for nonfarm uses. A detailed onsite investigation is needed to determine the potential and limitations for any proposed use. In surburban areas, Udorthents can be used for wildlife habitat, open space, and some recreation uses.

Udorthents are not assigned to interpretive groupings.

UAE—Udorthents, strip mine, steep. These soils are dominantly very shaly or very channery, loamy materials on ridgetops, side slopes, benches, low flats, and flood plains. They formed in areas where the original soils and bedrock were stripped away in order to remove the underlying coal or limestone or both. They occur as scattered areas throughout the counties. Areas are irregular in shape to long and narrow and range from 2 to 200 acres. Slopes are complex and irregular or smooth. The slope range is 25 to 100 percent.

Thickness of the fill material ranges from several feet to as much as 100 feet. The source of the fine earth is variable. In Beaver County it is largely Canfield, Ravenna, Gilpin, Hazleton, Culleoka, Guernsey, Vandergrift, Cavode, Wharton, and Ernest soils. In Lawrence County the source is mostly Canfield, Wooster, Ravenna, Gilpin, Loudonville, and Wharton soils. Coarse fragments rang-

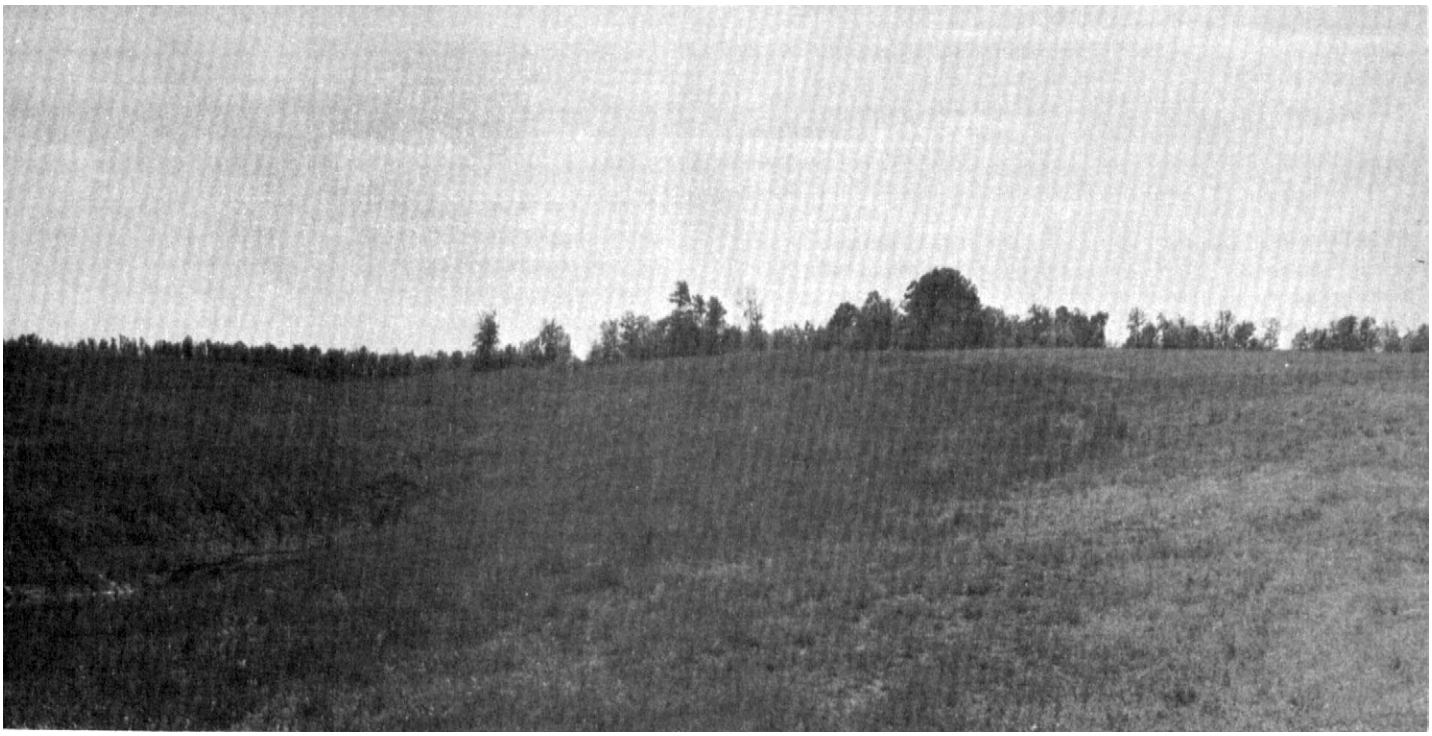


Figure 21.—Area of Udorthents, strip mine. The area to the left has been planted in grass with a minimum of leveling and preparation. The area to the right has been smoothed, limed, fertilized, and seeded to a grass-legume hay mixture.

ing in size from fine shale or gravel to stones make up 30 to 95 percent of the material. They consist mainly of shale, siltstone, sandstone, and limestone and small quantities of coal and carbonaceous shale.

Included with these soils in mapping are small areas of gently sloping and moderately steep Udorthents, quarries, and bedrock escarpments. Also included are small areas of Arents, Hazleton, Loudonville, Gilpin, Weikert, Wooster, Canfield, Ravenna, Wharton, and Cavode soils. Small areas that contain a very high percentage of coal fragments and carbonaceous shale are at sites of active or abandoned tipples and mines.

Permeability is moderately slow to very rapid, and available water capacity is low or very low. Runoff is rapid to very rapid. The hazard of erosion is very severe. These soils are extremely acid to moderately alkaline, but they are dominantly extremely acid to strongly acid.

Most areas of Udorthents have only a sparse cover of grasses, briers, and aspen. Some areas have been planted to trees, mainly conifers. A few areas have been regraded and smoothed, and seeded to grasses and legumes. Generally the potential is poor for all uses.

These soils are not suited to cultivated crops or pasture because of the steep slopes and severe erosion hazard. If areas of these soils are smoothed, they can be used for drought-resistant grasses and legumes. Adequate lime and fertilizer are generally needed. Trees can be planted on these soils, however, regrading will be needed on many areas because of the steepness and complexity of the slopes. Removing undesirable plants conserves moisture and improves the stand. Machine planting is generally not possible because of steepness of slopes.

These soils are seriously limited for nonfarm uses. A detailed onsite investigation is needed to determine the potential and limitations for any proposed use. In surburban areas, Udorthents can be used for wildlife habitat and some recreation.

Udorthents are not assigned to interpretive groupings.

Ub—Urban land-Arents complex. This map unit consists of areas of Urban land and Arents on flood plains, terraces, and uplands. It is mostly along the major waterways and large highways, but small areas are sparsely scattered in other places. Slopes are nearly level to very steep and are smooth, convex, or concave. Areas are irregular in shape to long and narrow and range from 2 to 200 acres. Urban land and Arents occur together in such intricate patterns that it was impractical to map them separately.

About 50 percent of this complex is Urban land. Urban land is covered with streets, highways, parking lots, factories, shopping centers, buildings, and other structures

that obscure or alter the soils so that identification is not feasible. Slopes are nearly level to sloping.

About 40 percent of this complex is Arents, in areas of cuts and fills made to reshape the land surface. These areas consist of heterogenous earthy material, rock fragments, and parts of other soils. Coarse fragments make up 0 to 90 percent of the material. Slopes are nearly level to very steep.

Included with this complex in mapping are small, relatively undisturbed areas of Gilpin, Weikert, Wooster, Canfield, Conotton, Philo, Atkins, Lobdell, Holly, Brinkerton, Frenchtown, and Purdy soils. Also included are narrow fill and bedrock escarpments.

Permeability, available water capacity, runoff, internal drainage, and reaction are variable in this unit. Depth to bedrock is about 12 inches to 50 feet or more. Many areas are surface drained through sewer systems and open drains. After heavy rainfall water tends to pond on the surface in some depressions and areas that have been compacted.

A large part of this map unit is covered with buildings, asphalt, concrete, or other impervious surfaces. The open part is mostly grassland or woodland, or it is idle with a sparse cover of native grasses, briers, and brush.

The cut areas that are steep or contain many coarse fragments are droughty and not well suited for any use. Planting these areas in shallow rooting, drought resistant grasses and legumes will reduce erosion and runoff. Most fills and cut areas that are not too steep or shallow to bedrock are fairly well suited to grasses, trees, and shrubs for lawns, landscaping, or recreation.

Many of the nearly level to gently sloping cut areas are suitable for use as building sites. Depth to bedrock and wetness are limitations in other areas. Fill areas are frequently subject to subsidence and are not well suited to use as building sites. This unit is so variable that onsite investigation is needed to determine its potential and limitations for any proposed use.

This map unit is not assigned to interpretive groupings.

UcB—Urban land-Canfield complex, 0 to 8 percent slopes. This map unit consists of nearly level and gently sloping areas of Urban land and deep, moderately well drained Canfield soil on broad ridgetops, benches, and low flats in glacial uplands. It is mainly in the vicinity of New Castle, but a few areas are widely scattered throughout Lawrence County. Slopes are smooth, convex, or concave. Areas are irregular in shape. Most range from 2 to 200 acres. Urban land and Canfield soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, shopping centers, factories, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Canfield soil. Typically this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is yellowish brown, friable silt loam with a few mottles in the lower part; and the lower 29 inches is mottled brown and dark yellowish brown, very firm and brittle silt loam and gravelly loam. The substratum to a depth of 60 inches is mottled dark yellowish brown, firm gravelly loam. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few sloping and moderately steep areas of Urban land and Canfield soil, narrow areas of fill, and bedrock escarpments. Also included are areas of Arents, Ravenna, Frenchtown, Chili, Conotton, and Wooster soils.

Most areas of this map unit are surface drained through sewer systems and gutters. Urban land is covered and characteristics are obscured. Permeability is slow in the Canfield soil, and available water capacity is moderate. The seasonal high water table is 18 to 36 inches below the surface. This soil has a fragipan at a depth of 15 to 30 inches. Runoff is medium to slow. In unlimed areas, the Canfield soil is very strongly acid or strongly acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil and in the substratum. Roots are restricted by the seasonal high water table and the fragipan. The hazard of erosion is slight or moderate.

The Canfield soil, or open part of this map unit, is in yards, lawns, cemeteries, parks, and open space.

The Canfield soil is well suited to vegetables, flowers, grasses, trees, and shrubs. Seasonal wetness is a limitation for gardens, landscaping, lawns, golf courses, and recreation areas.

The seasonal high water table and slow permeability are limitations for onsite disposal of waste, construction of buildings with basements, and for intensive recreation development such as athletic fields. Foundation drains with proper outlets are needed to prevent seepage of water into basements. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UcD—Urban land-Canfield complex, 8 to 25 percent slopes. This map unit consists of sloping and moderately steep areas of Urban land and deep, moderately well drained Canfield soil on ridges and side slopes in glacial uplands. It is mainly in the vicinity of New Castle, but a few areas are widely scattered throughout Lawrence County. Slopes are smooth, concave, or convex. Areas are irregular in shape or long and narrow and range from 2 to 75 acres. Urban land and Canfield soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, build-

ings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Canfield soil. Typically this soil has a brown silt loam surface layer about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 12 inches is yellowish brown, friable silt loam with a few mottles in the lower part; and the lower 29 inches is mottled brown and dark yellowish brown, very firm and brittle silt loam and gravelly loam. The substratum to a depth of 60 inches is mottled dark yellowish brown, firm gravelly loam. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few nearly level, gently sloping, and steep areas of Urban land and Canfield soil, narrow areas of fill, and bedrock escarpments. Also included are areas of Arents, Wooster, Loudonville, Ravenna, Frenchtown, Conotton, and Chili soils.

Most areas of this map unit are surface drained through sewer systems and gutters. Urban land is covered and characteristics are obscured. Permeability is slow in the Canfield soil, and available water capacity is moderate. The seasonal high water table is 18 to 36 inches below the surface. This soil has a fragipan at a depth of 15 to 30 inches. Runoff is medium to rapid. In unlimed areas, the Canfield soil is very strongly acid or strongly acid in the surface layer and upper part of the subsoil and medium acid to neutral in the lower part of the subsoil and in the substratum. Roots are restricted by the seasonal high water table and the fragipan. The hazard of erosion is severe or very severe.

The Canfield soil, or open part of this map unit, is in yards, lawns, cemeteries, parks, and open space.

The Canfield soil is fair for growing grasses, vegetables, flowers, trees, and shrubs. The slope and seasonal wetness are limitations for gardens, landscaping, lawns, golf courses, and recreation areas.

The seasonal high water table, slow permeability, and slope are limitations for onsite disposal of waste, construction of buildings, and intensive recreation developments such as athletic fields. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If these soils are disturbed for construction, management practices will be needed to control erosion and sediment. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UfB—Urban land-Conotton complex, 0 to 8 percent slopes. This map unit consists of nearly level and gently sloping areas of Urban land and deep, well drained and somewhat excessively drained Conotton soil on high terraces, benches, and lowlands. It is along the major waterways in Beaver County and in the vicinity of New Castle and Ellwood City in Lawrence County. Slopes are smooth, convex, or concave. Areas are irregular in shape or long and narrow and range from 2 to 300 acres. Urban land and Conotton soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, shopping centers, factories, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is areas of Conotton soil. Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown, very friable very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few sloping, moderately steep, and steep areas of Urban land and Conotton soil; narrow areas of fill; and bedrock escarpments. Also included are areas of Arents, Allegheny, Chili, Monongahela, Canfield, Wharton, Tyler, Purdy, and Gilpin soils.

Most areas of this map unit are surface drained through sewer systems and gutters. Narrow valley bottoms and low areas adjacent to the larger waterways are subject to flooding. Depressions often remain wet for long periods. Urban land is covered and characteristics are obscured. Permeability is rapid in the Conotton soil, and available water capacity is moderately low. In unlimed areas, the Conotton soil is very strongly acid to medium acid in the upper part of the solum, strongly acid to neutral in the lower part, and medium acid to mildly alkaline in the substratum. Runoff is medium. The hazard of erosion is slight to moderate.

The Conotton soil, or open part of this map unit, is in yards, lawns, parks, cemeteries, and open space.

The Conotton soil is suited to vegetables, flowers, grasses, trees, and shrubs. Moderate to low available water capacity and gravelly surfaces are limitations for gardens, landscaping, lawns, golf courses, and nonintensive recreation developments.

These soils have few limitations for building sites. Gravel is a limitation for shallow excavations, playgrounds, and athletic fields. Because of the gravelly substratum, there is a hazard of ground water contamination if these soils are used for onsite disposal of waste. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UfD—Urban land-Conotton complex, 8 to 25 percent slopes. This map unit consists of sloping and mod-

erately steep areas of Urban land and deep, well drained and somewhat excessively drained Conotton soil on high terraces, benches, and lower side slopes. It is along the Ohio and Beaver Rivers in Beaver County and in the vicinity of New Castle and Ellwood City in Lawrence County. Slopes are smooth, convex, or concave. Areas are irregular in shape or long and narrow and range from 2 to 50 acres. Urban land and Conotton soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Conotton soil. Typically this soil has a dark brown gravelly loam surface layer about 6 inches thick. The subsoil extends to a depth of 56 inches. The upper 5 inches is strong brown, very friable, gravelly fine sandy loam; and the lower 45 inches is reddish brown and strong brown, very friable, very gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown, loose stratified gravel and sand. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few gently sloping and steep areas of Urban land and Conotton soil, narrow areas of fill, and bedrock escarpments. Also included are areas of Arents, Allegheny, Chili, Monongahela, Canfield, Tyler, Wharton, Gilpin, Weikert, and Loudonville soils.

Most areas of this map unit are surface drained through sewer systems and gutters. Streams in narrow valleys overflow and lower slopes remain wet for significant periods following intensive rainfall. Urban land is covered and characteristics are obscured. Permeability is rapid in the Conotton soil, and available water capacity is moderate to low. In unlimed areas, the Conotton soil is very strongly acid to medium acid in the surface layer and upper part of the subsoil, strongly acid to neutral in the lower part of the subsoil, and medium acid to mildly alkaline in the substratum. Runoff is rapid and the hazard of erosion is severe to very severe where unprotected.

The Conotton soil, or open part of this map unit, is in yards, lawns, parks, cemeteries, and open space.

The Conotton soil is fairly well suited to vegetables, flowers, grasses, trees, and shrubs. Moderate to low available water capacity, slope, and gravelly surfaces are limitations for gardens, landscaping, lawns, golf courses, and recreation areas.

Slope is the major limitation for building sites and intensive recreation developments such as athletic fields. If these soils are disturbed for construction, management practices will be needed to control erosion and sediment. Because of the permeable, gravelly substratum, there is a hazard of groundwater contamination if these soils are used for onsite disposal of waste. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UgB—Urban land-Gilpin complex, 0 to 8 percent slopes. This map unit consists of nearly level and gently sloping areas of Urban land and moderately deep, well drained Gilpin soil on ridgetops in residual uplands. Areas are scattered throughout Beaver County. Slopes are smooth, convex or concave. Areas are usually irregular in shape and range from 2 to 50 acres. Urban land and Gilpin soils occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Gilpin soil. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone bedrock is at a depth of 30 inches. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few sloping, moderately steep, and steep areas of Urban land and Gilpin soil, narrow areas of fill, and bedrock escarpments. Also included are areas of Arents, Tilsit, Clymer, and Hazleton soils.

Most areas of this map unit are surface drained through sewer systems and gutters. The Urban land is covered and characteristics are obscured. Permeability is moderate in the Gilpin soil, and available water capacity is moderate. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. Runoff is medium. Roots are restricted by bedrock at a depth of 20 to 40 inches. The hazard of erosion is moderate.

The Gilpin soil, or open part of this map unit, is in yards, lawns, parks, and open space.

The Gilpin soil is suited to grasses, flowers, vegetables, trees, and shrubs. Moderate available water capacity and depth to bedrock can be limitations for gardens, lawns, landscaping, golf courses, and recreation areas.

Depth to bedrock is a limitation for onsite disposal of waste and construction of buildings with basements. If these soils are disturbed for construction, management practices will be needed to control erosion and sediment. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UgD—Urban land-Gilpin complex, 8 to 25 percent slopes. This map unit consists of sloping and moderate-

ly steep areas of Urban land and moderately deep, well drained Gilpin soil on ridges and side slopes in residual uplands. It is scattered throughout Beaver County. Slopes are smooth or convex. Areas are usually irregular in shape or long and narrow and range from 2 to 50 acres. Urban land and Gilpin soils occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Gilpin soil. Typically this soil has a dark brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm, very shaly silt loam. Fractured shale and siltstone are at a depth of about 30 inches. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few gently sloping and steep areas of Urban land and Gilpin soil, narrow areas of fill, and bedrock escarpments. Also included are areas of Arents, Weikert, Wharton, Cavode, Tilsit, Upshur, and Ernest soils.

Most areas of this map unit are surface drained through sewer systems and gutters. The Urban land is covered and characteristics are obscured. Permeability is moderate in the Gilpin soil, and available water capacity is moderate. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. Runoff is medium to very rapid, and the hazard of erosion is severe or very severe. Roots are restricted by shale at a depth of 20 to 40 inches.

The Gilpin soil, or open part of this map unit, is in yards, lawns, parks, and open space.

The Gilpin soil is fairly well suited to grasses, flowers, vegetables, trees, and shrubs. Slope, depth to bedrock, and moderate available water capacity can be limitations for gardens, landscaping, lawns, golf courses, and recreation areas.

Depth to bedrock and slope are limitations for onsite disposal of waste and construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion and sediment. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UwB—Urban land-Wharton complex, 0 to 8 percent slopes. This map unit consists of nearly level and gently sloping areas of Urban land and deep, moderately well drained Wharton soil on broad ridgetops and benches in residual uplands. It is scattered throughout Beaver County. Slopes are smooth, concave, or occasionally convex. Areas are irregular in shape to long and narrow and range from 2 to 200 acres. Urban land and Wharton soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, shopping centers, schools, homes, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Wharton soil. Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled yellowish brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few sloping, moderately steep and steep areas of Urban land and Wharton soil, narrow areas of fill, and bedrock escarpments. Also included are small areas of Arents, Gilpin, Cavode, Guernsey, Vandergrift, Upshur, Brinkerton, Ernest, and Culleoka soils.

Most areas of this map unit are surface drained through sewers and gutters. Some depressions, valley bottoms, and lowlands remain wet for long periods. Streams in narrow drainageways overflow following periods of intensive rainfall. Urban land is covered and characteristics are obscured. Permeability is slow and moderately slow in the Wharton soil, and available water capacity is high. The seasonal high water table is 18 to 36 inches below the surface. Runoff is slow to medium. In unlimed areas, the Wharton soil is strongly acid or very strongly acid in the surface layer and subsoil. Bedrock is at a depth of 40 to 72 inches. Roots are restricted by the seasonal high water table. The hazard of erosion is slight to moderate.

The Wharton soil, or open part of this map unit, is in yards, lawns, cemeteries, parks, and open space.

The Wharton soil is well suited to vegetables, flowers, grasses, trees, and shrubs. It is slow to dry out and warm up in the spring, and surface compaction can be a problem where the soil is subject to vehicular or foot traffic. This soil has few limitations for gardens, landscaping, lawns, golf courses, and nonintensive recreation areas.

Slow and moderately slow permeability, seasonal high water table, and unstable soil materials are limitations for onsite disposal of waste, construction of buildings with basements, and for intensive recreation developments such as athletic fields. Foundation drains with proper outlets are needed to prevent seepage of water into basements. When these soils are disturbed for construction, practices will be needed to control erosion and

sediment. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

UwD—Urban land-Wharton complex, 8 to 25 percent slopes. This map unit consists of sloping and moderately steep areas of Urban land and deep, moderately well drained Wharton soil on hillsides and side slopes in dissected residual uplands. It is scattered throughout Beaver County. Slopes are smooth, convex, or concave. Areas are long and narrow or irregular in shape and range from 2 to 50 acres. Urban land and Wharton soil occur together in such intricate patterns that it was impractical to map them separately.

About 70 percent of this complex is Urban land. This part of the unit is covered by streets, parking lots, shopping centers, schools, homes, and other structures that obscure or alter the soils so that identification is not feasible.

About 15 percent of this complex is Wharton soil. Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled yellowish brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam. In many areas the surface layer and the upper part of the subsoil have been mixed or otherwise disturbed during urbanization.

Included with this complex in mapping are a few nearly level, gently sloping, and steep areas of Urban land and Wharton soil, narrow areas of fill, and bedrock escarpments. Also included are small areas of Arents, Gilpin, Cavode, Guernsey, Upshur, Vandergrift, Ernest, Culleoka, Clymer, Hazleton, and Weikert soils.

Most areas of this unit are surface drained through sewers and gutters. Some depressions, foot slopes, and narrow valley bottoms remain wet for long periods, and streams in the narrow drainageways overflow following periods of intensive rainfall. Disturbed areas are frequently unstable and subject to slips and landslides. Urban land is covered and characteristics are obscured. Permeability is slow and moderately slow in the Wharton soil, and available water capacity is high. The seasonal high water table is at 18 to 36 inches. Runoff is medium to rapid. In unlimed areas, the Wharton soil is strongly acid or very strongly acid in the surface layer and subsoil. Bedrock is at a depth of 40 to 72 inches. Roots are restricted by the seasonal high water table. The hazard of erosion is severe to very severe.

The Wharton soil, or open part of this map unit, is in yards, lawns, cemeteries, parks, and open space.

The Wharton soil is fairly well suited to grasses, vegetables, flowers, trees, and shrubs. Slope and seasonal wetness are limitations for gardens, landscaping, lawns, golf courses, and nonintensive recreation areas. Surface compaction is a problem where the soil is subject to vehicular or foot traffic.

Slow and moderately slow permeability, seasonal high water table, slope, and unstable soil materials are limitations for onsite disposal of waste, construction of buildings, and for intensive recreation developments such as athletic fields. Foundation drains with proper outlets should be used to prevent seepage of water into basements. If these soils are disturbed for construction, practices will be needed to control erosion and sediment and to increase stability. All sanitary facilities should be connected to commercial sewers and treatment systems. A careful onsite investigation is needed to determine the potentials and limitations of this complex for any proposed use.

This map unit is not assigned to interpretive groupings.

VgD—Vandergrift-Gilpin complex, 15 to 35 percent slopes. This unit consists of deep, moderately well drained and somewhat poorly drained Vandergrift soil and moderately deep, well drained Gilpin soil. They are moderately steep and steep soils on hillsides in residual uplands. Slopes are concave. Most are 200 to 600 feet long. Areas are long and narrow and range from 2 to 30 acres. Vandergrift and Gilpin soils occur together in such intricate patterns that it was impractical to map them separately.

The Vandergrift soil makes up about 65 percent of this complex. Typically this soil has a dark brown heavy silt loam surface layer about 2 inches thick. The subsurface layer is reddish brown, friable silty clay loam about 6 inches thick. The subsoil extends to a depth of 58 inches. It is dark reddish brown, reddish brown, and dusky red, firm silty clay loam and silty clay that is mottled in the lower 36 inches. The substratum to a depth of 71 inches is reddish brown, firm silty clay loam.

The Gilpin soil makes up about 20 percent of this complex. Typically this soil has a very dark grayish brown silt loam surface layer about 3 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 27 inches. It is yellowish brown, friable silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

Included with these soils in mapping are small areas of sloping and very steep Vandergrift and Gilpin soils, narrow areas of fill, and bedrock escarpments. Small areas of Upshur, Wharton, Cavode, Culleoka, Guernsey, Weikert, Brinkerton, and Ernest soils are also included.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. Permeability is slow in the Vandergrift soil, and available water capacity is moderate to high. In unlimed areas, the Vandergrift soil is very strongly acid to neutral in the solum and strongly acid to mildly alkaline in the substratum. The Gilpin soil is strongly acid to extremely acid throughout. Runoff is

rapid or very rapid on both soils. Roots may be restricted by the firm clayey subsoil in the Vandergrift soil and by bedrock at a depth of 20 to 40 inches in the Gilpin soil. The Vandergrift soil has a clayey subsoil with a high shrink-swell potential. It is unstable and subject to slips and landslides.

Most areas are used for woodland and recreation.

Moderately steep to steep slopes, the very severe hazard of erosion, and the hazard of slips and landslides make these soils unsuited to cropland and poorly suited to pasture. If they are used for pasture, proper stocking to maintain key plant species and rotation of pasture are the chief management needs.

These soils are well suited to trees. A large acreage is woodland. Potential productivity is high. Roots may be restricted by the firm clayey subsoil in the Vandergrift soil and by bedrock at a depth of 20 to 40 inches in the Gilpin soil. Low strength and potential landslides, the very severe hazard of erosion, and slopes are serious equipment limitations for these soils.

These soils have severe limitations for nonfarm uses. The major limitations for both soils are moderately steep to steep slopes and the very severe hazard of erosion. The Gilpin soil has bedrock at a depth of 20 to 40 inches. The Vandergrift soil is slowly permeable with a seasonal high water table, a clayey subsoil, and a high shrink-swell potential. It is very unstable and is subject to slips and landslides. Areas of these soils are generally unsuited to any construction or earth moving operation. In areas of suburban development these soils can be used for wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is VIIe. The woodland symbol is 2w for the Vandergrift soil and 2r for the Gilpin soil.

WeF—Weikert-Rock outcrop complex, 25 to 80 percent slopes. This mapping unit consists of steep and very steep, shallow, well drained Weikert soil and Rock outcrop on hillsides in dissected residual uplands. Slopes are smooth or convex. The slope range is 25 to 80 percent. Most areas are long and narrow and range from 10 to 100 acres. Weikert soil and Rock outcrop occur together in such intricate patterns that it was impractical to map them separately.

About 65 percent of this complex is Weikert soil. Typically this soil has a very dark grayish brown shaly silt loam surface layer about 2 inches thick. The subsurface layer is brown, friable shaly silt loam about 5 inches thick. The subsoil extends to a depth of 15 inches. It is yellowish brown, friable shaly silt loam. The substratum to a depth of 18 inches is yellowish brown, firm, very shaly silt loam. Fractured shale is at a depth of 18 inches.

About 20 percent of this complex is Rock outcrop. This part of the unit consists of exposed bedrock. It generally occurs as strata or bands that extend across the slope for 100 feet to several thousand feet and ranges in thickness from 1 foot to 10 feet or more. These strata generally recur at irregular intervals up the slope. It consists of shale, siltstone, and sandstone ranging in consistence from highly weathered and fractured to very hard and massive.

Included with this complex in mapping are small areas of sloping and moderately steep Weikert soil and escarpments. Also included are areas of Gilpin, Hazleton, Culleoka, Upshur, Vandergrift, Loudonville, and Ernest soils.

The Weikert soil has bedrock at a depth of 10 to 20 inches, moderately rapid permeability, and very low available water capacity. Runoff is rapid or very rapid. In unlimed areas, the Weikert soil is medium acid to very strongly acid throughout. The more weathered areas of Rock outcrop permit some shallow root penetration along bedding plains. They are practically impermeable and have no appreciable available water capacity.

Most areas are wooded (fig. 2).

Areas of this map unit are unsuited to cropland and are poorly suited to pasture because of steepness of slope, very low available water capacity, and very severe erosion hazard. The Weikert soil has bedrock at a depth of 10 to 20 inches, and the Rock outcrop will not support plant life.

This unit is fairly well suited to poorly suited to trees. Roots are restricted by bedrock at a depth of less than 20 inches. Potential productivity is moderate in the Weikert soil. Major management problems are the serious loss of seedlings because of very low available water capacity and severe equipment limitations because of slopes and rock outcrop.

The steep and very steep slopes and bedrock at a depth of less than 20 inches are severe limitations for nonfarm uses. In suburban areas this unit can be used for woodland, and wildlife habitat, undeveloped recreation areas, or areas maintained in trees or shrubs.

The capability subclass VIIe. The woodland symbol is 4d for Weikert soil.

WhA—Wharton silt loam, 0 to 3 percent slopes. This nearly level, deep, moderately well drained soil is on broad ridgetops in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 2 to 20 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled yellowish brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam.

Included with this soil in mapping are small areas of gently sloping Wharton soils and similar soils that contain more clay in the subsoil. A few scattered areas of Cavode, Ernest, Guernsey, Tilsit, Brinkerton, and Gilpin soils are also included.

Permeability is slow and moderately slow, and available water capacity is high. Runoff is slow to medium. The

seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Roots are restricted by the seasonal high water table. In unlimed areas, this soil is strongly acid or very strongly acid in the solum and very strongly acid or extremely acid in the substratum. Bedrock is at a depth of 40 to 72 inches.

Most of the acreage is cropland. A few areas are pasture and woodland.

Wetness delays plowing and causes the soil to warm slowly in spring. Use of cover crops, grass and legumes in the cropping system, and utilizing crop residue are practices that maintain organic matter content. Diversions and subsurface drains are needed to remove excess water and provide for timely tillage.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted for short periods during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The slow and moderately slow permeability and the seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If this soil is disturbed for construction, practices may be needed to control erosion and sediment.

The capability subclass is IIw. The woodland symbol is 2o.

WhB—Wharton silt loam, 3 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on broad ridgetops and side slopes in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 5 to 50 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled yellowish brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam.

Included with this soil in mapping are small areas of nearly level and sloping Wharton soils, similar soils that contain more clay in the subsoil, and similar soils that contain more shale in the surface layer and subsoil. A few scattered areas of Cavode, Gilpin, Tilsit, Guernsey, Ernest, Brinkerton, and Canfield soils are also included.

Permeability is slow and moderately slow, and available water capacity is high. Runoff is medium. The seasonal high water table is 18 to 36 inches below the surface for long periods during wet seasons. Roots are restricted by the seasonal high water table. In unlimed areas, this soil is strongly acid or very strongly acid in the surface layer and subsoil and very strongly acid or extremely acid in the substratum. Bedrock is at a depth of 40 to 72 inches.

Most of the acreage is cropland. A few areas are pasture and woodland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Wetness delays plowing and causes the soil to warm slowly in the spring. Minimum tillage, diversions, use of cover crops, grass and legumes in the cropping system, contour stripcropping, and grassed waterways are measures that reduce runoff and help to control erosion. Surface and subsurface drains are needed to remove excess water and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted for short periods during wet seasons because of the seasonal high water table. Machine planting is practical in the larger areas.

The slow and moderately slow permeability and a seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with subsurface basements (fig. 22). Foundation drains with proper outlets are needed to prevent seepage of water into basements. If the soil is disturbed for construction, practices will be needed to control erosion and sediment.

The capability subclass is IIe. The woodland symbol is 2o.

WhC—Wharton silt loam, 8 to 15 percent slopes. This sloping, deep, moderately well drained soil is on ridgetops and side slopes in residual uplands. Slopes are smooth or concave and are generally 200 to 600 feet long. Areas are irregular in shape and range from 3 to 50 acres or more.

Typically this soil has a dark grayish brown silt loam surface layer about 10 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled yellowish brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam.

Included with this soil in mapping are small areas of gently sloping and moderately steep Wharton soils, similar soils that contain more clay in the subsoil, and similar soils that contain more shale in the surface layer and subsoil. A few scattered areas of Gilpin, Weikert,

Figure 22.—Septic tank system failure on Wharton silt loam, 3 to 8 percent slopes. Sewage effluent is discharged on the soil surface due to slow permeability and seasonal high water table.

Cavode, Guernsey, Ernest, and Canfield soils are also included.

Permeability is slow and moderately slow, and available water capacity is high. Runoff is medium to rapid. This soil has a seasonal high water table at a depth of 18 to 36 inches for long periods during wet seasons. Roots are restricted by the seasonal high water table. In unlimed areas, this soil is strongly acid or very strongly acid in the surface layer and subsoil and very strongly acid or extremely acid in the substratum. Bedrock is at a depth of 40 to 72 inches.

Most of the acreage is cropland and pasture. A few areas are wooded or idle.

The hazard of erosion is severe if this soil is used for cultivated crops. Wetness delays plowing and causes the soil to warm slowly in spring. Minimum tillage, use of cover crops, grass and legumes in the cropping system, contour stripcropping, diversions, and grassed waterways are measures that reduce runoff and help to control erosion. Subsurface drains are needed to improve drainage and provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter

content and reduces the tendency of the soils to clod and crust.

This soil is well suited to pasture. Overgrazing and grazing when the soil is wet are major concerns of pasture management. If the pasture is grazed when wet, the surface layer compacts. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

This soil is well suited to trees. Removing undesirable species increases production. Use of equipment may be restricted by slope for short periods during wet seasons, because of the seasonal high water table. Machine planting is practical in the larger areas.

The slope, slow and moderately slow permeability, and seasonal high water table are limitations for most nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings with subsurface basements. Foundation drains with proper outlets are needed to prevent seepage of water into basements. If the soil is disturbed for construction, practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 2r.

WnD—Wharton-Gilpin silt loams, 15 to 25 percent slopes. This moderately steep, deep, moderately well drained Wharton soil and moderately steep, moderately deep, well drained Gilpin soil are on hillsides and side slopes in dissected residual uplands. Slopes are smooth or convex and are generally 200 to 400 feet long. Areas are long and narrow and range from 3 to 30 acres or more. Wharton and Gilpin soils occur together in such intricate patterns that it was impractical to map them separately.

The Wharton soil makes up about 50 percent of this complex. Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 12 inches is yellowish brown, friable silt loam; and the lower 24 inches is mottled brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and brown, firm shaly silt loam.

The Gilpin soil makes up about 35 percent of this complex. Typically this soil has a dark grayish brown silt loam surface layer about 8 inches thick. The subsoil to a depth of 27 inches is yellowish brown, friable, silt loam and shaly silt loam. The substratum to a depth of 30 inches is yellowish brown, firm very shaly silt loam. Fractured shale and siltstone are at a depth of 30 inches.

Included with these soils in mapping are a few small areas of sloping and steep Wharton and Gilpin soils and scattered areas of Hazleton, Weikert, Ernest, Culleoka, Guernsey, Cavode, Canfield, and Atkins soils.

Permeability is slow and moderately slow in the Wharton soil, and available water capacity is high. The seasonal high water table is 18 to 36 inches below the surface in wet seasons. In unlimed areas, the Wharton soil is strongly acid or very strongly acid in the surface layer and subsoil and very strongly acid or extremely acid in the substratum. Bedrock is at a depth of 40 to 72 inches.

Permeability is moderate in the Gilpin soil, and available water capacity is moderate. In unlimed areas, the Gilpin soil is strongly acid to extremely acid throughout. Roots may be restricted by bedrock at a depth of 20 to 40 inches. Runoff is rapid on both of these soils.

Most areas are pasture and woodland or are idle. Some of the acreage is cropland.

These soils can be used for cultivated crops with adequate management practices. If they are used for cultivated crops, the hazard of erosion is very severe. Minimum tillage, cover crops, grass and legumes in the cropping system, contour stripcropping, diversions, and grassed waterways are measures that reduce runoff and help to control erosion. Subsurface drains are needed in the Wharton soil to reduce wetness caused by seeps and springs and to provide for timely tillage. Incorporating crop residue into the surface layer maintains the organic matter content and improves tilth.

These soils are fairly well suited to pasture. Proper stocking to maintain key plant species, rotation of pasture, and restricted grazing during wet periods are the chief management needs.

These soils are well suited to trees. Roots may be restricted by bedrock in the Gilpin soil. Removing undesirable species increases production. Machine planting in large areas is generally practical but is limited by slope.

These soils have limitations for nonfarm uses. The Wharton soil has limitations because of slope, slow and moderately slow permeability, and the seasonal high water table. Use of the Gilpin soil is limited by slope and bedrock at a depth of 20 to 40 inches. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If these soils are disturbed for construction, management practices will be needed to control erosion and sediment. In suburban areas these soils are suited to wildlife habitat, undeveloped recreation areas, and other open space uses maintained in grass, shrubs, or trees.

The capability subclass is IVe. The woodland symbol is 2r.

WoB—Wooster gravelly silt loam, 3 to 8 percent slopes. This gently sloping, deep, well drained soil is on ridges in glaciated uplands. Slopes are smooth or convex and are generally 100 to 500 feet long. Areas are irregular in shape. Most are 2 to 20 acres.

Typically this soil has a dark brown, gravelly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of about 65 inches. The upper 17 inches is dark yellowish brown and yellowish brown, friable gravelly silt loam and silt loam; the next 37 inches is yellowish brown, very firm and brittle gravelly loam; and the lower 6 inches is dark yellowish brown, firm gravelly loam. The

substratum to a depth of 72 inches is dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are a few areas of nearly level and sloping Wooster soils and similar soils that contain more coarse fragments in the lower part of the subsoil and substratum or do not have a fragipan. Also included are small scattered areas of Loudonville, Chili, Conotton, Canfield, Braceville, and Gilpin soils.

Permeability is moderately slow, and available water capacity is moderate. Runoff is medium. This soil has more than 15 percent gravel in the surface layer. Roots are restricted by the fragipan at a depth of 18 to 36 inches. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and subsoil and medium acid to neutral in the substratum.

Most of the acreage is cropland.

The hazard of erosion is moderate if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Stripcropping, minimum tillage, diversions, and grassed waterways are some measures that reduce runoff and help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. The gravelly surface layer (fig. 23) may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is very high, but roots may be limited by the fragipan. Management problems are few. Machine planting is practical in the larger areas.

The moderately slow permeability is a limitation for some nonfarm uses, for example, onsite disposal of waste.

The capability subclass is IIe. The woodland symbol is 1o.

WoC—Wooster gravelly silt loam, 8 to 15 percent slopes. This sloping, deep, well drained soil is on ridges and hills in glaciated uplands. Slopes are convex and are generally 100 to 500 feet long. Areas are long and narrow. Most are 2 to 20 acres.

Typically this soil has a dark brown gravelly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of about 65 inches. The upper 17 inches is dark yellowish brown and yellowish brown, friable gravelly silt loam and silt loam; the next 37 inches is yellowish brown, very firm and brittle gravelly loam; and the lower

Figure 23.—Typical area of Wooster gravelly silt loam, 3 to 8 percent slopes, in cropland. The gravelly surface may interfere with the seeding and harvesting of some crops.

6 inches is dark yellowish brown, firm gravelly loam. The substratum to a depth of 72 inches is dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are a few areas of gently sloping and moderately steep Wooster soils and similar soils that contain more coarse fragments in the lower part of the subsoil and substratum or do not have a fragipan. Also included are small areas of Loudonville, Chili, Conotton, Canfield, Braceville, and Gilpin soils.

Permeability is moderately slow, and available water capacity is moderate. Runoff is medium to rapid. This soil has more than 15 percent gravel in the surface layer. Roots are restricted by the fragipan at a depth of 18 to 36 inches. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and subsoil and medium acid to neutral in the substratum.

Most of the acreage is cropland, pasture, and woodland.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, minimum tillage, diversions, and grassed waterways are some measures that reduce runoff and help to control erosion. Growing cover crops, utilizing crop residue, and including hay in the cropping system maintain the organic matter content and good tilth. The gravelly surface layer may interfere with the seeding of small grain and the mechanical harvesting of some crops such as potatoes.

This soil is well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees. Potential productivity is very high, but roots can be limited by the fragipan. Management problems are few. Machine planting is practical in the large areas.

The slope and moderately slow permeability are limitations for some nonfarm uses. These limitations are severe for onsite disposal of waste. If this soil is disturbed for construction, practices will be needed to control erosion and sediment.

The capability subclass is IIIe. The woodland symbol is 1o.

WoD—Wooster gravelly silt loam, 15 to 25 percent slopes. This moderately steep, deep, well drained soil is on side slopes and hills in glaciated uplands. Slopes are convex and are generally 100 to 400 feet long. Areas are long and narrow and range from 2 to 20 acres.

Typically this soil has a dark brown, gravelly silt loam surface layer about 5 inches thick. The subsoil extends to a depth of about 65 inches. The upper 17 inches is dark yellowish brown and yellowish brown, friable gravelly silt loam and silt loam; the next 37 inches is yellowish brown, very firm and brittle gravelly loam; and the lower 6 inches is dark yellowish brown, firm gravelly loam. The substratum to a depth of 72 inches is dark yellowish brown, firm gravelly loam.

Included with this soil in mapping are narrow escarpments, areas of sloping, steep, and very steep Wooster soils, and similar soils that contain more coarse fragments throughout or do not have a fragipan. A few scattered areas of Loudonville, Conotton, Gilpin, Hazleton, Canfield, and Weikert soils are also included.

Permeability is moderately slow, and available water capacity is moderate. Runoff is rapid. This soil has more than 15 percent gravel in the surface layer. Roots are restricted by the fragipan at a depth of 18 to 36 inches. In unlimed areas, this soil is very strongly acid to medium acid in the surface layer and subsoil and medium acid to neutral in the substratum.

Most areas are wooded or idle. Some of the acreage is cropland and pasture.

The hazard of erosion is severe if this soil is used for cultivated crops. Crops respond well to fertilization and good management. Contour stripcropping, grassed waterways, minimum tillage, cover crops, crop residue, and hay in the cropping system reduce runoff and help to control erosion. The gravelly surface layer may interfere with the seeding of small grain.

This soil is fairly well suited to pasture. Proper stocking to maintain key plant species and rotation of pasture are the chief management needs. Periodic application of nutrients is needed to maintain fertility.

This soil is well suited to trees, and part of it is wooded. Potential productivity is very high, but roots may be restricted by the fragipan. Use of equipment for planting, managing, and harvesting is limited by moderately steep slopes.

The moderately steep slopes and moderately slow permeability are limitations for many nonfarm uses. These limitations are severe for onsite disposal of waste and construction of buildings, streets, and roads. If this soil is disturbed for construction, practices will be needed to control runoff, erosion, and sediment.

The capability subclass is IVe. The woodland symbol is 1r.

Use and management of the soils

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

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

Information in this section can be used to plan the use and management of soils for crops and pasture; as

woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

Crops and pasture

John C. Spitzer, conservation agronomist, Soil Conservation Service, helped prepare this section.

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

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

Farming is a major land use in Beaver and Lawrence Counties. According to the Conservation Needs Inventory, 174,159 acres was used for crops and pasture in 1967. Of this total, 46,878 acres was permanent pasture; 21,323 acres row crops, mainly corn; 21,949 acres close grown crops, mainly wheat and oats; 16,752 acres rotation hay and pasture; 28,056 acres permanent hayland; and 1,427 acres orchards. The rest was for conservation use only, such as sod waterways, diversions, filterstrips, and impoundment areas, or idle cropland.

Many soils are too steep to be used for cropland and have poor potential for increased production of food. Most of the soils with suitable slopes have good potential. About 58,000 acres with good potential for cropland is currently used as woodland, and about 39,000 acres is used for pasture, hay, and temporarily idle cropland. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the survey area. This soil survey can greatly facilitate the application of such technology.

Soil erosion is the major soil management problem on most of the cropland and pasture. Canfield, Gilpin, Chili, Clymer, and Wharton are potentially productive soils for crops and pasture, but if the slope exceeds 3 percent the erosion hazard is moderate to very severe.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils with a layer in or below the subsoil that limits the depth of the root zone. Such layers include the fragipan in the Canfield, Ravenna, Tilsit, Wooster, Monongahela, and Ernest soils and the bedrock in the Weikert, Gilpin, Culleoka, and Loudonville soils. Erosion also reduces productivity on soils that tend to be droughty, such as Conotton and Weikert soils. Second, soil erosion on farmland may result in sediment deposition in streams and reservoirs. Erosion control minimizes the pollution of streams by sediment and improves water quality for municipal use, recreation, fish, and wildlife.

Preparing a good seedbed and tilling are difficult on gravelly, shaly, or channery soils such as Conotton, Wooster, Hazleton, and Weikert. If these soils are eroded, the limitation becomes more severe.

Erosion control practices provide a protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps a plant cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils. Legume and grass forage crops in the cropping system help to reduce erosion on sloping land. They also provide nutrients and improve tilth for the following crop.

Slopes are so short and irregular that contour tillage or terracing is not practical in many areas of the sloping Braceville, Conotton, and Wooster soils. Cropping systems that provide a substantial plant cover are needed on these soils to control erosion. Additional soil protection is obtained where minimum tillage is practiced.

Minimizing tillage and leaving crop residue increase infiltration and reduce the erosion hazard. These practices can be adapted to most soils in the surey area. No tillage for corn is effective in reducing erosion on sloping land and can be adapted to most soils, but not to the poorly drained and very poorly drained soils.

Terraces and diversions reduce the length of slope, resulting in less runoff and erosion. They are most practical on deep, well drained soils that have smooth slopes. Chili, Clymer, Hazleton, and Allegheny soils are suitable for terraces and diversions. Many other soils are less suitable for terraces or diversions because of irregular slopes, wetness, or bedrock within a depth of 40 inches.

Contour farming and stripcropping are common erosion control practices (fig. 13). They are best adapted to

soils with smooth, uniform slopes, including most areas of the sloping Ravenna, Clymer, Tilsit, and Wharton soils.

Information on the design of erosion control practices for each kind of soil is contained in the Technical Guide, available in local field offices of the Soil Conservation Service.

Soil drainage is the major management need on about 25 percent of the acreage used for crops and pasture. Some soils are so wet that the production of crops common to the area is generally not successful without artificial drainage. These are the poorly drained and very poorly drained Frenchtown, Canadice, Brinkerton, Purdy, Atkins, Holly, and Sloan soils, which make up about 8,000 acres of farmland in the survey area.

Unless artificially drained, the somewhat poorly drained soils are so wet that crops are damaged during most years. These are the Cavode, Ravenna, Tyler, and Rexford soils, which make up about 32,000 acres of farmland.

Some areas of the wetter soils along drainageways and in swales are commonly included in mapping with the moderately well drained Philo, Lobdell, Canfield, Ernest, and Braceville soils. Artificial drainage is needed in most of these wetter areas.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of both drainage systems is needed in most areas of poorly drained soils that are used for the more intensive cropping systems. Drains have to be more closely spaced in soils with slow permeability than in the more permeable soils. Finding adequate outlets for subsurface drainage systems is often difficult in areas of Canadice, Frenchtown, Brinkerton, Holly, and Atkins soils.

Many soils in the survey area have low natural fertility. Some upland soils that have never been limed are strongly acid. They require applications of ground limestone to raise the pH value sufficiently for good growth of alfalfa and other crops.

Levels of available phosphorus and magnesium are naturally low in most soils. Additions of lime and fertilizer should be based on the results of soil tests and on crop needs and the expected yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are friable and porous and have stable structure.

Many soils used for crops have a surface layer that is fairly low in organic matter content. Generally, the structure of these soils is weak, and intense rainfall causes crusting of the exposed surface. The crust is hard when dry and is nearly impervious to water. Once the crust forms, infiltration is reduced and runoff increased. Regular additions of crop residue, manure, and other organic material improve soil structure and reduce crust formation.

Fall plowing is generally not a good practice on soils that have a silt loam surface layer that is low in organic matter because of the crust that forms in winter and spring. Many of the soils are nearly as dense and hard at planting time after fall plowing as they were before they were plowed. Also, much of the cropland consists of sloping soils that are subject to erosion if they are plowed in fall.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn is the major row crop, but grain sorghum, potatoes, soybeans, and similar crops can be grown if economic conditions are favorable. Wheat, oats, and barley are the common close-grown crops.

The most common specialty crops grown commercially are apples, vegetables, and nursery plants. Deep, well drained soils that warm up early in spring are best suited to these crops. Good air drainage is needed to reduce the risk of frost damage.

The Allegheny, Clymer, Hazleton, and Chili soils in the survey area have the best combination of soil properties and air drainage for fruit and vegetables. Pope and Chagrin are also good for vegetables, but they are sometimes flooded.

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

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

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

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

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

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed be-

cause the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Land capability classification

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

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

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

Class I soils have slight limitations that restrict their use.

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

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

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

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

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

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

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

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

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

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

Paxton G. Wolfe, woodland conservationist, Soil Conservation Service, helped prepare this section.

Approximately 227,300 acres of Beaver and Lawrence Counties is woodland—134,600 acres in Beaver County and 92,700 acres in Lawrence County (*11*). This is 44 percent of the total land area in the two counties. Farmers own 31 percent, and private concerns own 68 percent. Only 1 percent is publicly owned. There are 216,500 acres of commercial woodland in the survey area. Less than 5 percent of the woodland is classified as noncommercial.

Stands of second and third growth trees make up the woodland. The principal forest cover types (*9*) and the extent of each, as given by the Forest Service, are as follows:

The oak-hickory cover type makes up 28 percent of the total woodland in the survey area. It consists mainly of white oak, red oak, and hickory, although black oak and chestnut oak dominate some areas. The principal associates are yellow-poplar, shagbark hickory, white ash, red maple, and beech.

The elm-ash-red maple cover type makes up 23 percent of the total woodland. It is dominated by white ash, American elm, and red maple. Associates are slippery elm, yellow birch, sycamore, and hemlock.

The aspen-birch cover type makes up 23 percent of the woodland. Quaking aspen, bigtooth aspen, and gray birch are dominant. The principal associates are pin cherry, red maple, yellow birch, white pine, ash, and sugar maple.

The maple-beech-birch cover type is on 19 percent of the woodland. Sugar maple, beech, and yellow birch are the component species. Associates are varying mixtures of basswood, red maple, hemlock, red oak, white ash, white pine, black birch, black cherry, yellow-poplar, and cucumbertree.

The chestnut oak cover type is on 2 percent. Chestnut oak grows in pure stands or is dominant. Common associates are red oak, white oak, black oak, scarlet oak, pitch pine, blackgum, and red maple.

The white pine cover type makes up 4 percent of the woodland in the survey area. White pine is pure or domi-

nant. Principal associates are Virginia and pitch pine, ash, sugar and red maple, hemlock, red and white oak, quaking and bigtooth aspen, and yellow and black birch.

Virginia pine-pitch pine completes the primary forest cover types with 1 percent of the total woodland. Virginia pine and pitch pine predominate. Principal associates are red oak, black oak, scarlet oak, chestnut oak, and hickory.

Sawtimber makes up approximately 52 percent of the acreage in commercial woodland, poletimber 16 percent, and seedlings and saplings 25 percent. The remaining 7 percent is classified as nonstocked or less than 10 percent growing-stock trees.

Approximately 80 percent of the woodland is on soils with a potential productivity of very high, high, or moderately high. About 15 percent is on soils rated moderate. The shallow Weikert soils, for example, have moderate potential productivity for important trees. Less than 5 percent of the woodland is on soils with a low productivity rating, such as the poorly drained Canadice soils.

In general, the soils in the survey area are capable of supporting good stands of red oak, sugar maple, ash, and white pine. Trees grow better on the deep, well drained soils than on the shallow or poorly drained soils.

A woodland owner can encourage the growth of desirable species by using intensive woodland management practices on soils rated very high, high, and moderately high for potential productivity. Generally a high level of management to increase yields of wood crops on soils rated low is too expensive.

Soils rated moderate are the most difficult to appraise for woodland management. A thorough inventory of the growing stock and its quality on the site is needed. The market potential of these species and the proximity of the site to larger areas of more productive soils determine the level of woodland management that is affordable.

Woodland is important for watershed protection, recreation, wildlife habitat, and esthetic uses, and as a source of income from wood crops. Woodland on soils rated better than moderate should return a good profit if properly managed and protected from fire, disease, insects, and livestock grazing.

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

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

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

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

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

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

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 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. Other species that commonly occur on the soil are also listed regardless of potential value and growth potential.

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

Recreation

Clayton L. Heiney, wildlife biologist, Soil Conservation Service, helped prepare this section.

Approximately 25,000 acres or nearly 5 percent of the survey area is used primarily for outdoor recreation. Most of this land is parks, state game lands, camps, and golf courses. Many small areas of public and private land provide picnicking, camping, hiking, swimming, horseback riding, tennis, hunting, fishing, and boating.

Two state parks are in the survey area. McConnell's Mill State Park is a 2,500-acre natural scenic area in the eastern part of Lawrence County. Among its attractions are a forested, rocky gorge 400 feet deep and more than 9 miles long (fig. 2). Other attractions are a restored grain mill, a covered bridge, hiking trails, and picnic grounds. White water boaters are attracted to the Slippery Rock Creek that rushes through the gorge.

Raccoon Creek State Park is about 8,000 acres of wooded hills and an 80-acre lake in the southern part of Beaver County. It provides camping, picnicking, hiking, nature study, swimming, boating, and fishing.

Beaver and Lawrence Counties maintain parks occupying more than 3,500 acres (*3, 7*). The largest are Brady's Run, Economy, and Brush Creek Parks in Beaver County. Many townships and smaller municipalities support parks with picnic areas, playgrounds, swimming pools, and athletic fields.

More than 3,500 acres of state game lands are maintained by the Pennsylvania Game Commission for wildlife and for public hunting.

The Pennsylvania Fish Commission manages Hereford Manor Lakes, in the northeastern part of Beaver County, for public fishing. The commission is also developing lakes in the vicinity of Bessemer in Lawrence County. It stocks game fish in park lakes and in many streams in the area. Private lakes and ponds also provide fishing and boating (fig. 5). Popular boating waters are the Ohio, Beaver, and Shenango Rivers.

Outdoor recreation is an important and necessary part of our way of life. Many new recreation developments will be located near communities and urban areas to serve increasing demands. A knowledge of the soil limitations is essential in planning, selecting sites, and constructing recreation facilities.

Most of the soils in the survey area have some potential for a variety of recreation activities. The deep, well drained, nearly level or gently sloping soils have the best potential for recreation uses, such as picnicking and camping. Steep slopes, unsuited for these activities, are suitable for skiing. Soils with moderate limitations—steepness and wetness for example—have potential for hiking trails, hunting, nature study, and other types of recreation that require only slight land alteration. The soils that have the poorest potential for most recreation uses are poorly drained, very poorly drained, steep, or very steep.

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

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

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

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

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

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

Paths and trails for hiking, horseback riding, and bicycling 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

Clayton L. Heiney, Jr., wildlife biologist, Soil Conservation Service, helped prepare this section.

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

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, 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 flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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

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

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

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

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

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce

grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include 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, woodpeckers, squirrels, gray fox, raccoon, deer, and bear.

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

Lloyd E. Thomas, assistant state conservation engineer, Soil Conservation Service, helped prepare this section.

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

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

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

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

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

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

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

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

Building site development

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

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil.

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

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

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, 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 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

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

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, 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 effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

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

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

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

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered

daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

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

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

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

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

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

Construction materials

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

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

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

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

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

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 12 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

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 properties.

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

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches

of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

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

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

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

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

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

Water management

Table 13 gives information on the soil properties and site features that affect water management. The kinds of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds.

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 potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

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

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or 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.

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

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

Engineering properties

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

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

Texture is given in the standard terms used by the U.S. Department of Agriculture (*10*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

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

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

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

Physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils. Laboratory data on Pennsylvania soils are available from the Soil Characterization Laboratory, Department of Agronomy, The Pennsylvania State University.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Soil and water features

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

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

The four hydrologic soil groups are:

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

elly sands. These soils have a high rate of water transmission.

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

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

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

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

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

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

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

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

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

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

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

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

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 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 creates a severe corrosion environ-

ment. 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.

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*12*). 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. In table 17, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

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

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

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

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

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

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

Soil series and morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*10*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*12*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Allegheny series

Soils of the Allegheny series are fine-loamy, mixed, mesic Typic Hapludults. These deep, well drained soils on high terraces formed in old alluvial material dominantly from acid sandstone, siltstone, and shale. The slope range is 3 to 15 percent, but the slope is dominantly 3 to 8 percent.

Allegheny soils are associated on the landscape with the moderately well drained Monongahela soils, the somewhat poorly drained Tyler soils, and the poorly drained Purdy soils.

Typical pedon of Allegheny silt loam, 8 to 15 percent slopes, on the west side of 8th Avenue, 500 feet southeast of its junction with Center Avenue, and 0.7 mile northeast of the junction of Route 992 and PA 65; in Conway Borough, Beaver County:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; very fri-

able; slightly sticky, slightly plastic; 1 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 1 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—13 to 24 inches; strong brown (7.5YR 5/6) heavy silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin brown (7.5YR 4/4) clay films on ped faces and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—24 to 30 inches; strong brown (7.5YR 5/6) heavy silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin brown (7.5YR 4/4) clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear wavy boundary.

IIB23t—30 to 40 inches; brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on coarse fragments and some clay bridging of sand grains; few fine black (10YR 2/1) coatings on ped faces and coarse fragments; 15 percent coarse fragments; strongly acid; clear wavy boundary.

IIB3—40 to 44 inches; brown (7.5YR 4/4) very gravelly sandy loam; weak coarse subangular blocky structure; friable, slightly sticky, nonplastic; few thin clay films on coarse fragments and some clay bridging of sand grains; few fine black (10YR 2/1) coatings on coarse fragments; 55 percent coarse fragments; strongly acid; clear wavy boundary.

IIC—44 to 60 inches; brown (7.5YR 4/4) very gravelly sandy loam; massive; very friable, nonsticky, nonplastic; 70 percent coarse fragments; strongly acid.

Solum thickness ranges from 30 to 60 inches. Depth to bedrock is 48 to more than 120 inches. The content of coarse fragments ranges from 0 to 15 percent in the A, B1, and B2t horizons, from 0 to 35 percent in the B3 and C horizons above any lithologic discontinuity, and from 20 to 70 percent in the IIB3 and IIC horizons below a depth of 40 inches. Unless the soil is limed, reaction ranges from strongly acid to extremely acid.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 8. Texture of the B1 horizon is sandy loam to silt loam. Texture of the B2 horizon is sandy clay loam to silt loam. Texture of the B3 horizon is fine sandy loam to clay loam in the fine earth.

The C horizon has hue of 7.5YR to 5Y, value of 4 to 7, and chroma of 1 to 6. Texture is sandy loam to clay loam in the fine earth. In some pedons below a depth of 40 inches, the IIC horizon is stratified sand through loam.

Arents

Arents are deep to shallow, moderately well drained to somewhat excessively drained soils. They formed as a result of reshaping the surface of cut and fill land. Specific uses are for industrial developments, highways, shopping centers, apartment complexes, and housing developments. The slope range is 0 to 100 percent.

Arents are associated on the landscape with Pope, Philo, Chagrin, Lobdell, Gilpin, Upshur, Guernsey, Vandergrift, Wharton, Ernest, Wooster, Chili, Conotton, and Canfield soils. Arents lack the distinct horizons that are typical of the associated soils.

Arents are so variable that no typical pedon is given. These soils have no horizons because they have been deeply mixed by earthmoving operations. They contain fragments of A and B horizons that can be identified as parts of former soils. These fragments are scattered throughout the soil and are mixed with the materials of other horizons. In some pedons below a depth of 4 feet to more than 10 feet, other soils or parts of other soils remain undisturbed.

Depth to bedrock ranges from 12 inches to more than 50 feet. The content of coarse fragments ranges from 0 to 90 percent throughout the soil. Reaction ranges from slightly acid to extremely acid above a depth of 48 inches and from mildly alkaline to extremely acid below.

Colors are in hue of 2.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. Texture above a depth of 48 inches ranges from sandy loam to clay in the fine earth. Texture below a depth of 48 inches ranges from sand to clay in the fine earth.

Atkins series

Soils of the Atkins series are fine-loamy, mixed, acid, mesic Typic Fluvaquents. They are deep, poorly drained soils on flood plains. They formed in alluvial material dominantly from acid shale, siltstone, and sandstone. The slope range is 0 to 3 percent.

Atkins soils are associated on the landscape with the well drained Pope soils and the moderately well drained Philo soils.

Typical pedon of Atkins silt loam; 75 feet west of Route 04062, 110 feet north of its junction with Route 04081, and 5 miles east of Beaver Falls, in New Sewickley Township, Beaver County:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate very fine granular structure; very friable, nonsticky, slightly plastic; slightly acid; clear smooth boundary.

B1g—6 to 14 inches; dark gray (10YR 4/1) silt loam; many fine faint brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.

B2g—14 to 24 inches; olive gray (5Y 5/2) silt loam; few fine faint yellowish brown (10YR 5/4) mottles; weak

medium subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.

B3g—24 to 32 inches; light olive gray (5Y 6/2) heavy loam; many fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; strongly acid; gradual wavy boundary.

Cg—32 to 50 inches; light brownish gray (2.5Y 6/2) weakly stratified loam and silt loam; many fine and medium prominent yellowish brown (10YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; strongly acid; clear wavy boundary.

IICg—50 to 60 inches; light brownish gray (2.5Y 6/2) stratified gravelly sandy loam and sandy loam; many medium prominent strong brown (7.5YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; 15 percent coarse fragments; strongly acid.

Solum thickness ranges from 30 to 50 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 20 percent in the solum and from 0 to 35 percent in the C horizon. Reaction throughout is strongly acid or very strongly acid unless the soil is limed.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2.

The B horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled. The dominant chroma at a depth of 30 inches depends on hue and value. If the hue is 10YR or 2.5Y and the value is 6, the chroma is 2 or less. If the value is 4 or 5, the chroma is 1 or less. Hue of 5Y has chroma of 2 or less. Texture is dominantly silt loam or heavy loam but ranges from silty clay loam to heavy sandy loam in the fine earth.

The C horizon is neutral or has hue of 10YR to 5Y, value of 5 or 6, and chroma of 0 to 6. It is weakly stratified. Texture ranges from sandy loam to light silty clay loam in the fine earth. In some pedons below a depth of 40 inches, the IIC horizon is stratified sand and gravel.

Braceville series

Soils of the Braceville series are coarse-loamy, mixed, mesic Typic Fragiochrepts. These deep, moderately well drained soils on outwash plains, kames, terraces, and moraines formed in glacial outwash material. They are dominantly stratified sand, gravel, and silt. The slope range is 3 to 15 percent.

Braceville soils are associated on the landscape with the well drained and somewhat excessively drained Conotton soils, the well drained Chili soils, the moderately well drained Canfield soils, and the somewhat poorly drained and poorly drained Rexford soils.

Typical pedon of Braceville loam, 3 to 8 percent slopes, in cropland, 300 feet south of the barn on the east side of Route T508, 0.25 mile south of its junction with Route T543, 1 mile east of Plain Grove in Plain Grove Township, Lawrence County:

Ap—0 to 8 inches; brown (10YR 4/3) loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21—8 to 14 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B22—14 to 20 inches; yellowish brown (10YR 5/4) loam; few fine faint brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles and few fine distinct grayish brown (10YR 5/2) mottles in lower part; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; 10 to 15 percent coarse fragments; slightly acid; abrupt wavy boundary.

Bx1—20 to 26 inches; yellowish brown (10YR 5/4) gravelly loam; many medium and fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure; very firm, brittle, slightly sticky, nonplastic; 20 percent coarse fragments; slightly acid; clear wavy boundary.

IIBx2—26 to 38 inches; yellowish brown (10YR 5/4) gravelly sandy loam; common fine distinct light brownish gray (10YR 6/2), pale brown (10YR 6/3), and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to weak thick platy; firm, brittle, slightly sticky, nonplastic; 25 percent coarse fragments; slightly acid; gradual wavy boundary.

IIIC1—38 to 46 inches; yellowish brown (10YR 5/4) sandy loam and loamy sand; common fine faint brown (10YR 5/3), pale brown (10YR 6/3), and yellowish brown (10YR 5/6) mottles; massive; firm, becoming friable in the lower part, nonsticky, nonplastic; 10 percent coarse fragments; slightly acid; clear wavy boundary.

IVC2—46 to 60 inches; brown (10YR 5/3) and yellowish brown (10YR 5/4 to 10YR 5/6) stratified sand and gravel; single grain; slightly acid.

Solum thickness ranges from 30 to 55 inches. Depth to the fragipan ranges from 15 to 30 inches. Depth to bedrock is more than 60 inches. Depth to stratified sand and gravel ranges from 30 to 72 inches. The content of coarse fragments ranges from 0 to 30 percent above the fragipan and from 20 to 50 percent in the pan. Unless the soil is limed, reaction ranges from very strongly acid to medium acid above the Bx horizon and from strongly acid to slightly acid in the Bx and C horizons.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 or 4, and chroma of 2 to 4.

The B and Bx horizons have hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. Low chroma

mottles are within a depth of 12 to 30 inches. Texture ranges from silt loam to sandy loam in the fine earth.

The C horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 0 to 6. It is stratified. Texture ranges from silt loam to sandy loam in the fine earth to stratified sand and gravel.

Brinkerton series

Soils of the Brinkerton series are fine-silty, mixed, mesic Typic Fragiaqualfs. These deep, poorly drained soils on low flats, foot slopes, and in depressions formed in colluvial material derived from acid gray shale and siltstone. The slope range is 0 to 15 percent, but the slope is dominantly 0 to 8 percent.

Brinkerton soils are associated on the landscape with the poorly drained Atkins soils, the somewhat poorly drained Cavode soils, the moderately well drained Ernest, Tilsit, and Wharton soils, the moderately deep, well drained Gilpin soils, and the shallow, well drained Weikert soils.

Typical pedon of Brinkerton silt loam, 0 to 3 percent slopes, in cropland; 75 feet north of Route 04076, 0.1 mile east of its junction with Route 04063, and 3.5 miles east-northeast of Beaver Falls in North Sewickley Township, Beaver County:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable, slightly sticky, slightly plastic; 1 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1g—9 to 15 inches; gray (10YR 5/1) silt loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; 1 percent coarse fragments; strongly acid; clear wavy boundary.

B21tg—15 to 20 inches; light brownish gray (2.5Y 6/2) heavy silt loam; many fine and medium prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films and silt coatings on ped faces and in pores; 3 percent coarse fragments; medium acid; clear wavy boundary.

B22tg—20 to 29 inches; grayish brown (10YR 5/2) heavy silt loam; many fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; few fine prominent black coatings; 5 percent coarse fragments; medium acid; gradual wavy boundary.

Bx1—29 to 38 inches; light brownish gray (2.5Y 6/2) heavy silt loam; gray (10YR 6/1) prism and ped faces; many medium prominent strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; common medium prominent black coatings; 5 percent coarse fragments; medium acid; gradual wavy boundary.

Bx2—38 to 50 inches; light brownish gray (2.5Y 6/2) light silty clay loam; gray (10YR 6/1) prism and ped faces; many fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; common medium prominent black coatings; 5 percent coarse fragments; medium acid; gradual wavy boundary.

Cg—50 to 60 inches; gray (10YR 5/1) shaly silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky, slightly plastic; 20 percent coarse fragments; medium acid.

Solum thickness ranges from 40 to 50 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 15 to 30 inches. The content of coarse fragments ranges from 0 to 10 percent above the fragipan, from 2 to 20 percent in the pan, and from 10 to 80 percent in the C horizon. Unless the soil is limed, reaction ranges from very strongly acid to medium acid in the solum and from strongly acid to slightly acid in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is mottled. Texture is silt loam or silty clay loam.

The Bx horizon is neutral or has hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 0 to 2. It is mottled. Texture ranges from loam to light silty clay loam in the fine earth.

The C horizon is neutral or has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 to 3. It is mottled. Texture ranges from loam to silty clay loam in the fine earth.

Canadice series

Soils of the Canadice series are fine, illitic, mesic Typic Ochraqualfs. These deep, poorly drained soils occupy old lake plains and slack water areas along stream valleys. They formed in clayey glacial lake sediments. The slope range is 0 to 3 percent.

Canadice soils are associated on the landscape with the poorly drained Holly soils and the very poorly drained Sloan soils on flood plains; and with the poorly drained Frenchtown soils, the poorly drained and somewhat poorly drained Rexford soils, and the somewhat poorly drained Ravenna soils on uplands.

Typical pedon of Canadice silt loam; 36 feet south of State Game Lands access road, 445 feet east of the intersection of the access road with Route T504 (McNulty Road), and 0.5 mile north of the intersection

of Route T504 and Route 37048. The site is on State Game Lands 151, 2 miles north of Plain Grove, Plain Grove Township, Lawrence County:

Ap—0 to 8 inches; very dark gray (10YR 3/1) moist and light gray (10YR 6/1) dry silt loam; moderate medium and fine granular structure; friable, sticky, plastic; 1 percent coarse fragments; medium acid; abrupt smooth boundary.

A3—8 to 11 inches; dark gray (10YR 4/1) moist and light gray (10YR 6/1) dry silty clay loam; few fine faint gray (10YR 5/1) and very dark gray (10YR 3/1) mottles; moderate fine and very fine subangular blocky structure; friable, sticky, plastic; few fine pebbles; medium acid; clear smooth boundary.

B21tg—11 to 16 inches; gray (10YR 5/1) silty clay; dark gray (10YR 4/1) prism faces; common fine faint dark grayish brown (10YR 4/2) mottles; weak coarse prismatic structure parting to moderate medium and fine angular blocky; friable, sticky, plastic; thin discontinuous clay films on ped faces and lining pores; medium acid; clear smooth boundary.

B22tg—16 to 22 inches; gray (10YR 5/1) heavy silty clay; gray (N 5/0) prism faces; many medium and fine distinct yellowish brown (10YR 5/4, 10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; firm, sticky, very plastic; thick continuous clay films on interior ped faces; medium acid; gradual smooth boundary.

B23tg—22 to 32 inches; gray (10YR 5/1) heavy silty clay; gray (N 5/0) prism faces; many coarse and medium distinct strong brown (7.5YR 5/6 and 7.5YR 5/8) mottles; strong very coarse prismatic structure parting to weak very thick platy and medium angular blocky; very firm, sticky, very plastic; moderately thick continuous clay films on prism faces, thin discontinuous clay films on interior ped faces and filling pores; medium acid; gradual smooth boundary.

B24tg—32 to 36 inches; gray (N 5/0) and brown (10YR 4/3) heavy silty clay; gray (N 5/0) prism faces; many medium distinct strong brown (7.5YR 5/6 and 7.5YR 5/8) mottles; moderate coarse prismatic structure parting to weak thick platy; very firm, sticky, very plastic; thin discontinuous clay films on ped faces and filling pores; neutral; gradual smooth boundary.

B3g—36 to 42 inches; dark gray (N 4/0) silty clay; common coarse and medium distinct strong brown (7.5YR 5/6 and 7.5YR 5/8) and gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm, sticky, plastic; neutral; gradual smooth boundary.

C1—42 to 54 inches; dark gray (N 4/0) heavy silty clay; few streaks and patches of dark yellowish brown (10YR 4/4); weak very coarse prismatic structure; very firm, sticky, very plastic; few lenses containing fine gravel in upper part; neutral; clear smooth boundary.

C2—54 to 68 inches; gray (N 5/0) silty clay; massive; very firm, sticky, plastic; varved; mildly alkaline.

Solum thickness ranges from 30 to 60 inches. Depth to bedrock is more than 60 inches. There are no coarse fragments, but some pedons contain a small amount of fine gravel. Unless the soil is limed, reaction ranges from very strongly acid to slightly acid in the A horizon, from strongly acid to neutral in the upper part of the B horizon, from slightly acid to mildly alkaline in the lower part of the B horizon, and from neutral to moderately alkaline in the C horizon.

The A horizon has hue of 10YR or 2.5Y; value of 2 to 5 moist, 6 or more dry; and chroma of 1 to 3.

The B horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled. Texture is dominantly silty clay but ranges from heavy silty clay loam to clay.

The C horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled. Texture ranges from silty clay loam to clay. This horizon is typically massive or varved. In some pedons the C horizon is underlain by glacial till or layers of sand.

Canfield series

Soils of the Canfield series are fine-loamy, mixed, mesic Aquic Fragiudalfs. These deep, moderately well drained soils on knolls and ridges on till plains formed in glacial till material. The slope range is 3 to 25 percent, but the slope is dominantly 3 to 15 percent.

Canfield soils are associated on the landscape with the moderately deep, well drained Loudonville soils; the deep, well drained Wooster soils; the somewhat poorly drained Ravenna soils; and the poorly drained Frenchtown and Canadice soils.

Typical pedon of Canfield silt loam, 3 to 8 percent slopes, in cropland; on the south side of Route T609, 700 feet east of its junction with Route T464, and 2 miles southeast of New Wilmington in Wilmington Township, Lawrence County:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable, nonsticky, slightly plastic; slightly acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear smooth boundary.

B21t—13 to 18 inches; yellowish brown (10YR 5/6) heavy silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

B22t—18 to 21 inches; yellowish brown (10YR 5/6) heavy silt loam; few medium distinct strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1—21 to 31 inches; brown (7.5YR 4/4) silt loam; light brownish gray (2.5Y 6/2) prism faces; common coarse distinct strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; common coarse prominent black coatings; 5 percent coarse fragments; strongly acid; clear wavy boundary.

Bx2—31 to 50 inches; dark yellowish brown (10YR 4/4) gravelly loam; light brownish gray (2.5Y 6/2) ped and prism faces; common medium prominent strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; common coarse prominent black coatings; 15 percent coarse fragments; medium acid; clear wavy boundary.

C—50 to 60 inches; dark yellowish brown (10YR 4/4) gravelly loam; common medium prominent strong brown (7.5YR 5/6) and light grayish brown (2.5Y 6/2) mottles; massive; firm, slightly sticky, slightly plastic; 15 percent coarse fragments; slightly acid.

Solum thickness ranges from 40 to 70 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 15 to 30 inches. The content of coarse fragments ranges from 0 to 15 percent in the Ap, B1, and B2 horizons, from 5 to 20 percent in the Bx horizon, and from 5 to 35 percent in the C horizon. Unless the soil is limed, reaction is strongly acid or very strongly acid in the upper part of the solum and ranges from medium acid to neutral in the lower part of the solum and in the C horizon.

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

The B1 horizon has hue of 10YR, value of 5, and chroma of 3 or 4. Texture is silt loam or loam.

The B2 horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is mottled in the upper 10 inches of the argillic horizon. Texture is silt loam or loam.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 4 and 5, and chroma of 3 to 6. Texture is silt loam, loam, or heavy sandy loam in the fine earth.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is commonly mottled. Texture is loam, silt loam, or heavy sandy loam in the fine earth.

Cavode series

Soils of the Cavode series are clayey, mixed, mesic Aeric Ochraquults. They are deep, somewhat poorly drained soils on ridgetops, benches, and hillsides. They formed in residual material from acid shale and siltstone. The slope range is 0 to 25 percent, but the slope is dominantly 3 to 15 percent.

Cavode soils are associated on the landscape with the poorly drained Brinkerton soils, the moderately well drained Wharton and Ernest soils, the moderately deep, well drained Gilpin soils, and the shallow, well drained Weikert soils.

Typical pedon of Cavode silt loam, 3 to 8 percent slopes, on the south side of Route 04078, 0.4 mile east of its junction with PA 65, and 4.0 miles northeast of Beaver Falls in North Sewickley Township, Beaver County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) moist, light brownish gray (10YR 6/2) dry, silt loam; moderate medium granular structure; very friable, slightly sticky, slightly plastic; neutral; abrupt smooth boundary.

B21t—8 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and brown (10YR 5/3) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, plastic; few thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

B22t—12 to 18 inches; dark yellowish brown (10YR 4/4) heavy silty clay loam; many fine prominent light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; friable, sticky, plastic; common thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

B23tg—18 to 37 inches; grayish brown (10YR 5/2) silty clay; many medium faint pale brown (10YR 6/3) and many medium prominent strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; firm, sticky, plastic; many moderately thick clay films on ped faces and in pores; many very dark brown coatings; 10 percent coarse fragments; strongly acid; abrupt smooth boundary.

B3g—37 to 46 inches; dark gray (5Y 4/1) silty clay loam; weak coarse prismatic structure parting to weak medium platy; friable, sticky, slightly plastic; common moderately thick clay films on ped faces; common black coal chips; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Cg—46 to 50 inches; dark gray (5Y 4/1) very shaly silty clay loam; massive; firm, sticky, slightly plastic; 70 percent coarse fragments; very strongly acid; clear wavy boundary.

R—50 inches; olive brown (2.5Y 4/4) shale.

Solum thickness ranges from 30 to 55 inches. Depth to bedrock ranges from 40 to 72 inches. The content of coarse fragments ranges from 0 to 15 percent in the upper part of the solum and from 10 to 80 percent in the B3 and C horizons. Unless the soil is limed, reaction is very strongly acid or strongly acid throughout.

The Ap horizon has hue of 10YR, value of 3 or 4 moist, 6 or more dry, and chroma of 2 to 4.

The upper part of the B horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is mottled. The lower part of the B horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It is mottled. Texture is silty clay loam, silty clay, or clay in the fine earth.

The C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. Texture ranges from silt loam to clay, including clay loam in the fine earth.

Chagrin series

Soils of the Chagrin series are fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts. These deep, well drained soils on flood plains formed in alluvial material from glaciated areas. The slope range is 0 to 3 percent.

Chagrin soils are associated on the landscape with the moderately well drained Lobdell soils, the poorly drained Holly soils, and the very poorly drained Sloan soils.

Typical pedon of Chagrin silt loam, in cropland; 210 feet east of an old fence row, and 300 feet north of Route T501, 0.5 mile east of its junction with Route T324, and 1.25 miles northeast of Hillsville, in Mahoning Township, Lawrence County:

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; neutral; abrupt smooth boundary.

B21—12 to 31 inches; yellowish brown (10YR 5/4) heavy loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; medium acid; gradual wavy boundary.

B22—31 to 43 inches; dark yellowish brown (10YR 4/4) stratified heavy sandy loam and loam; brown (7.5YR 4/4) ped faces; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; medium acid; gradual wavy boundary.

C—43 to 65 inches; dark yellowish brown (10YR 4/4) sandy loam; massive, very friable, nonsticky, nonplastic; 2 percent coarse fragments; medium acid.

Solum thickness ranges from 24 to 48 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 15 percent in the particle size control section. Unless the soil is limed, reaction ranges from medium acid to neutral throughout.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. In some pedons thin layers have value of 2 or 3 and chroma of 2. Texture is dominantly silt loam or loam but in thin horizons it ranges from sandy loam to silty clay loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. Texture ranges from silt loam to sandy loam and sand. This horizon is commonly stratified.

Chili series

Soils of the Chili series are fine-loamy, mixed, mesic Typic Hapludalfs. These deep, well drained soils on outwash plains, kames, and terraces formed in glacial outwash material. The slope range is 3 to 15 percent.

Chili soils are associated on the landscape with the well drained and somewhat excessively drained Conotton soils, the moderately well drained Braceville soils, the somewhat poorly drained and poorly drained Rexford soils, and the poorly drained Canadice soils.

Typical pedon of Chili silt loam, 3 to 8 percent slopes, on the south side of Route T603, 0.1 mile east of its junction with Route T476, 0.1 mile north of its junction with PA 956, and 2 miles southwest of Volant in Wilmington Township, Lawrence County:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable, nonsticky, nonplastic; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, nonplastic; 5 percent coarse fragments; strongly acid; clear wavy boundary.

IIB21t—14 to 30 inches; yellowish brown (10YR 5/4) gravelly loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 25 percent coarse fragments; medium acid; clear wavy boundary.

IIB22t—30 to 38 inches; brown (7.5YR 5/4) gravelly loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; 30 percent coarse fragments; medium acid; gradual wavy boundary.

IIB3—38 to 52 inches; brown (7.5YR 4/4) very gravelly sandy loam; weak medium subangular blocky structure; very friable, slightly sticky, nonplastic; few thin clay films on gravel and some clay bridging of sand grains; 50 percent coarse fragments; slightly acid; abrupt smooth boundary.

IIIC—52 to 60 inches; brown (7.5YR 5/4) stratified loamy sand and gravelly loamy sand; single grain; loose, nonsticky, nonplastic; 30 percent coarse fragments; slightly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 30 percent above 20 inches, from 15 to 50 percent between 20 and 40 inches, and from 25 to 60 percent below 40 inches. Weighted average of the coarse fragments is less than 35 percent in the particle size control section. Unless the

soil is limed, reaction ranges from very strongly acid to slightly acid in the upper part of the solum, from strongly acid to medium acid in the lower 40 inches of the B horizon and from strongly acid to slightly acid in the upper part of the C horizon. Reaction decreases with depth from medium acid to neutral within 60 inches.

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

The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is sandy loam, loam, or silt loam in the fine earth.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. Fine earth texture in the upper part of the horizon is heavy sandy loam, loam, light clay loam, or sandy clay loam. Silt loam and light silty clay loam are at a depth of 22 inches. In the lower part of the Bt horizon, texture is sandy loam, loam, and light clay loam in the fine earth.

The B3 horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. Texture in the fine earth is sandy loam or loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 4. It is stratified sand and gravel.

Clymer series

Soils of the Clymer series are fine-loamy, mixed, mesic Typic Hapludults. These deep, well drained soils on hills and ridges formed in residual material from acid sandstone, siltstone, and interbedded shale. The slope range is 3 to 25 percent, but the slope is dominantly 3 to 15 percent.

Clymer soils are associated on the landscape with the deep, well drained Hazleton soils; the moderately deep, well drained Gilpin soils; the shallow, well drained Weikert soils; and the deep, moderately well drained Ernest soils.

Typical pedon of Clymer loam, 3 to 8 percent slopes, on the north side of PA 151, 1.1 miles west of its junction with PA 18, and 3.75 miles southeast of Hookstown in Green Township, Beaver County:

Ap—0 to 8 inches; dark brown (10YR 3/3) loam; moderate fine granular structure; very friable, nonsticky, slightly plastic; 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; strongly acid; clear smooth boundary.

B21t—13 to 23 inches; strong brown (7.5YR 5/6) clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, plastic; common thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—23 to 33 inches; yellowish brown (10YR 5/6) channery sandy clay loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B3—33 to 38 inches; yellowish brown (10YR 5/6) channery sandy loam; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; clay bridging of some sand grains; 30 percent coarse fragments; strongly acid; diffuse wavy boundary.

C—38 to 70 inches; yellowish brown (10YR 5/4) very channery sandy loam; massive; very friable, nonsticky, nonplastic; 65 percent coarse fragments; strongly acid; diffuse wavy boundary.

R—70 inches; weathered sandstone.

Solum thickness ranges from 24 to 40 inches. Depth to bedrock ranges from 40 inches to more than 84 inches. The content of coarse fragments ranges from 0 to 25 percent in the upper part of the solum, from 10 to 35 percent in the lower part, and from 20 to 80 percent in the C horizon. Average of the coarse fragments is less than 35 percent in the particle size control section. Unless the soil is limed, reaction ranges from strongly acid to extremely acid throughout.

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

The B horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 to 8. Texture ranges from clay loam to sandy loam in the fine earth.

The C horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 6. It may be faintly mottled below a depth of 40 inches. Texture is dominantly sandy loam or loam in the fine earth.

Conotton series

Soils of the Conotton series are loamy-skeletal, mixed, mesic Typic Hapludalfs. These deep, well drained and somewhat excessively drained soils on outwash plains, terraces, kames, and eskers formed in glacial outwash material. The slope range is 3 to 50 percent, but the slope is dominantly 8 to 25 percent.

Conotton soils are associated on the landscape with the well drained Chili soils, the moderately well drained Braceville soils, the somewhat poorly drained and poorly drained Rexford soils, and the poorly drained Canadice soils.

Typical pedon of Conotton gravelly loam, 3 to 8 percent slopes, at the edge of a gravel pit, 50 feet south of Route 37062, 0.2 mile south of its junction with Route T549, and 0.75 mile northwest of Eastbrook in Hickory Township, Lawrence County;

Ap—0 to 6 inches; dark brown (10YR 4/3) gravelly loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; 15 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—6 to 11 inches; strong brown (7.5YR 5/6) gravelly fine sandy loam; weak fine subangular blocky struc-

ture; very friable, slightly sticky, nonplastic; 35 percent coarse fragments; slightly acid; clear wavy boundary.

B21t—11 to 30 inches; reddish brown (5YR 4/4) very gravelly sandy loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; common clay bridging of sand grains and few thin clay films on gravel; 55 percent coarse fragments; medium acid; clear wavy boundary.

B22t—30 to 56 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; massive; very friable, nonsticky, nonplastic; common clay bridging of sand grains and few thin clay films on gravel; 60 percent coarse fragments; medium acid; gradual wavy boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) stratified gravel and sand; single grain; loose, nonsticky, nonplastic; 65 percent coarse fragments; neutral.

Solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 10 to 20 percent in the Ap horizon, 20 to 60 percent in the B horizon, and 40 to 70 percent in the C horizon. Average of the coarse fragments is more than 35 percent from 10 to 40 inches. Unless the soil is limed, reaction is very strongly acid and strongly acid in the upper part of the solum, strongly acid to neutral in the lower part, and medium acid to mildly alkaline in the C horizon.

The Ap horizon has hue of 10YR or 7.5YR; value of 3 or 4 moist, 6 or more dry; and chroma of 2 or 3.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is commonly sandy loam or loam in the fine earth.

The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. Texture is dominantly sandy loam or loam in the fine earth.

The C horizon dominantly has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is stratified sand and gravel.

Culleoka series

Soils of the Culleoka series are fine-loamy, mixed, mesic Ultic Hapludalfs. These moderately deep, well drained soils on hills and ridges formed in residual material from interbedded acid and nonacid shale and siltstone. The slope range is 3 to 25 percent, but the slope is dominantly 3 to 15 percent.

Culleoka soils are associated on the landscape with the moderately well drained Guernsey and Wharton soils; the moderately well drained and somewhat poorly drained Vandergrift soils; the shallow, well drained Weikert soils; and the deep, well drained Upshur soils.

Typical pedon of Culleoka silt loam, 3 to 8 percent slopes, in Raccoon Creek State Park, 200 feet north of the main park road, 150 feet south of the main picnic area parking lot, 2.6 miles east of the junction of the park road with PA 18, and 3 miles northeast of Frankfort Springs in Hanover Township, Beaver County:

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—7 to 9 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; medium acid; clear wavy boundary.

B21t—9 to 20 inches; yellowish brown (10YR 5/4) heavy silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin dark yellowish brown (10YR 4/4) clay films on ped faces and in pores; 10 percent coarse fragments; medium acid; clear wavy boundary.

B22t—20 to 27 inches; yellowish brown (10YR 5/6) light silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; few fine black coatings on ped faces; 10 percent coarse fragments; medium acid; clear wavy boundary.

C—27 to 32 inches; yellowish brown (10YR 5/6) shaly light silty clay loam; weak medium platy structure inherited from the bedrock bedding planes; firm, slightly sticky, slightly plastic; few thin clay films in pores; few fine black coatings on coarse fragments and ped faces; 30 percent coarse fragments; medium acid; clear wavy boundary.

R—32 inches; weathered interbedded siltstone and shale.

Solum thickness ranges from 20 to 37 inches. Depth to bedrock is 20 to 40 inches. The content of coarse fragments ranges from 0 to 25 percent in the A horizon, from 10 to 35 percent in the B horizon, and from 25 to 75 percent in the C horizon. Unless the soil is limed, reaction is medium acid and strongly acid in the solum and slightly acid to strongly acid in the C horizon.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam, loam, or silty clay loam in the fine earth.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 and 5, and chroma of 4 to 6. Some pedons have grayish mottles. Texture ranges from loam to silty clay in the fine earth.

Ernest series

Soils of the Ernest series are fine-loamy, mixed, mesic Aquic Fragiudults. These deep, moderately well drained soils on foot slopes, benches, and lowlands formed in colluvial material from acid gray shale, siltstone, and sandstone. The slope range is 3 to 25 percent, but the slope is dominantly 3 to 15 percent.

Ernest soils are associated on the landscape with the shallow, well drained Weikert soils; the moderately deep,

well drained Gilpin soils; the deep, well drained Clymer soils; the moderately well drained Wharton and Tilsit soils; the somewhat poorly drained Cavode soils; and the poorly drained Brinkerton soils.

Typical pedon of Ernest silt loam, 8 to 15 percent slopes, on the east side of Route T596, 0.1 mile south of its junction with 78 spur (Big Knob Road), and 3.5 miles northeast of Rochester in New Sewickley Township, Beaver County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; moderate fine granular structure; very friable, nonsticky, nonplastic; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—12 to 17 inches; yellowish brown (10YR 5/6) heavy silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—17 to 24 inches; yellowish brown (10YR 5/4) light silty clay loam; common fine and medium distinct light brownish gray (2.5Y 6/2) and olive yellow (2.5Y 6/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; few fine black coatings on ped faces; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx—24 to 44 inches; strong brown (7.5YR 5/6) heavy silt loam; gray (5Y 6/1) prism faces; common fine distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure parting to moderate thick and very thick platy; very firm, brittle, slightly sticky, slightly plastic; many thin clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/6) heavy silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; firm, slightly sticky, slightly plastic; 10 percent coarse fragments; strongly acid.

Solum thickness ranges from 36 to 60 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 20 to 30 inches. The content of coarse fragments ranges from 5 to 20 percent above the Bx horizon and from 5 to 30 percent in the Bx and C horizons. Unless the soil is limed, reaction is strongly acid or very strongly acid throughout.

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

The B and the Bx horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. They are mottled in the upper 10 inches of the argillic horizon. The B horizon texture is silt loam or silty clay loam in the fine earth, but the Bx horizon can include clay loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is mottled. Texture ranges from silt loam to silty clay in the fine earth.

Frenchtown series

Soils of the Frenchtown series are fine-loamy, mixed, mesic Typic Fragiaqualfs. These deep, poorly drained soils on till plains and in associated minor drainageways formed in glacial till material. The slope range is 0 to 8 percent.

Frenchtown soils are associated on the landscape with the very poorly drained Sloan soils, the poorly drained Holly and Canadice soils, the somewhat poorly drained Ravenna soils, the moderately well drained Canfield soils, and the deep, well drained Wooster soils.

Typical pedon of Frenchtown silt loam, 0 to 3 percent slopes, 30 feet south of Route T561, 200 feet east of its junction with PA 18, and 4.5 miles north of New Castle in Neshannock Township, Lawrence County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; neutral; abrupt smooth boundary.

B1g—8 to 13 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B2tg—13 to 18 inches; light brownish gray (2.5Y 6/2) light silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

Bx1g—18 to 26 inches; brown (10YR 5/3) silt loam; gray (5Y 5/1) prism and ped faces; many medium faint olive gray (5Y 5/2) mottles; moderate very coarse prismatic structure parting to moderate medium platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; common fine and medium black coatings on ped faces; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

Bx2g—26 to 44 inches; grayish brown (2.5Y 5/2) silt loam; gray (5Y 5/1) prism and ped faces; few medium faint olive gray (5Y 5/2) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

C—44 to 60 inches; grayish brown (2.5Y 5/2) silt loam; few medium faint olive gray (5Y 5/2) mottles; mas-

sive; firm, slightly sticky, slightly plastic; 5 percent coarse fragments; mildly alkaline.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 16 to 32 inches. The content of coarse fragments ranges from 0 to 10 percent in the upper part of the solum and from 2 to 30 percent in the lower part and in the C horizon. Unless the soil is limed, reaction ranges from very strongly acid to medium acid in the upper part of the solum, from slightly acid to strongly acid in the lower part, and from medium acid to mildly alkaline in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2.

The B1 and Bt horizons have hue of 10YR to 5Y, value of 4 to 6, dominant chroma of 2 or less on ped surfaces and in ped interiors. These horizons are mottled. Texture is clay loam, loam, silty clay loam, or silt loam.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is mottled. Prism faces are neutral or have hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. Texture is loam, silt loam, or light clay loam in the fine earth.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is mottled. Texture is loam, silt loam, or light clay loam in the fine earth.

Gilpin series

Soils of the Gilpin series are fine-loamy, mixed, mesic Typic Hapludults. These moderately deep, well drained soils on ridges and hillsides formed in residual material from acid shale and siltstone. The slope range is 3 to 70 percent, but the slope is dominantly 8 to 70 percent.

Gilpin soils are associated on the landscape with the shallow, well drained Weikert soils; the deep, well drained Upshur soils; the moderately well drained Wharton, Ernest, and Tilsit soils; the somewhat poorly drained Cavode soils; and the poorly drained Brinkerton soils.

Typical pedon of Gilpin silt loam, 3 to 8 percent slopes, on the west side of Route 04091, 270 feet south of its junction with Route A892 (Dutch Ridge Road), and 3 miles northwest of Beaver in Brighton Township, Beaver County:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 17 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and pores; 10 to 15 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—17 to 23 inches; yellowish brown (10YR 5/6) shaly silt loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many moderately thick clay films on ped faces and in pores; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B3—23 to 27 inches; yellowish brown (10YR 5/4) shaly silt loam; weak medium platy structure inherited from the bedrock bedding planes; friable, slightly sticky, nonplastic; few thin clay films on coarse fragments; 40 percent coarse fragments; strongly acid; gradual wavy boundary.

C—27 to 30 inches; yellowish brown (10YR 5/4) very shaly silt loam; massive; firm, nonsticky, nonplastic; common medium prominent black coatings on coarse fragments; 90 percent coarse fragments; strongly acid; abrupt wavy boundary.

R—30 inches; light olive brown (2.5Y 5/6) fractured shale and siltstone.

Solum thickness ranges from 20 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments ranges from 5 to 40 percent in individual horizons of the solum and from 30 to 90 percent in the C horizon. Unless the soil is limed, reaction ranges from strongly acid to extremely acid throughout.

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

The Bt horizon has hue of 7.5YR to 2.5Y, value of 5, and chroma of 4 to 8. Texture ranges from silt loam to light clay loam in the fine earth.

The B3 and C horizons have hue of 10YR to 2.5Y, value of 3 to 5, and chroma of 3 to 6. Texture is silt loam or loam in the fine earth.

Guernsey series

Soils of the Guernsey series are fine, mixed, mesic Aquic Hapludalfs. These deep, moderately well drained soils on ridges and hillsides formed in residual material from slightly acid to calcareous shale and siltstone. The slope range is 3 to 25 percent, but the slope is dominantly 8 to 25 percent.

Guernsey soils are associated on the landscape with the deep, well drained Upshur soils; the moderately deep, well drained Culleoka and Gilpin soils; the shallow, well drained Weikert soils; the moderately well drained and somewhat poorly drained Vandergrift soils; and the moderately well drained Wharton soils.

Typical pedon of Guernsey silt loam, 8 to 15 percent slopes, in woodland, in Raccoon Creek State Park, 50 feet north of the main park road, 2.2 miles east of its junction with PA 18, and 2.5 miles northeast of Frankfort Springs in Hanover Township, Beaver County:

A1—0 to 2 inches; very dark brown (10YR 2/2) silt loam; moderate fine granular structure; very friable, nonsticky, nonplastic; 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

A2—2 to 7 inches; brown (10YR 4/3) silt loam; weak medium platy structure; friable, slightly sticky, slightly

plastic; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/4) heavy silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—12 to 16 inches; yellowish brown (10YR 5/4) heavy silt loam; strong medium subangular blocky structure; firm, slightly sticky, slightly plastic; common thin clay films on ped faces; 2 percent coarse fragments; medium acid; clear wavy boundary.

B22t—16 to 26 inches; light olive brown (2.5Y 5/4) heavy silty clay loam; grayish brown (2.5Y 5/2) prism faces; many medium distinct yellowish brown (10YR 5/8) mottles; strong medium and coarse prismatic structure parting to medium coarse angular blocky; firm, slightly sticky, plastic; many thin clay films on ped faces; common fine prominent black coatings on ped faces; less than 2 percent coarse fragments; neutral; clear wavy boundary.

B23tg—26 to 44 inches; grayish brown (2.5Y 5/2) heavy silty clay; many medium distinct yellowish brown (10YR 5/8) mottles; strong medium and coarse prismatic structure parting to weak coarse subangular blocky; very firm, sticky, plastic; many thin clay films on ped faces and in pores; 2 percent coarse fragments; neutral; clear wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) heavy silty clay; many fine distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/8) mottles; massive; very firm, sticky, plastic; few thin clay films in pores; 10 percent coarse fragments; mildly alkaline.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 0 to 20 percent in the upper 20 inches of the solum and from 0 to 35 percent below 20 inches. Unless the soil is limed, reaction ranges from very strongly acid to medium acid in the upper part of the solum and from medium acid to mildly alkaline in the lower part of the solum and in the C horizon.

The A1 horizon has a hue of 10YR, value of 2 or 3, and chroma of 2 or 3. The A2 and Ap horizons have a hue of 10YR, value of 4 or 5, and chroma of 2 or 3.

The B1 and B2t horizons above 15 to 28 inches have hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. The B2t has low chroma of ped faces or mottles in the upper 10 inches. Texture ranges from heavy silt loam to silty clay in the fine earth.

The B2t horizon below a depth of 15 to 28 inches has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is mottled. Lenses or strata have hue ranging from 5Y to 5YR. Texture ranges from heavy silty clay loam to clay in the fine earth. Clay is more than 35 percent in the particle size control section.

The C horizon has hue of 10YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is mottled. Texture commonly ranges from silty clay loam to clay in the fine earth.

Hazleton series

Soils of the Hazleton series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. These deep, well drained soils on hills and ridges formed in residual material from acid sandstone. The slope range is 3 to 25 percent, but the slope is dominantly 8 to 25 percent.

Hazleton soils are associated on the landscape with the deep well drained Clymer soils; the shallow, well drained Weikert soils; the moderately deep, well drained Gilpin soils; and the deep, moderately well drained Ernest soils.

Typical pedon of Hazleton channery loam, 15 to 25 percent slopes, on the northwest side of Route T670, 0.2 mile northeast of its junction with Route 04020 (Freedom-Crider Road), and 2.75 miles east of Freedom in New Sewickley Township, Beaver County:

Ap—0 to 7 inches; dark brown (10YR 3/3) channery loam; weak, medium, granular structure; very friable, nonsticky, nonplastic; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—7 to 13 inches; yellowish brown (10YR 5/4) channery sandy loam; weak coarse subangular blocky structure; very friable, nonsticky, nonplastic; clay bridging of some sand grains; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B22—13 to 26 inches; yellowish brown (10YR 5/6) channery sandy loam; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; clay bridging of some sand grains; 45 percent coarse fragments; strongly acid; clear wavy boundary.

B3—26 to 32 inches; yellowish brown (10YR 5/6) very channery loamy sand; weak medium subangular blocky structure; very friable, nonsticky, nonplastic; 60 percent coarse fragments; strongly acid; gradual wavy boundary.

C—32 to 55 inches; yellowish brown (10YR 5/6) very channery loamy sand; single grain; loose, nonsticky, nonplastic; 80 percent coarse fragments; strongly acid; diffuse wavy boundary.

R—55 inches; fractured sandstone.

Solum thickness ranges from 25 to 45 inches. Depth to bedrock ranges from 40 inches to more than 72 inches. The content of coarse fragments averages more than 35 percent in the particle size control section. The range is from 5 to 70 percent in individual horizons of the solum and from 35 to 80 percent in the C horizon. Unless the soil is limed, reaction ranges from strongly acid to extremely acid throughout.

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

The B horizon has hue of 10YR or 7.5YR, value of 3 to 6, and chroma of 3 to 6. Texture is sandy loam or loam in the fine earth.

The C horizon has hue of 5YR to 2.5Y, value of 3 to 6, and chroma of 2 to 6. Texture ranges from loam to loamy sand in the fine earth.

Holly series

Soils of the Holly series are fine-loamy, mixed, nonacid, mesic Typic Fluvaquents. These deep, poorly drained soils on flood plains formed in alluvial material derived from glaciated uplands. The slope range is 0 to 3 percent.

Holly soils are associated on the landscape with the well drained Chagrin soils, the moderately well drained Lobdell soils, the poorly drained Frenchtown and Canadice soils, and the very poorly drained Sloan soils.

Typical pedon of Holly silt loam, in hayland, 200 feet west of the Erie-Lackawanna Railroad, 175 feet south of the small stream, 560 feet west-southwest of the junction of Route 37038 and Route T382, and 2.6 miles southeast of Pulaski in Pulaski Township, Lawrence County:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; few medium faint dark gray (10YR 4/1) mottles; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; neutral; clear wavy boundary.

A3—10 to 15 inches; dark gray (10YR 4/1) silt loam; few medium faint very dark gray (10YR 3/1) and few fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure parting to moderate medium and fine granular; friable, slightly sticky, slightly plastic; slightly acid; abrupt wavy boundary.

B21g—15 to 30 inches; gray (5Y 5/1) to olive gray (5Y 5/2) silt loam; many fine and medium prominent strong brown (7.5YR 5/8) and common fine and medium distinct light gray (5Y 6/1) mottles; weak medium subangular blocky structure parting to weak fine subangular blocky; firm, sticky, plastic; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22g—30 to 44 inches; olive gray (5Y 5/2) heavy loam; many fine and medium prominent strong brown (7.5YR 5/8) and common fine and medium distinct light gray (5Y 6/1) mottles; weak fine and very fine subangular blocky structure; firm, sticky, plastic; medium acid; gradual wavy boundary.

B3g—44 to 60 inches; grayish brown (2.5Y 5/2) heavy loam; common medium and fine prominent dark yellowish brown (10YR 4/4) and strong brown (7.5YR 5/6) and (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm, sticky, slightly plastic; medium acid; clear wavy boundary.

Cg—60 to 63 inches; grayish brown (2.5Y 5/2) and gray (5Y 5/1) silt loam; common medium and fine prominent brown (7.5YR 4/4) mottles; massive; friable, sticky, slightly plastic; slightly acid.

The thickness of loamy deposits is more than 40 inches over sand and gravel or other materials. Depth to bedrock is more than 60 inches. The content of fragments in the particle size control section ranges from 0 to 15 percent. Unless the soil is limed, reaction ranges from medium acid to neutral throughout.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2.

The B horizon is gleyed and commonly mottled. It is neutral or has hue of 10YR to 5Y, value of 4 through 6, and chroma of 0 to 2. If hue is 10YR or 2.5Y and value is 5 or less, the chroma is 1. If the value is 6, the chroma is 1 or 2. If the hue is 5Y, the chroma is 1 or 2. Texture is dominantly silt loam or loam but includes sandy loam and silty clay loam. Layers of coarser or finer texture less than 4 inches thick occur in some pedons.

The C horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 6. It is commonly mottled. Texture ranges from sandy loam to silty clay loam. Below 40 inches, the C horizon is a variety of textures, including sand and gravel.

Lobdell series

Soils of the Lobdell series are fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts. These deep, moderately well drained soils on flood plains formed in alluvial material derived from glaciated uplands. The slope range is 0 to 3 percent.

Lobdell soils are associated on the landscape with the well drained Chagrin soils, the poorly drained Holly soils, and the very poorly drained Sloan soils.

Typical pedon of Lobdell silt loam, in cropland, 360 feet southeast of Route T593 (Nashua Road), 400 feet southwest of the bridge over the Shenango River, 0.4 mile southwest of the junction of Route T593 and Route 37038, and 3 miles southeast of Pulaski in Pulaski Township, Lawrence County:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable, nonsticky, nonplastic; less than 2 percent coarse fragments; neutral; abrupt smooth boundary.

B21—10 to 22 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; less than 2 percent coarse fragments; neutral; clear wavy boundary.

B22—22 to 33 inches; brown (10YR 4/3) silt loam; common medium faint dark gray (10YR 4/1) and dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; less than 2 percent coarse fragments; neutral; gradual wavy boundary.

B3g—33 to 39 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct brown (7.5YR

4/4) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; less than 2 percent coarse fragments; neutral; clear wavy boundary.

C1g—39 to 50 inches; olive gray (5Y 5/2) loam; common medium distinct brown (7.5YR 4/4) mottles; massive; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; neutral; abrupt smooth boundary.

C2g—50 to 60 inches; dark grayish brown (2.5Y 4/2) fine sandy loam; common medium distinct brown (7.5YR 4/4) mottles; massive; friable, nonsticky, nonplastic; less than 2 percent coarse fragments; neutral.

Solum thickness ranges from 24 to 40 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 15 percent in the particle size control section. Unless the soil is limed, reaction ranges from strongly acid to neutral at a depth of 24 inches and from medium acid to neutral below a depth of 24 inches.

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

The B horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 3 or 4. Low chroma mottles are at a depth of 15 to 24 inches. Thin layers in some pedons have chroma of 2. Texture is dominantly silt loam or loam, but includes individual horizons of sandy loam, fine sandy loam, clay loam, and silty clay loam.

The C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It is mottled. Texture ranges from sandy loam to clay loam or silt loam. This horizon may be stratified and below 40 inches includes a variety of textures.

Loudonville series

Soils of the Loudonville series are fine-loamy, mixed, mesic Ultic Hapludalfs. These moderately deep, well drained soils on ridges and hillsides in glaciated uplands formed in glacial till and in material from siltstone or shale bedrock. The slope range is 3 to 50 percent, but the slope is dominantly 15 to 50 percent.

Loudonville soils are associated on the landscape with the well drained Wooster soils, the moderately well drained Canfield soils, the somewhat poorly drained Ravenna soils, and the poorly drained Frenchtown soils.

Typical pedon of Loudonville gravelly silt loam, 8 to 15 percent slopes, on the north side of Route 37052, 0.2 mile east of its junction with Route 37067, and 5.5 miles northeast of Ellwood City in Slippery Rock Township, Lawrence County:

Ap—0 to 6 inches; dark brown (10YR 4/3) gravelly silt loam; moderate very fine granular structure; very friable, nonsticky, nonplastic; 15 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/4) gravelly silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 15 percent coarse fragments; strongly acid; clear wavy boundary.

B21t—10 to 23 inches; yellowish brown (10YR 5/6) gravelly heavy loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; 15 percent coarse fragments; strongly acid; clear wavy boundary.

IIB22t—23 to 34 inches; yellowish brown (10YR 5/6) shaly loam; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 30 percent coarse fragments; strongly acid; gradual wavy boundary.

IIR—34 inches; dark grayish brown (2.5Y 4/2) fractured siltstone and shale.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments ranges from 10 to 20 percent in the A and B horizons and from 10 to 75 percent in the IIB and IIC horizons. The minimum depth of a horizon with more than 35 percent coarse fragments is 20 inches. Unless the soil is limed, reaction ranges from medium acid to very strongly acid throughout.

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

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

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is loam, silt loam, clay loam, or silty clay loam.

The IIB and IIC horizons, if present, have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture ranges from loam to silty clay loam in the fine earth.

Monongahela series

Soils of the Monongahela series are fine-loamy, mixed, mesic Typic Fragiudults. These deep, moderately well drained soils on high terraces formed in old alluvial material dominantly from shale, siltstone, and sandstone. The slope range is 0 to 15 percent, but the slope is dominantly 3 to 8 percent.

Monongahela soils are associated on the landscape with the well drained Allegheny soils, the somewhat poorly drained Tyler soils, and the poorly drained Purdy soils.

Typical pedon of Monongahela silt loam, 0 to 3 percent slopes, in cropland on the west side of Route T647, 0.3 mile south of its junction with Route 04034, and 6.5 miles southeast of Ellwood City in Franklin Township, Beaver County:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine and medium granular structure; fri-

able, slightly sticky, slightly plastic; slightly acid; abrupt smooth boundary.

B21t—8 to 19 inches; yellowish brown (10YR 5/6) heavy silt loam; moderate fine and medium subangular blocky structure; firm, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—19 to 23 inches; yellowish brown (10YR 5/6) light silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; few fine black coatings on ped faces; 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bx1—23 to 35 inches; brown (10YR 5/3) light clay loam; grayish brown (10YR 5/2) prism and ped faces; common medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm, brittle, sticky, plastic; common thin clay films on ped faces and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bx2—35 to 48 inches; brown (10YR 5/3) light clay loam; grayish brown (10YR 5/2) prism and ped faces; many coarse distinct gray (5Y 6/1) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm, brittle, sticky, plastic; few thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

C—48 to 60 inches; brown (10YR 5/3) light clay loam; common medium distinct light brownish gray (2.5Y 6/2) and strong brown (7.5YR 5/6) mottles; massive; firm, sticky, plastic; 10 percent coarse fragments; strongly acid.

Solum thickness ranges from 40 to 72 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 18 to 30 inches. The content of coarse fragments ranges from 0 to 15 percent above the fragipan, from 0 to 25 percent in the fragipan, and from 10 to 40 percent in the C horizon. Unless the soil is limed, reaction is strongly acid or very strongly acid throughout.

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

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. It can be mottled in the lower part of the B2t horizon. Texture is silt loam, loam, light silty clay loam, clay loam, and sandy clay loam.

The Bx horizon has hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 2 to 6. It is mottled. Texture ranges from silt loam to sandy clay loam or light clay loam in the fine earth.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 8. It can be mottled. Texture ranges from sandy loam to clay loam in the fine earth.

Philo series

Soils of the Philo series are coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. These deep, moderately well drained soils on flood plains formed in alluvial material dominantly from sandstone, shale, and siltstone. The slope range is 0 to 3 percent.

Philo soils are associated on the landscape with the well drained Pope soils and the poorly drained Atkins soils.

Typical pedon of Philo silt loam, 60 feet west of Route 04027, 0.4 mile north of its junction with PA 588, and 5.75 miles southeast of Ellwood City in Marion Township, Beaver County:

Ap—0 to 12 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable, slightly sticky, slightly plastic; slightly acid; clear smooth boundary.

B21—12 to 19 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.

B22—19 to 31 inches; brown (10YR 5/3) silt loam; common medium distinct light brownish gray (2.5Y 6/2) and common medium faint light yellowish brown (10YR 6/4) mottles; weak coarse subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; gradual wavy boundary.

C1g—31 to 48 inches; light brownish gray (2.5Y 6/2) loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; many fine prominent black coatings; very strongly acid; diffuse wavy boundary.

C2g—48 to 60 inches; light brownish gray (2.5Y 6/2) loam; many medium distinct gray (5Y 6/1) and yellowish brown (10YR 5/4) mottles; massive; friable, slightly sticky, slightly plastic; many fine prominent black coatings; strongly acid.

Solum thickness ranges from 20 to 40 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 20 percent in the solum and from 0 to 30 percent in the C horizon. The average of the coarse fragments is 20 percent or less in the particle size control section. Unless the soil is limed, reaction ranges from very strongly acid to medium acid throughout.

The Ap horizon has hue of 10YR or 7.5YR; value of 3 or 4 moist, 6 or more dry; and chroma of 2 or 3.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. Low chroma mottles are at a depth of 12 to 24 inches. Texture ranges from silt loam to sandy loam in the fine earth.

The C horizon is neutral or has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled. Texture ranges from silt loam to sandy loam in the fine earth. The IIC horizon can be as shallow as 30 inches

with a 5 inch or more transition zone. Where present, the IIC horizon ranges in texture from silt loam to stratified sand and gravel.

Pope series

Soils of the Pope series are coarse-loamy, mixed, mesic Fluventic Dystrochrepts. These deep, well drained soils on flood plains formed in alluvial material dominantly from sandstone, shale, and siltstone. The slope range is 0 to 3 percent.

Pope soils are associated on the landscape with the moderately well drained Philo soils and the poorly drained Atkins soils.

Typical pedon of Pope silt loam, in cropland, 110 feet west of Route 04101, 0.6 mile southeast of its junction with PA 18, and 4.5 miles southwest of Monaca in Potter Township, Beaver County:

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable, slightly sticky, slightly plastic; medium acid; abrupt smooth boundary.

B1—11 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; medium acid; clear wavy boundary.

B21—14 to 22 inches; brown (7.5YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films in pores; strongly acid; gradual wavy boundary.

B22—22 to 31 inches; brown (7.5YR 4/4) sandy loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films in pores; strongly acid; clear wavy boundary.

B3—31 to 41 inches; brown (7.5YR 4/4) sandy loam; few coarse distinct grayish brown (2.5Y 5/2) mottles along root channels; weak medium and coarse subangular blocky structure; very friable, slightly sticky, nonplastic; strongly acid; gradual wavy boundary.

C1—41 to 52 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose, nonsticky, nonplastic; 5 percent coarse fragments; strongly acid; gradual wavy boundary.

C2—52 to 60 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; single grain; loose, nonsticky, nonplastic; 60 percent coarse fragments; strongly acid.

Solum thickness ranges from 30 to 50 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 30 percent in the solum and from 0 to 60 percent in the C horizon. Unless the soil is limed, reaction ranges from extremely acid to strongly acid throughout.

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

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Some pedons are mottled below a depth of 24 inches. Texture ranges from silt loam to sandy loam in the fine earth.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. Texture in the fine earth is loamy sand, sandy loam, loam, or sandy clay loam, or any of these stratified textures.

Purdy series

Soils of the Purdy series are clayey, mixed, mesic Typic Ochraquults. These deep, poorly drained soils on stream terraces formed in old alluvial slack water material. The slope range is 0 to 3 percent.

Purdy soils are associated on the landscape with the well drained Allegheny soils, the moderately well drained Monongahela soils, and the somewhat poorly drained Tyler soils.

Typical pedon of Purdy silt loam, in cropland, 330 feet west-southwest of the junction of Route 04078 and Route 04100, and 3 miles south-southeast of Ellwood City in North Sewickley Township, Beaver County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable, slightly sticky, slightly plastic; medium acid; abrupt smooth boundary.

B1g—8 to 14 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, sticky, plastic; strongly acid; abrupt wavy boundary.

B2tg—14 to 30 inches; gray (N 5/0) silty clay; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; common thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

B3g—30 to 36 inches; gray (N 5/0) silty clay; many medium prominent strong brown (7.5YR 5/6) mottles; weak coarse angular blocky structure; firm, sticky, plastic; strongly acid; clear wavy boundary.

Cg—36 to 60 inches; light gray (N 6/0) silty clay loam; many medium and coarse prominent strong brown (7.5YR 5/6) mottles; massive; firm, sticky, plastic; strongly acid.

Solum thickness ranges from 28 to 50 inches. Depth to bedrock or unconforming substrata is more than 60 inches. There are commonly no coarse fragments in the solum, but in the C horizon coarse fragments range from 0 to 15 percent. Unless the soil is limed, reaction is very strongly acid or strongly acid throughout.

The Ap horizon is neutral or has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 to 2.

The B horizon is neutral or has hue of 10YR to 5Y, value of 4 or 5, and chroma of 0 to 2. It is mottled.

Texture is dominantly silty clay but ranges to include silty clay loam and clay loam. Clay averages more than 35 percent in the upper 20 inches of the argillic horizon.

The C horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 3. It is mottled. Texture is silty clay, silty clay loam, clay, and clay loam.

Ravenna series

Soils of the Ravenna series are fine-loamy, mixed, mesic Aeric Fragiaqualfs. They are deep, somewhat poorly drained, nearly level and undulating soils on till plains formed in glacial till material. The slope range is 0 to 15 percent, but the slope is dominantly 3 to 8 percent.

Ravenna soils are associated on the landscape with the poorly drained Frenchtown and Canadice soils; the moderately well drained Canfield soils; the deep, well drained Wooster soils; and the moderately deep, well drained Loudonville soils.

Typical pedon of Ravenna silt loam, 3 to 8 percent slopes, on the north side of Route 37024, 0.25 mile east of its junction with Route T484, directly across the road from its junction with the west end of Route T403, and 6 miles northeast of Ellwood City in Slippery Rock Township, Lawrence County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1g—8 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine distinct strong brown (7.5YR 5/6) and common fine faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B2tg—12 to 20 inches; pale brown (10YR 6/3) silt loam; light brownish gray (2.5Y 6/2) ped faces; common medium distinct yellowish brown (10YR 5/6) and common medium faint light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; many thin clay films on ped faces and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1g—20 to 36 inches; light olive brown (2.5Y 5/4) heavy silt loam; light brownish gray (2.5Y 6/2) prism and ped faces; common medium distinct strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; common fine black coatings on ped faces; 2 percent coarse fragments; medium acid; gradual wavy boundary.

Bx2g—36 to 60 inches; dark yellowish brown (10YR 4/4) heavy loam; light brownish gray (2.5Y 6/2) prism and ped faces; common medium distinct reddish yellow (7.5YR 6/6) and light gray (2.5Y 6/1) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; few fine black coatings on ped faces; 10 percent coarse fragments; slightly acid; clear wavy boundary.

C—60 to 62 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct reddish yellow (7.5YR 6/6) and light gray (2.5Y 6/1) mottles; massive; firm, slightly sticky, slightly plastic; 10 percent coarse fragments; neutral.

Solum thickness ranges from 40 to 70 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 14 to 30 inches. The content of coarse fragments ranges from 2 to 25 percent throughout. Unless the soil is limed, reaction ranges from medium acid to extremely acid in the upper part of the solum, from very strongly acid to slightly acid in the lower part of the solum, and from slightly acid to mildly alkaline in the C horizon.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is mottled. The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3.

The B1 horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3. It is mottled.

The B2t horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is mottled. Textures of the B1 and B2t horizons are silt loam or loam in the fine earth.

The Bx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is mottled. Texture ranges from heavy silt loam to heavy sandy loam in the fine earth.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam, loam, or heavy sandy loam in the fine earth.

Rexford series

Soils of the Rexford series are coarse-loamy, mixed, mesic Aeric Fragiaquepts. These deep, somewhat poorly drained and poorly drained soils on outwash plains and terraces formed in glacial outwash material consisting dominantly of stratified sand, silt, and gravel. The slope range is 3 to 8 percent.

Rexford soils are associated on the landscape with the well drained Chili soils, the well drained and somewhat excessively drained Conotton soils, and the moderately well drained Braceville soils.

Typical pedon of Rexford silt loam, 3 to 8 percent slopes, in pasture on the south side of PA 208, 0.75 mile east of its junction with Route 37074, and 1.2 miles west of Volant in Wilmington Township, Lawrence County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B21—8 to 12 inches; brown (10YR 5/3) loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; slightly acid; clear wavy boundary.

B22g—12 to 18 inches; grayish brown (10YR 5/2) gravelly loam; common medium distinct olive gray (5Y 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; 15 percent coarse fragments; slightly acid; abrupt smooth boundary.

Bx1—18 to 25 inches; dark grayish brown (10YR 4/2) loam; olive gray (5Y 5/2) prism faces; many medium distinct olive gray (5Y 5/2) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm, brittle, slightly sticky, slightly plastic; 10 percent coarse fragments; medium acid; gradual wavy boundary.

IIBx2—25 to 38 inches; olive gray (5Y 5/2) gravelly sandy loam; light olive gray (5Y 6/2) prism faces; many medium prominent strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm, brittle, slightly sticky, nonplastic; 30 percent coarse fragments; medium acid; clear wavy boundary.

IIBx3—38 to 44 inches; olive brown (2.5Y 4/4) sandy loam; light olive gray (5Y 6/2) prism faces; few medium distinct olive gray (5Y 5/2) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate thick platy; firm, brittle, slightly sticky, nonplastic; 10 percent coarse fragments; medium acid; gradual wavy boundary.

IIIC—44 to 60 inches; olive brown (2.5Y 4/4) very gravelly loamy sand; common medium distinct olive gray (5Y 5/2) mottles; single grain; very friable, nonsticky, nonplastic; 50 percent coarse fragments; slightly acid.

Solum thickness ranges from 24 to 50 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 15 to 24 inches. Depth to sand and gravel ranges from 35 to 72 inches. The content of coarse fragments ranges from 0 to 40 percent in individual horizons of the solum. Unless the soil is limed, reaction ranges from very strongly acid to medium acid above the fragipan and from strongly acid to slightly acid in the Bx and C horizons.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2.

The B2 horizon has hue of 7.5YR or 2.5Y and value of 4 to 6. Chroma ranges from 1 to 6 in individual horizons, but chroma of 2 or less is dominant. The B2 horizon is commonly mottled. Texture is loam, sandy loam, or silt loam in the fine earth.

The Bx horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It is mottled. Texture is dominantly loam or sandy loam in the fine earth.

The C horizon has hue of 5YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It can be mottled. Texture in the fine earth ranges from sandy loam, loam, or silt loam to stratified sand and gravel.

Sloan series

Soils of the Sloan series are fine-loamy, mixed, mesic Fluvaquentic Haplaquolls. These deep, very poorly drained soils on flood plains formed in alluvial material from glaciated uplands. The slope range is 0 to 3 percent, but the slope is dominantly 0 to 1 percent.

Sloan soils are associated on the landscape with the poorly drained Holly soils, the moderately well drained Lobdell soils, and the well drained Chagrin soils.

Typical pedon of Sloan silt loam, 200 feet east of Route T504 (McNulty Road), on south side of Jamison Run on State Game Lands 151, and 2.5 miles north of Plain Grove in Plain Grove Township, Lawrence County:

A11—0 to 6 inches; black (10YR 2/1) silt loam; filaments and streaks of yellowish red (5YR 4/6); moderate medium granular structure; friable, sticky, nonplastic; slightly acid; clear wavy boundary.

A12—6 to 11 inches; black (10YR 2/1) silt loam; few fine faint dark gray (10YR 4/1) mottles; moderate fine angular blocky structure parting to moderate medium granular; friable, sticky, slightly plastic; slightly acid; gradual wavy boundary.

A13—11 to 18 inches; black (10YR 2/1) light silty clay loam to heavy silt loam; common fine distinct gray (10YR 5/1) mottles; moderate medium and fine angular blocky structure; friable, sticky, slightly plastic; slightly acid; clear wavy boundary.

B21g—18 to 26 inches; dark gray (10YR 4/1) silty clay loam; many medium and fine distinct black (10YR 2/1) and gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; neutral; clear wavy boundary.

B22g—26 to 38 inches; dark gray (10YR 4/1) to gray (10YR 5/1) silty clay loam; many medium distinct brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; firm, sticky, plastic; 1 percent fine gravel; neutral; clear wavy boundary.

IIB3g—38 to 43 inches; dark gray (5Y 4/1) to gray (5Y 5/1) loam; many medium and fine distinct olive (5Y 5/3 and 5Y 4/3) mottles; weak medium subangular blocky structure; friable, slightly sticky, nonplastic; 1 percent fine gravel; neutral; gradual wavy boundary.

IICg—43 to 60 inches; dark gray (N 4/0) and gray (N 5/0) loam; massive; firm, slightly sticky, slightly plastic; neutral.

Solum thickness ranges from 36 to 55 inches. Depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 5 percent in the solum and from 0 to 20 percent in the IIC horizon. Reaction ranges from slightly acid to mildly alkaline in the upper part of the solum and from neutral to moderately alkaline in the lower part of the solum and in the IIC horizon.

The A horizon is neutral or has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0 to 2. The A horizon is less than 24 inches thick.

The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It is mottled. Texture ranges from silty clay loam to loam.

The IIC horizon is neutral or has hue of 10YR to 5Y, value of 4 to 6, and chroma of 0 to 2. It is mottled. The material is stratified, and texture is variable.

Tilsit series

Soils of the Tilsit series are fine-silty, mixed, mesic Typic Fragiudults. They are deep, moderately well drained soils on broad ridgetops and side slopes. They formed in dominantly residual material from siltstone interbedded with shale and fine grained sandstone. The slope range is 3 to 15 percent, but the slope is dominantly 3 to 8 percent.

Tilsit soils are associated on the landscape with the deep, well drained Clymer soils; the moderately deep, well drained Gilpin soils; the shallow, well drained Weikert soils; the moderately well drained Wharton and Ernest soils; the somewhat poorly drained Cavode soils; and the poorly drained Brinkerton soils.

Typical pedon of Tilsit silt loam, 3 to 8 percent slopes, on the north side of a small residential development road, 950 feet east of its junction with PA 51, 0.6 mile north of its junction with Route 04074 (Center Grange Road), and 3 miles southwest of Monaca in Center Township, Beaver County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; very friable, slightly sticky, slightly plastic; medium acid; abrupt smooth boundary.

B21t—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

B22t—14 to 21 inches; yellowish brown (10YR 5/4) silt loam; weak and moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; strongly acid; clear wavy boundary.

Bx1—21 to 30 inches; yellowish brown (10YR 5/4) silt loam; light olive gray (5Y 6/2) prism faces; common fine and medium distinct light olive gray (5Y 6/2) and dark grayish brown (10YR 4/2) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; strongly acid; gradual wavy boundary.

Bx2—30 to 39 inches; brown (10YR 5/3) heavy silt loam; gray (5Y 5/1) prism faces; common medium distinct light gray (5Y 6/1) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B3—39 to 48 inches; brown (10YR 5/3) light silty clay loam; gray (5Y 5/1) prism faces and pale olive (5Y 6/3) ped faces; common medium distinct light gray (5Y 6/1) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak coarse subangular blocky; firm, slightly sticky, slightly plastic; 10 percent coarse fragments; strongly acid; clear wavy boundary.

C—48 to 60 inches; brown (10YR 5/3) very shaly silty clay loam; common medium distinct gray (5Y 5/1) and strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky, slightly plastic; 50 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 60 inches. Depth to bedrock is 40 to 120 inches. Depth to the fragipan ranges from 18 to 28 inches. The content of coarse fragments ranges from 0 to 10 percent in the solum and from 10 to 50 percent in the C horizon. Unless the soil is limed, reaction is strongly acid or very strongly acid throughout.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 to 6. Some pedons are mottled below the upper 10 inches of the argillic horizon. Texture is silt loam or silty clay loam.

The Bx and B3 horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. They are mottled. Texture ranges from light silty clay loam to loam or silt loam.

The C horizon has hue of 10YR to 2.5Y, value of 5 or 6, and chroma of 2 to 6. It can be mottled. Texture ranges from loam or silt loam to silty clay in the fine earth.

Tyler series

Soils of the Tyler series are fine-silty, mixed, mesic Aeric Fragiaquults. These deep, somewhat poorly drained soils on high terraces formed in old alluvial material dominantly from shale and siltstone. The slope range is 0 to 8 percent.

Tyler soils are associated on the landscape with the well drained Allegheny soils, the moderately well drained Monongahela soils, and the poorly drained Purdy soils.

Typical pedon of Tyler silt loam, 0 to 3 percent slopes, on the east side of Route 04087, 0.5 mile west of its junction with PA 588, and 6 miles northeast of Beaver Falls in Marion Township, Beaver County:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable, nonsticky, nonplastic; slightly acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; common fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.

B2tg—13 to 24 inches; pale brown (10YR 6/3) heavy silt loam; light brownish gray (10YR 6/2) ped faces; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; very strongly acid; clear wavy boundary.

Bx1—24 to 32 inches; brown (10YR 5/3) silt loam; gray (10YR 5/1) prism faces, grayish brown (10YR 5/2) ped faces; many medium prominent yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; very strongly acid; gradual wavy boundary.

Bx2—32 to 48 inches; brown (10YR 5/3) light clay loam; gray (10YR 5/1) prism faces, grayish brown (10YR 5/2) ped faces; many medium prominent yellowish brown (10YR 5/6) and light brownish gray (2.5Y 6/2) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; strongly acid; gradual wavy boundary.

C—48 to 60 inches; yellowish brown (10YR 5/4) stratified silt loam and loam; many medium prominent light brownish gray (2.5Y 6/2) and many medium faint yellowish brown (10YR 5/6) mottles; massive; firm; slightly sticky, slightly plastic; medium acid.

Solum thickness ranges from 40 to 70 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan ranges from 15 to 24 inches. There are commonly no coarse fragments in the solum. Unless the soil is limed, reaction ranges from strongly acid to extremely acid in the solum and from medium acid to very strongly acid in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3.

The B1 and B2 horizons have hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6. They are mottled. Chroma of 2 or less is dominant on ped faces in the B2 horizon. Texture is silt loam or silty clay loam.

The Bx horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 3 to 6. It is mottled. Prism and ped faces have chroma of 2 or less. Texture ranges from silt loam to light silty clay loam in the upper part and from light clay loam to silty clay loam in the lower part.

The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 3 to 6. It is mottled. Texture is stratified silt loam, loam, and silty clay loam. In some pedons there are strata of loamy sand or silty clay.

Udorthents

Udorthents consist of deep, moderately well drained to excessively drained soils. They formed as a result of mixing former soils with bedrock during the process of strip mining coal and limestone. These soils are on ridgetops, side slopes, benches, and low-lying flats. The slope range is 0 to 100 percent, but the slope is dominantly 8 to 80 percent.

Udorthents are near Canfield, Ravenna, Gilpin, Weikert, Hazleton, Ernest, Wharton, Vandergrift, Guernsey, Culleoka, and Cavode soils in Beaver County. They are near Canfield, Wooster, Loudonville, Ravenna, Gilpin, Cavode, and Wharton soils in Lawrence County.

No typical pedon is given because of the variability of these soils.

Solum thickness ranges from 0 to 10 inches. Depth to bedrock is commonly more than 6 feet and ranges to more than 100 feet. The content of coarse fragments ranges from 30 to 95 percent throughout. Reaction ranges from extremely acid to moderately alkaline but is dominantly extremely acid to medium acid.

The A horizon, if present, has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 3. Texture ranges from sandy loam to silt loam in the fine earth.

The B horizon, if present, has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 6. It may be mottled. Texture ranges from sandy loam to silty clay loam in the fine earth.

The C horizon has hue of 7.5YR to 5Y, value of 3 to 5, and chroma of 1 to 6. It may be mottled. Texture ranges from loamy sand to silty clay in the fine earth.

Upshur series

Soils of the Upshur series are fine, mixed, mesic Typic Hapludalfs. They are deep, well drained soils on ridges, benches, and hillsides. They formed in residual material from nonacid reddish shale. Landslides are common on these soils. The slope range is 3 to 60 percent, but the slope is dominantly 15 to 60 percent.

Upshur soils are on the landscape in association with the moderately well drained and somewhat poorly drained Vandergrift soils, the moderately well drained Guernsey and Wharton soils, the moderately deep, well drained Gilpin and Culleoka soils, and the shallow, well drained Weikert soils.

Typical pedon of Upshur silty clay loam, in an area of Gilpin-Upshur complex, 15 to 25 percent slopes, on the

north side of Hilltop Court Road, 75 feet northwest of its junction with Silverdale Drive, 0.3 mile north of its junction with Route 04081, 1.2 miles east of its junction with Route 992 (Conway-Wallrose Road), and 4 miles east of Conway in Economy Borough, Beaver County:

Ap—0 to 5 inches; reddish brown (5YR 4/3) silty clay loam; moderate fine granular structure; friable, slightly sticky, plastic; strongly acid; abrupt smooth boundary.

B21t—5 to 8 inches; dark reddish brown (2.5YR 3/4) heavy silty clay; moderate fine subangular blocky structure; firm, sticky, plastic; few thin clay films on ped faces and in pores; medium acid; clear wavy boundary.

B22t—8 to 23 inches; dusky red (10R 3/4) clay; moderate fine angular blocky structure; firm, very sticky, very plastic; many thin and moderately thick clay films on ped faces and in pores; medium acid; gradual wavy boundary.

B23t—23 to 34 inches; dusky red (10R 3/4) clay; moderate medium angular blocky structure; firm, very sticky, very plastic; many thin and moderately thick clay films on ped faces and in pores; medium acid; gradual wavy boundary.

B3—34 to 40 inches; dark reddish brown (2.5YR 3/4) clay; weak medium angular blocky structure; firm, sticky, plastic; common thin clay films on ped faces and in pores; medium acid; diffuse wavy boundary.

C—40 to 60 inches; dusky red (10R 3/3) very shaly silty clay; massive; firm, sticky, plastic; 60 percent coarse fragments; slightly acid.

Solum thickness ranges from 26 to 44 inches. Depth to bedrock ranges from 40 to more than 72 inches. The content of coarse fragments ranges from 0 to 10 percent in the upper part of the solum, from 0 to 25 percent in the lower part, and from 20 to 60 percent in the C horizon. Unless the soil is limed, reaction ranges from very strongly acid to medium acid in the upper 20 inches of the solum and from very strongly acid to neutral below 20 inches.

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

The B horizon has hue of 5YR to 10R, value of 3 or 4, and chroma of 3 or 4. Texture is silty clay or clay.

The C horizon has hue of 5YR to 10R, value of 3 or 4, and chroma of 3 or 4. Some pedons are variegated with olive, olive brown, or yellow. Texture ranges from silty clay loam to clay in the fine earth.

Vandergrift series

Soils of the Vandergrift series are fine, mixed, mesic Aquic Hapludalfs. They are deep, moderately well drained and somewhat poorly drained soils on ridges, side slopes, benches, and foot slopes. They formed in residual material from interbedded calcareous and noncalcareous red and gray shale and siltstone. Landslides and slips are common on these soils. The slope range is 3 to 35 percent, but the slope is dominantly 8 to 25 percent.

Vandergrift soils are associated on the landscape with the deep, well drained Upshur soils; the moderately deep, well drained Gilpin and Culleoka soils; the moderately well drained Wharton and Guernsey soils; and the somewhat poorly drained Cavode soils.

Typical pedon of Vandergrift silty clay loam, in an area of Vandergrift-Gilpin complex, 15 to 35 percent slopes, in woodland in Raccoon Creek State Park, 200 feet east of the parking area on the south side of the main park road, 1.6 miles west of U.S. 30, and 3.5 miles northeast of Frankfort Springs in Hanover Township, Beaver County:

A1—0 to 2 inches; dark brown (7.5YR 3/2) heavy silt loam; moderate fine granular structure; friable, slightly sticky, slightly plastic; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—2 to 8 inches; reddish brown (5YR 4/3) silty clay loam; moderate fine and very fine subangular blocky structure; friable, sticky, plastic; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B1—8 to 16 inches; dark reddish brown (2.5YR 3/4) silty clay loam; moderate fine and medium angular blocky structure; firm, sticky, plastic; medium acid; clear wavy boundary.

B21t—16 to 22 inches; reddish brown (2.5YR 4/4) silty clay; moderate coarse prismatic structure parting to moderate medium and coarse angular blocky; firm, sticky, plastic; common thin clay films on ped faces and in pores; slightly acid; clear wavy boundary.

B22t—22 to 37 inches; reddish brown (5YR 4/4) silty clay; many medium and coarse prominent light gray (2.5Y 7/1) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky with diagonal slide planes; firm, sticky, plastic; many thin and moderately thick clay films; common medium black coatings; slightly acid; abrupt wavy boundary.

B23t—37 to 43 inches; dark reddish brown (2.5YR 3/4) silty clay loam; light gray (10YR 6/1) ped faces; moderate coarse prismatic structure parting to moderate coarse angular blocky with diagonal slide planes; firm, sticky, plastic; many thin and moderately thick clay films; few medium black coatings; slightly acid; clear wavy boundary.

B24t—43 to 58 inches; dusky red (2.5YR 3/2) silty clay loam; light gray (10YR 6/1) ped faces; moderate coarse prismatic structure parting to moderate coarse angular blocky with diagonal slide planes; firm, sticky, plastic; many thin and moderately thick clay films; 8 percent coarse fragments; slightly acid; gradual wavy boundary.

C—58 to 71 inches; reddish brown (5YR 4/4) silty clay loam; massive with evidence of diagonal slide

planes; firm, sticky, plastic; few thin clay films in pores; few fine black coatings; 30 percent coarse fragments; neutral.

Solum thickness ranges from 35 to 60 inches. Depth to bedrock is 40 to more than 80 inches. The content of coarse fragments is less than 10 percent in the solum, and it ranges from 5 to 90 percent in the C horizon. Unless the soil is limed, reaction ranges from very strongly acid to neutral in the solum and from strongly acid to mildly alkaline in the C horizon.

The A horizon has hue of 10YR to 2.5YR, value of 3 or 4 moist, 6 or more dry; and chroma of 2 to 4.

The B1 horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 2 to 4. Texture is dominantly silty clay loam or silty clay.

The Bt horizon has hue of 5YR to 10R, value of 3 or 4, and chroma of 2 to 6. It has low chroma mottles in the upper 10 inches. Texture is silty clay, silty clay loam, or clay.

The C horizon has hue of 10YR to 10R, value of 3 to 6, and chroma of 2 to 6. It is often streaked with contrasting colors. Texture is silty clay loam or clay loam in the fine earth.

Weikert series

Soils of the Weikert series are loamy-skeletal, mixed, mesic Lithic Dystrochrepts. These shallow, well drained soils on ridges and hillsides formed in residual material from interbedded acid shale, siltstone, and some sandstone. The slope range is 3 to 80 percent, but the slope is dominantly 15 to 80 percent.

Weikert soils are associated on the landscape with the moderately deep, well drained Gilpin and Culleoka soils; the moderately well drained Wharton, Ernest, Tilsit, and Guernsey soils; the somewhat poorly drained Cavode soils; and the poorly drained Brinkerton soils.

Typical pedon of Weikert shaly silt loam, in an area of Gilpin-Weikert complex, 3 to 8 percent slopes, 20 feet east of Route T578, 0.3 mile north of its junction with Route T613, and 4 miles southeast of Ellwood City in North Sewickley Township, Beaver County:

Ap—0 to 7 inches; dark brown (10YR 4/3) shaly silt loam; weak fine granular structure; very friable, nonsticky, nonplastic; 25 percent coarse fragments; strongly acid; abrupt smooth boundary.

B2—7 to 15 inches; yellowish brown (10YR 5/4) shaly silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 40 percent coarse fragments; strongly acid; clear wavy boundary.

C—15 to 18 inches; yellowish brown (10YR 5/4) very shaly silt loam; moderate medium platy structure inherited from the bedrock bedding planes; firm, nonsticky, nonplastic; 80 percent coarse fragments; strongly acid; abrupt smooth boundary.

R—18 inches; olive (5Y 4/4) fractured shale; many medium black coatings on shale fragments.

Solum thickness ranges from 10 to 20 inches. Depth to bedrock is 10 to 20 inches. The content of coarse fragments ranges from 20 to 50 percent in the Ap horizon, from 30 to 65 percent in the B horizon, and from 60 to 85 percent in the C horizon. Unless the soil is limed, reaction ranges from medium acid to very strongly acid throughout.

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

The B horizon has hue of 7.5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. Texture is silt loam or loam in the fine earth.

The C horizon has hue of 7.5YR to 10YR, value of 4 to 6, and chroma of 3 to 6. Texture is silt loam or loam in the fine earth.

Wharton series

Soils of the Wharton series are fine-loamy, mixed, mesic Aquic Hapludults. They are deep, moderately well drained soils on broad ridgetops and side slopes. They formed in residual material from interbedded acid shale and siltstone. The slope range is 0 to 25 percent, but the slope is dominantly 3 to 15 percent.

Wharton soils are associated on the landscape with the moderately well drained Ernest and Tilsit soils; the somewhat poorly drained Cavode soils; the moderately deep, well drained Gilpin soils; the shallow, well drained Weikert soils; and the deep, well drained Clymer soils.

Typical pedon of Wharton silt loam, 3 to 8 percent slopes, 120 feet southeast of the intersection of Route 04062 and Route T652, 0.5 mile north of Unionville in New Sewickley Township, Beaver County:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium granular structure; very friable, slightly sticky, nonplastic; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—10 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic; 1 percent coarse fragments; medium acid; clear wavy boundary.

B21t—16 to 22 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles in lower part; moderate fine blocky structure; friable, sticky, plastic; common thin clay films on ped faces and in pores; 1 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—22 to 30 inches; yellowish brown (10YR 5/4) light silty clay loam; common grayish brown (10YR 5/2) prism faces; common medium and fine prominent strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure part-

ing to weak medium platy and moderate fine blocky; firm, sticky, plastic; many thin clay films on ped faces and in pores; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

B23t—30 to 40 inches; yellowish brown (10YR 5/4) light silty clay loam; light brownish gray (10YR 6/2) prism faces; many medium and fine prominent grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium and fine blocky; firm, sticky, plastic; many clay films on ped faces and filling pores; 3 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3t—40 to 46 inches; yellowish brown (10YR 5/4) heavy silt loam; common light brownish gray (10YR 6/2) prism faces; many medium and fine distinct light brownish gray (10YR 6/2), grayish brown (10YR 5/2), and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak medium blocky; firm, sticky, slightly plastic; common thin clay films on ped faces and in pores; 5 to 10 percent coarse fragments; extremely acid; gradual wavy boundary.

C—46 to 60 inches; yellowish brown (10YR 5/4) and brown (10YR 4/3) shaly silt loam; common medium and fine grayish brown (10YR 5/2) mottles; weak thick platy structure parting to weak fine subangular blocky; firm, sticky, slightly plastic; black coatings on some ped faces and coarse fragments; 20 percent coarse fragments; extremely acid.

Solum thickness ranges from 30 to 60 inches. Depth to rippable bedrock is 40 to 72 inches. Depth to low chroma mottles ranges from 15 to 32 inches. The content of coarse fragments ranges from 0 to 15 percent in the A, B1, and B2t horizons, 5 to 50 percent in the B3 horizon, and 20 to 90 percent in the C horizon. Unless the soil is limed, reaction is strongly acid or very strongly acid in the solum and very strongly acid or extremely acid in the C horizon.

The Ap horizon has hue of 10YR, value of 3 to 5 moist, 6 or more dry; and chroma of 2 or 3.

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

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. The upper part of the B2t horizon is generally not mottled. The lower part of the B2t horizon has low chroma prism or ped faces. It is mottled. The B3t horizon, if present, is mottled. Texture of individual Bt horizons is silt loam, silty clay loam, clay loam, or silty clay. The Bt horizon averages less than 35 percent clay in the particle size control section.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is commonly mottled. Texture ranges from silt loam to silty clay in the fine earth.

Wooster series

Soils of the Wooster series are fine-loamy, mixed, mesic Typic Fragiudalfs. These deep, well drained soils on hills and ridges on till plains and moraines formed in glacial till material. The slope range is 3 to 25 percent, but the slope is dominantly 8 to 25 percent.

Wooster soils are associated on the landscape with the moderately deep, well drained Loudonville soils; the moderately well drained Canfield soils; the somewhat poorly drained Ravenna soils; and the poorly drained Frenchtown soils.

Typical pedon of Wooster gravelly silt loam, 8 to 15 percent slopes, on the north side of Route T603, 0.2 mile west of its junction with Route 37080, and 2.4 miles southeast of Volant in Washington Township, Lawrence County:

Ap—0 to 5 inches; dark brown (10YR 4/3) gravelly silt loam; weak fine granular structure; friable, nonsticky, nonplastic; 15 percent coarse fragments; slightly acid; clear wavy boundary.

B1—5 to 12 inches; dark yellowish brown (10YR 4/4) gravelly silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B2t—12 to 22 inches; yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; common thin clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1—22 to 52 inches; yellowish brown (10YR 5/4) gravelly loam; brown (10YR 5/3) prism faces; weak very coarse prismatic structure parting to weak thick and very thick platy; very firm, brittle, slightly sticky, slightly plastic; common thin clay films in pores; 15 percent coarse fragments; medium acid; gradual wavy boundary.

Bx2—52 to 59 inches; yellowish brown (10YR 5/4) gravelly loam; brown (10YR 5/3) prism faces; few fine faint brown (10YR 5/3) mottles; weak very coarse prismatic structure parting to weak thick and very thick platy; very firm, brittle, slightly sticky, slightly plastic; few thin clay films in pores; 20 percent coarse fragments; medium acid; gradual wavy boundary.

B3—59 to 65 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak medium subangular blocky structure; firm, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 25 percent coarse fragments; medium acid; gradual wavy boundary.

C—65 to 72 inches; dark yellowish brown (10YR 4/4) gravelly loam; massive; firm, slightly sticky, slightly plastic; 30 percent coarse fragments; slightly acid.

Solum thickness ranges from 40 to 80 inches. Depth to bedrock is more than 60 inches. Depth to the fragipan

ranges from 18 to 36 inches. The content of coarse fragments ranges from 2 to 20 percent above the Bx horizon, 5 to 25 percent in the Bx and B3 horizons, and 5 to 30 percent in the C horizon. Unless the soil is limed, reaction ranges from very strongly acid to medium acid in the solum and from medium acid to neutral in the C horizon.

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

The B1 horizon has hue of 10YR, value of 4 or 5, and chroma of 4. Texture is silt loam or loam in the fine earth.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is silt loam, loam, or light clay loam in the fine earth.

The Bx horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Prism and ped faces have hue of 10YR to 5Y, value of 3 to 5, and chroma of 2 to 4. In some pedons the Bx horizon is mottled. Texture is loam, silt loam, light clay loam, and light silty clay loam in the fine earth.

The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is loam in the fine earth.

The C horizon has hue of 10YR to 2.5Y, value of 3 to 5, and chroma of 3 to 6. Texture ranges from sandy loam to silt loam in the fine earth.

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Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils 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 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	more than 5.2

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock. Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). 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.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

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.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. 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 and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an 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. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). 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 (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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.

Low strength. The soil is not strong enough to support loads.

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 areas. Areas that have little or no natural soil and support little or no vegetation.

Moraine (geology). 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. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material.

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

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.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). 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.

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.

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 degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

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 groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

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 or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

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 (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

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."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area 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.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the low lands along streams.

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.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data were recorded in the period 1951-77 at New Castle, Pa.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	36.3	18.5	27.4	64	-13	31	2.63	1.63	3.53	8	9.5
February---	40.0	20.0	30.0	65	-10	18	2.37	1.31	3.22	7	8.6
March------	49.6	27.1	38.4	78	5	108	3.43	2.18	4.56	9	7.9
April------	63.4	36.6	50.0	86	16	309	3.53	2.02	4.75	9	.8
May--------	73.5	45.6	59.6	90	26	608	3.47	1.92	4.74	9	.1
June-------	81.5	55.1	68.3	94	37	849	4.11	2.70	5.38	8	.0
July-------	84.7	58.6	71.7	94	43	983	3.87	2.28	5.29	7	.0
August-----	83.3	57.4	70.4	94	40	942	3.53	1.93	4.82	7	.0
September--	77.3	51.1	64.2	94	32	726	3.26	1.61	4.59	7	.0
October----	66.5	40.1	53.3	85	22	412	2.64	1.04	3.93	6	.1
November---	51.8	32.6	42.2	74	9	132	2.75	1.79	3.61	8	2.7
December---	40.0	23.5	31.8	68	-3	47	2.66	1.56	3.62	8	8.3
Yearly:											
Average--	62.3	38.9	50.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	96	-13	---	---	---	---	---	---
Total----	---	---	---	---	---	5,165	38.25	32.65	43.61	93	38.0

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40°F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1951-77 at New Castle, Pa.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 1	May 16	June 1
2 years in 10 later than--	April 27	May 11	May 26
5 years in 10 later than--	April 18	May 1	May 16
First freezing temperature in fall:			
1 year in 10 earlier than--	October 16	October 4	September 22
2 years in 10 earlier than--	October 23	October 9	September 27
5 years in 10 earlier than--	November 3	October 20	October 6

TABLE 3.--GROWING SEASON

[Data were recorded in the period 1951-77 at New Castle, Pa.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	177	150	119
8 years in 10	184	158	127
5 years in 10	199	172	142
2 years in 10	213	186	158
1 year in 10	221	194	166

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Beaver County	Lawrence County	Total--	
		Acres	Acres	Area Acres	Extent Pct
AgB	Allegheny silt loam, 3 to 8 percent slopes	1,008	42	1,050	0.2
AgC	Allegheny silt loam, 8 to 15 percent slopes	358	8	366	0.1
At	Atkins silt loam	5,914	372	6,286	1.2
BcB	Braceville loam, 3 to 8 percent slopes	553	1,927	2,480	0.5
BcC	Braceville loam, 8 to 15 percent slopes	209	1,014	1,223	0.2
BkA	Brinkerton silt loam, 0 to 3 percent slopes	475	0	475	0.1
BkB	Brinkerton silt loam, 3 to 8 percent slopes	921	55	976	0.2
BkC	Brinkerton silt loam, 8 to 15 percent slopes	271	11	282	0.1
Ca	Canadice silt loam	1,413	3,497	4,910	0.9
CdB	Canfield silt loam, 3 to 8 percent slopes	3,666	32,026	35,692	6.9
CdC	Canfield silt loam, 8 to 15 percent slopes	2,925	21,073	23,998	4.6
CdD	Canfield silt loam, 15 to 25 percent slopes	435	5,376	5,811	1.1
CeA	Cavode silt loam, 0 to 3 percent slopes	647	0	647	0.1
CeB	Cavode silt loam, 3 to 8 percent slopes	3,782	364	4,146	0.8
CeC	Cavode silt loam, 8 to 15 percent slopes	3,699	655	4,354	0.8
CeD	Cavode silt loam, 15 to 25 percent slopes	1,039	189	1,228	0.2
Cg	Chagrin silt loam	228	1,284	1,512	0.3
ChB	Chili silt loam, 3 to 8 percent slopes	296	5,724	6,020	1.2
ChC	Chili silt loam, 8 to 15 percent slopes	120	2,481	2,601	0.5
CmB	Clymer loam, 3 to 8 percent slopes	2,999	240	3,239	0.6
CmC	Clymer loam, 8 to 15 percent slopes	4,152	198	4,350	0.8
CmD	Clymer loam, 15 to 25 percent slopes	636	84	720	0.1
CoB	Conotton gravelly loam, 3 to 8 percent slopes	1,128	1,985	3,113	0.6
CoC	Conotton gravelly loam, 8 to 15 percent slopes	562	5,149	5,711	1.1
CoD	Conotton gravelly loam, 15 to 25 percent slopes	462	3,885	4,347	0.8
CoF	Conotton gravelly loam, 25 to 50 percent slopes	0	1,547	1,547	0.3
CuB	Culleoka silt loam, 3 to 8 percent slopes	1,541	1	1,542	0.3
CuC	Culleoka silt loam, 8 to 15 percent slopes	1,616	19	1,635	0.3
CuD	Culleoka silt loam, 15 to 25 percent slopes	663	64	727	0.1
Du	Dumps	939	505	1,444	0.3
ErB	Ernest silt loam, 3 to 8 percent slopes	1,712	134	1,846	0.4
ErC	Ernest silt loam, 8 to 15 percent slopes	4,161	573	4,734	0.9
ErD	Ernest silt loam, 15 to 25 percent slopes	968	466	1,434	0.3
EsD	Ernest very stony silt loam, 8 to 25 percent slopes	633	48	681	0.1
FnA	Frenchtown silt loam, 0 to 3 percent slopes	63	7,865	7,928	1.5
FnB	Frenchtown silt loam, 3 to 8 percent slopes	201	3,858	4,059	0.8
GnB	Gilpin silt loam, 3 to 8 percent slopes	9,103	523	9,626	1.8
GnC	Gilpin silt loam, 8 to 15 percent slopes	15,585	1,214	16,799	3.2
GnD	Gilpin silt loam, 15 to 25 percent slopes	11,887	1,963	13,850	2.7
GpB	Gilpin-Upshur complex, 3 to 8 percent slopes	1,142	0	1,142	0.2
GpC	Gilpin-Upshur complex, 8 to 15 percent slopes	3,567	0	3,567	0.7
GpD	Gilpin-Upshur complex, 15 to 25 percent slopes	7,146	0	7,146	1.4
GpF	Gilpin-Upshur complex, 25 to 60 percent slopes	10,877	0	10,877	2.1
GsB	Gilpin-Weikert complex, 3 to 8 percent slopes	2,324	78	2,402	0.5
GsC	Gilpin-Weikert complex, 8 to 15 percent slopes	6,894	174	7,068	1.4
GsD	Gilpin-Weikert complex, 15 to 25 percent slopes	13,401	916	14,317	2.7
GsF	Gilpin-Weikert complex, 25 to 70 percent slopes	48,930	5,685	54,615	10.5
GtB	Guernsey silt loam, 3 to 8 percent slopes	1,199	6	1,205	0.2
GtC	Guernsey silt loam, 8 to 15 percent slopes	2,218	16	2,234	0.4
GvB	Guernsey-Vandergrift complex, 3 to 8 percent slopes	1,358	0	1,358	0.3
GvC	Guernsey-Vandergrift complex, 8 to 15 percent slopes	4,232	2	4,234	0.8
GvD	Guernsey-Vandergrift complex, 15 to 25 percent slopes	3,153	0	3,153	0.6
HaB	Hazleton channery loam, 3 to 8 percent slopes	998	43	1,041	0.2
HaC	Hazleton channery loam, 8 to 15 percent slopes	2,901	130	3,031	0.6
HaD	Hazleton channery loam, 15 to 25 percent slopes	3,569	296	3,865	0.7
Ho	Holly silt loam	1,352	8,721	10,073	1.9
Lb	Lobdell silt loam	649	4,404	5,053	1.0
LoB	Loudonville gravelly silt loam, 3 to 8 percent slopes	120	260	380	0.1
LoC	Loudonville gravelly silt loam, 8 to 15 percent slopes	559	790	1,349	0.3
LoD	Loudonville gravelly silt loam, 15 to 25 percent slopes	835	2,260	3,095	0.6
LoF	Loudonville gravelly silt loam, 25 to 50 percent slopes	383	6,304	6,687	1.3
MoA	Monongahela silt loam, 0 to 3 percent slopes	539	57	596	0.1
MoB	Monongahela silt loam, 3 to 8 percent slopes	4,992	870	5,862	1.1
MoC	Monongahela silt loam, 8 to 15 percent slopes	1,227	123	1,350	0.3
Ph	Philo silt loam	2,728	221	2,949	0.6
Pn	Pits	316	787	1,103	0.2
Po	Pope silt loam	1,325	25	1,350	0.3
Pu	Purdy silt loam	733	0	733	0.1
RaA	Ravenna silt loam, 0 to 3 percent slopes	298	9,859	10,157	2.0
RaB	Ravenna silt loam, 3 to 8 percent slopes	949	37,464	38,413	7.4
RaC	Ravenna silt loam, 8 to 15 percent slopes	399	7,956	8,355	1.6

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Beaver county	Lawrence county	Total--	
				Area	Extent
		Acres	Acres	Acres	Pct
ReB	Rexford silt loam, 3 to 8 percent slopes	191	544	735	0.1
Sn	Sloan silt loam	101	2,436	2,537	0.5
TsB	Tilsit silt loam, 3 to 8 percent slopes	5,790	7	5,797	1.1
TsC	Tilsit silt loam, 8 to 15 percent slopes	2,259	20	2,279	0.4
TyA	Tyler silt loam, 0 to 3 percent slopes	1,441	154	1,595	0.3
TyB	Tyler silt loam, 3 to 8 percent slopes	1,762	236	1,998	0.4
UAB	Udorthents, strip mine, gently sloping	1,125	3,663	4,788	0.9
UAD	Udorthents, strip mine, moderately steep	1,740	5,735	7,475	1.4
UAE	Udorthents, strip mine, steep	5,283	8,144	13,427	2.6
Ub	Urban land-Arents complex	4,087	3,843	7,930	1.5
UcB	Urban land-Canfield complex, 0 to 8 percent slopes	0	1,451	1,451	0.3
UcD	Urban land-Canfield complex, 8 to 25 percent slopes	0	431	431	0.1
UfB	Urban land-Conotton complex, 0 to 8 percent slopes	6,153	906	7,059	1.4
UfD	Urban land-Conotton complex, 8 to 25 percent slopes	933	441	1,374	0.3
UgB	Urban land-Gilpin complex, 0 to 8 percent slopes	956	34	990	0.2
UgD	Urban land-Gilpin complex, 8 to 25 percent slopes	1,409	179	1,588	0.3
UwB	Urban land-Wharton complex, 0 to 8 percent slopes	1,150	47	1,197	0.2
UwD	Urban land-Wharton complex, 8 to 25 percent slopes	486	81	567	0.1
VgD	Vandergrift-Gilpin complex, 15 to 35 percent slopes	1,877	0	1,877	0.4
weF	Weikert-Rock outcrop complex, 25 to 80 percent slopes	4,981	2,031	7,012	1.3
WhA	Wharton silt loam, 0 to 3 percent slopes	437	12	449	0.1
WhB	Wharton silt loam, 3 to 8 percent slopes	6,888	706	7,594	1.5
WhC	Wharton silt loam, 8 to 15 percent slopes	9,049	1,616	10,665	2.0
WnD	Wharton-Gilpin silt loams, 15 to 25 percent slopes	3,559	1,479	5,038	1.0
WoB	Wooster gravelly silt loam, 3 to 8 percent slopes	489	1,316	1,805	0.3
WoC	Wooster gravelly silt loam, 8 to 15 percent slopes	445	2,859	3,304	0.6
WoD	Wooster gravelly silt loam, 15 to 25 percent slopes	726	2,643	3,369	0.6
W	Water	4,480	0	4,480	0.9
	Total	286,080	234,880	520,960	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
AgB---- Allegheny	115	23	75	45	4.5	3.5	8.5
AgC---- Allegheny	105	21	70	40	4.0	3.5	8.0
At---- Atkins	100	20	60	---	---	3.0	5.5
BcB---- Braceville	105	21	80	40	4.5	3.5	8.5
BcC---- Braceville	100	20	75	35	4.0	3.0	8.0
BkA---- Brinkerton	90	18	60	---	---	2.5	5.0
BkB---- Brinkerton	90	18	60	---	---	2.5	5.0
BkC---- Brinkerton	80	16	55	---	---	2.5	5.0
Ca---- Canadice	75	15	60	---	---	2.5	5.0
CdB---- Canfield	100	20	75	40	3.5	3.0	6.5
CdC---- Canfield	95	19	70	35	3.5	3.0	6.5
CdD---- Canfield	90	18	70	35	3.0	2.5	6.0
CeA---- Cavode	85	17	65	35	---	3.0	5.5
CeB---- Cavode	85	17	65	35	---	3.0	5.5
CeC---- Cavode	80	16	60	30	---	3.0	5.5
CeD---- Cavode	75	15	55	25	---	2.5	4.5
Cg---- Chagrin	125	25	80	45	5.0	4.5	8.5
ChB---- Chili	100	70	80	40	3.5	4.5	6.5
ChC---- Chili	90	18	70	35	3.5	4.0	6.5
CmB---- Clymer	120	24	75	45	4.5	3.5	8.5
CmC---- Clymer	110	22	70	40	4.0	3.0	8.0

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
CmD---- Clymer	95	19	60	35	4.0	3.0	8.0
CoB---- Conotton	90	18	65	45	4.5	3.5	8.0
CoC---- Conotton	80	16	55	40	4.0	3.0	7.5
CoD---- Conotton	75	15	50	35	4.0	3.0	7.0
CuB---- Culleoka	110	22	70	45	4.0	4.0	8.0
CuC---- Culleoka	100	20	65	40	4.0	3.5	7.0
CuD---- Culleoka	90	18	60	35	3.5	2.5	5.0
Du**. Dumps							
ErB---- Ernest	100	20	65	40	3.5	3.0	6.5
ErC---- Ernest	95	19	60	35	3.5	3.0	6.0
ErD---- Ernest	90	18	55	35	3.0	2.5	5.5
FnA---- Frenchtown	90	18	70	---	---	2.5	5.0
FnB---- Frenchtown	90	18	70	---	---	2.5	5.0
GnB---- Gilpin	90	18	65	40	3.5	3.0	7.0
GnC---- Gilpin	85	17	60	35	3.5	3.0	7.0
GnD---- Gilpin	80	16	55	30	3.0	2.5	6.0
GpB---- Gilpin	90	18	65	40	3.7	3.0	7.0
GpC---- Gilpin	85	17	60	35	3.7	3.0	7.0
GsB---- Gilpin	80	16	60	35	3.0	2.5	5.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
GsC---- Gilpin	75	15	55	30	3.0	2.5	6.0
GtB---- Guernsey	90	18	60	40	3.5	4.0	6.5
GtC---- Guernsey	80	16	50	35	3.5	3.5	6.0
GvB---- Guernsey	90	18	60	40	3.5	4.0	6.5
GvC---- Guernsey	80	16	55	35	3.5	3.5	6.0
GvD---- Guernsey	75	15	50	30	3.0	3.0	5.5
HaB---- Hazleton	125	25	75	45	4.5	3.5	8.5
HaC---- Hazleton	115	23	70	40	4.5	3.5	8.0
HaD---- Hazleton	110	22	60	35	4.0	3.0	7.5
Ho---- Holly	100	20	70	---	---	3.5	6.5
Lb---- Lobdell	120	24	80	45	4.5	4.5	8.0
LoB---- Loudonville	95	19	75	40	3.5	3.0	7.0
LoC---- Loudonville	85	17	70	40	3.5	3.5	6.5
LoD---- Loudonville	75	15	65	30	3.0	3.5	6.0
MoA---- Monongahela	110	22	65	40	3.5	3.0	6.5
MoB---- Monongahela	110	22	65	40	3.5	3.0	6.5
MoC---- Monongahela	90	18	60	35	3.0	3.0	6.5
Ph---- Philo	130	26	80	45	4.5	3.5	8.5
Pn**. Pits							
Po---- Pope	130	26	80	45	5.0	4.0	8.5

See footnotes at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
Pu---------- Purdy	80	16	55	---	---	2.5	5.5
RaA---------- Ravenna	100	20	70	40	---	3.6	5.5
RaB---------- Ravenna	95	19	70	35	---	3.5	5.5
RaC---------- Ravenna	85	17	65	30	---	3.2	5.5
ReB---------- Rexford	80	16	65	---	---	3.0	5.5
TsB---------- Tilsit	100	20	65	40	3.0	4.5	6.5
TsC---------- Tilsit	90	18	60	35	3.0	4.5	6.5
TyA---------- Tyler	95	19	60	40	---	3.0	5.5
TyB---------- Tyler	85	17	60	35	---	3.0	5.5
WhA---------- Wharton	90	18	65	40	3.5	3.0	6.5
WhB---------- Wharton	90	18	65	40	3.5	3.0	6.5
WhC---------- Wharton	80	16	60	35	3.5	3.0	6.5
WnD---------- Wharton	75	15	55	30	3.0	2.5	5.0
WoB---------- Wooster	105	21	80	40	4.5	4.5	8.5
WoC---------- Wooster	95	19	75	35	4.5	4.5	8.5
WoD---------- Wooster	85	17	70	30	4.0	3.5	8.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,862	---	---	---
II	144,154	84,057	60,097	---
III	143,322	100,405	40,004	3,113
IV	66,012	58,636	7,376	---
V	---	---	---	---
VI	33,178	32,497	---	681
VII	75,920	75,928	---	---
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AgB, AgC---------- Allegheny	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Austrian pine, yellow-poplar, black walnut, Japanese larch, red pine, Norway spruce.
						Yellow-poplar-------	90	
						Virginia pine-------	75	
						Eastern white pine--	90	
At---------- Atkins	1w	Slight	Severe	Severe	Moderate	Pin oak----------	100	Eastern white pine, white spruce.
						Red maple----------	75	
						American sycamore---	75	
BcB, BcC---------- Braceville	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar, Japanese larch, Norway spruce, eastern white pine, black cherry.
						White ash----------	80	
						Sugar maple---------	80	
						Black cherry--------	80	
						Yellow-poplar-------	90	
BkA, BkB---------- Brinkerton	2w	Slight	Severe	Severe	Moderate	Northern red oak----	77	Eastern white pine, white spruce, yellow-poplar.
						Sugar maple---------	77	
BkC---------- Brinkerton	2w	Moderate	Severe	Severe	Moderate	Northern red oak----	77	Eastern white pine, white spruce, yellow-poplar.
						Sugar maple---------	77	
Ca---------- Canadice	5w	Slight	Severe	Severe	Moderate	Red maple----------	50	Eastern white pine, white spruce.
						Eastern white pine--	55	
CdB, CdC---------- Canfield	1o	Slight	Slight	Slight	Slight	Northern red oak----	87	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
						Yellow-poplar-------	89	
						White ash----------	83	
						Black cherry--------	85	
						Sugar maple---------	70	
CdD---------- Canfield	1r	Moderate	Moderate	Slight	Slight	Northern red oak----	87	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
						Yellow-poplar-------	89	
						White ash----------	83	
						Black cherry--------	85	
						Sugar maple---------	70	
CeA, CeB---------- Cavode	2w	Slight	Moderate	Moderate	Moderate	Northern red oak----	83	Eastern white pine, yellow-poplar, black cherry, Norway spruce, white spruce.
						Yellow-poplar-------	95	
CeC---------- Cavode	2w	Moderate	Moderate	Moderate	Moderate	Northern red oak----	83	Eastern white pine, yellow-poplar, black cherry, Norway spruce, white spruce.
						Yellow-poplar-------	95	
CeD---------- Cavode	2r	Severe	Moderate	Moderate	Moderate	Northern red oak----	83	Eastern white pine, yellow-poplar, black cherry, Norway spruce, white spruce.
						Yellow-poplar-------	95	
Cg---------- Chagrin	1o	Slight	Slight	Slight	Slight	Northern red oak----	87	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
						Yellow-poplar-------	95	
						Sugar maple---------	85	

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
ChB, ChC---------- Chili	2o	Slight	Slight	Slight	Slight	White oak----------	80	Eastern white pine, red pine, black cherry, yellow-poplar.
						Northern red oak----	85	
CmB, CmC---------- Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak----	77	Eastern white pine, Virginia pine, black cherry, yellow-poplar.
						Yellow-poplar-------	90	
						Eastern white pine--	90	
CmD---------- Clymer	2r	Slight	Moderate	Slight	Slight	Northern red oak----	83	Eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
CoB, CoC---------- Conotton	3f	Slight	Slight	Moderate	Slight	White oak----------	70	Eastern white pine, red pine, black cherry, yellow-poplar, Virginia pine.
						Northern red oak----	70	
						Black cherry--------	70	
						Black oak----------	70	
						Chestnut oak--------	70	
CoD---------- Conotton	3f	Slight	Moderate	Moderate	Slight	White oak----------	70	Eastern white pine, red pine, black cherry, yellow-poplar, Virginia pine.
						Northern red oak----	70	
						Black cherry--------	70	
						Black oak----------	70	
						Chestnut oak--------	70	
CoF---------- Conotton	3f	Moderate	Severe	Moderate	Slight	White oak----------	70	Eastern white pine, red pine, black cherry, yellow-poplar, Virginia pine.
						Northern red oak----	70	
						Black cherry--------	70	
						Black oak----------	70	
						Chestnut oak--------	70	
CuB, CuC---------- Culleoka	2o	Slight	Slight	Slight	Slight	Yellow-poplar-------	76	Eastern white pine, black walnut, yellow-poplar, Virginia pine, black locust.
						Northern red oak----	94	
CuD---------- Culleoka	2r	Moderate	Moderate	Slight	Slight	Yellow-poplar-------	94	Eastern white pine, black walnut, yellow-poplar, Virginia pine, black locust.
						Northern red oak----	76	
ErB---------- Ernest	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Austrian pine.
						Yellow-poplar-------	90	
						White ash----------	70	
						Black walnut--------	70	
ErC---------- Ernest	2r	Moderate	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Austrian pine.
						Yellow-poplar-------	90	
						White ash----------	70	
						Black walnut--------	70	
ErD---------- Ernest	2r	Severe	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Austrian pine.
						Yellow poplar-------	90	
						White oak----------	70	
						Black walnut--------	70	
EsD---------- Ernest	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce.
						Yellow-poplar-------	90	
						White ash----------	70	
						Black walnut--------	70	
FnA, FnB---------- Frenchtown	1w	Slight	Severe	Severe	Moderate	White ash----------	87	Eastern white pine, Norway spruce, white ash, yellow-poplar.
						Sugar maple---------	83	
						Northern red oak----	89	
						Yellow-poplar-------	93	
						Black cherry--------	88	

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
GnB, GnC---------- Gilpin	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
GnD---------- Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
GpB*:								
Gilpin----------	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
Upshur----------	3c	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar.
						Yellow-poplar-------	82	
						Eastern white pine--	82	
						Virginia pine-------	66	
GpC*:								
Gilpin----------	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
Upshur----------	3c	Moderate	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar.
						Yellow-poplar-------	82	
						Eastern white pine--	82	
						Virginia pine-------	66	
GpD*:								
Gilpin----------	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
Upshur----------	3c	Severe	Severe	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar.
						Yellow-poplar-------	89	
						Eastern white pine--	89	
						Virginia pine-------	71	
GpF*:								
Gilpin----------	2r	Severe	Severe	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
Upshur----------	3c	Severe	Severe	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar.
						Yellow-poplar-------	89	
						Eastern white pine--	89	
						Virginia pine-------	71	
GsB#, GsC*:								
Gilpin----------	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
GsB*, GsC*:								
Weikert	4d	Slight	Slight	Severe	Moderate	Northern red oak Virginia pine	59 56	Virginia pine, red pine, eastern white pine.
GsD*:								
Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Weikert	4d	Slight	Moderate	Severe	Moderate	Northern red oak Virginia pine	59 60	Eastern white pine, Virginia pine.
GsF*:								
Gilpin	2r	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Weikert	4d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	59 60	Eastern white pine, Virginia pine.
GtB, GtC Guernsey	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple Black walnut	78 95 70 70	Eastern white pine, yellow-poplar, black walnut.
GvB*:								
Guernsey	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple Black walnut	78 95 70 70	Eastern white pine, yellow-poplar, black walnut.
Vandergrift	2w	Slight	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	76 86 70 70	Eastern white pine, yellow-poplar, Japanese larch, white spruce.
GvC*:								
Guernsey	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple Black walnut	78 95 70 70	Eastern white pine, yellow-poplar, black walnut.
Vandergrift	2w	Slight	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	76 86 70 70	Eastern white pine, yellow-poplar, Japanese larch, white spruce.
GvD*:								
Guernsey	2r	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Sugar maple Black walnut	78 95 70 70	Eastern white pine, yellow-poplar, black walnut.
Vandergrift	2w	Slight	Severe	Moderate	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	76 86 70 70	Eastern white pine, yellow-poplar, Japanese larch, white spruce.
HaB, HaC Hazleton	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	70 80	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
HaD---------- Hazleton	3r	Slight	Moderate	Slight	Slight	Northern red oak----	70	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow-poplar-------	80	
Ho---------- Holly	1w	Slight	Severe	Severe	Moderate	Pin oak-------------	90	Red maple, white ash.
						Swamp white oak-----	75	
						Red maple-----------	75	
						White ash-----------	75	
Lb---------- Lobdell	1o	Slight	Slight	Slight	Slight	Northern red oak----	87	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
						Yellow-poplar-------	96	
						Sugar maple---------	75	
						Black walnut--------	75	
LoB, LoC---------- Loudonville	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
						White oak-----------	75	
						Black oak-----------	80	
						Black cherry--------	80	
LoD---------- Loudonville	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
						White oak-----------	75	
						Black oak-----------	80	
						Black cherry--------	80	
LoF---------- Loudonville	2r	Severe	Severe	Slight	Slight	Northern red oak----	80	Eastern white pine, black walnut, yellow-poplar.
						White oak-----------	75	
						Black oak-----------	80	
						Black cherry--------	80	
MoA, MoB---------- Monongahela	3w	Slight	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar, black cherry, Japanese larch.
						Yellow-poplar-------	85	
						Eastern white pine--	72	
						Virginia pine-------	77	
MoC---------- Monongahela	3w	Moderate	Moderate	Slight	Slight	Northern red oak----	70	Eastern white pine, Virginia pine, yellow-poplar, black cherry, Japanese larch.
						Yellow-poplar-------	85	
						Eastern white pine--	72	
						Virginia pine-------	77	
Ph---------- Philo	1w	Slight	Slight	Slight	Slight	Virginia pine-------	74	Eastern white pine, yellow-poplar.
						Northern red oak----	85	
						Yellow-poplar-------	102	
Po---------- Pope	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar, black walnut, black cherry, Norway spruce, Japanese larch.
						Yellow-poplar-------	102	
						Eastern white pine--	89	
						Virginia pine-------	74	
Pu---------- Purdy	1w	Slight	Severe	Severe	Moderate	Pin oak-------------	83	Virginia pine, eastern white pine.
						Virginia pine-------	75	
						Yellow-poplar-------	90	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
RaA, RaB, RaC--- Ravenna	2w	Slight	Moderate	Moderate	Moderate	Pin oak Northern red oak Black oak Yellow-poplar Sugar maple	83 80 80 90 85	Eastern white pine, yellow-poplar, Norway spruce.
ReB--- Rexford	3w	Slight	Moderate	Moderate	Moderate	Northern red oak White ash Sugar maple Black cherry	70 70 70 70	Black cherry, Japanese larch, Norway spruce, white spruce, eastern white pine.
Sn--- Sloan	2w	Slight	Severe	Severe	Severe	Pin oak Swamp white oak Red maple	80 70 70	Norway spruce, red maple, white ash.
TsB, TsC--- Tilsit	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	70 89 80 70	Eastern white pine, Virginia pine.
TyA, TyB--- Tyler	2w	Slight	Moderate	Moderate	Moderate	Northern red oak Yellow-poplar Pin oak Red maple White ash	80 90 90 70 70	Eastern white pine, yellow-poplar.
UcB*, UcD*: Urban land.								
Canfield---	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White ash Black cherry Sugar maple	87 89 83 85 70	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce.
UfB*, UfD*: Urban land.								
Conotton---	3f	Slight	Slight	Moderate	Slight	White oak Northern red oak Black cherry Black oak Chestnut oak	70 70 70 70 70	Eastern white pine, red pine, black cherry, yellow-poplar, Virginia pine.
UgB*: Urban land.								
Gilpin---	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
UgD*: Urban land.								
Gilpin---	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
UwB*: Urban land.								
Wharton---	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
UwD*:								
Urban land.								
Wharton	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
VgD*:								
Vandergrift	2w	Slight	Severe	Moderate	Moderate	Northern red oak Yellow-poplar White ash Sugar maple	76 86 70 70	Eastern white pine, yellow-poplar, Japanese larch, white spruce.
Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
WeF*:								
Weikert	4d	Moderate	Severe	Severe	Moderate	Northern red oak Virginia pine	59 60	Eastern white pine, shortleaf pine, Virginia pine.
Rock outcrop.								
WhA, WhB Wharton	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
WhC Wharton	2r	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
WnD*:								
Wharton	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
WoB, WoC Wooster	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	86 96 85	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce, red pine, black cherry.
WoD Wooster	1r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Sugar maple	86 96 85	Eastern white pine, black walnut, yellow-poplar, white ash, Norway spruce, red pine, black cherry.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AgB---- Allegheny	Slight	Slight	Moderate: slope.	Slight	Slight.
AgC---- Allegheny	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
At---- Atkins	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
BcB---- Braceville	Moderate: percs slowly, wetness.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
BcC---- Braceville	Moderate: slope, percs slowly, wetness.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
BkA, BkB---- Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BkC---- Brinkerton	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.
Ca---- Canadice	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
CdB---- Canfield	Moderate: wetness, percs slowly.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
CdC---- Canfield	Moderate: slope, wetness, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
CdD---- Canfield	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CeA, CeB---- Cavode	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CeC---- Cavode	Severe: wetness.	Moderate: slope, wetness.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness.
CeD---- Cavode	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: slope, wetness.	Severe: slope.
Cg---- Chagrin	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
ChB---- Chili	Slight	Slight	Moderate: slope.	Slight	Slight.
ChC---- Chili	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, small stones.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CmB--- Clymer	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
CmC--- Clymer	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CmD--- Clymer	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CoB--- Conotton	Moderate: small stones.	Moderate: small stones.	Moderate: slope, small stones.	Slight	Moderate: small stones.
CoC--- Conotton	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope.	Slight	Moderate: slope, small stones.
CoD--- Conotton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CoF--- Conotton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CuB--- Culleoka	Slight	Slight	Moderate: depth to rock, slope.	Slight	Moderate: depth to rock, small stones.
CuC--- Culleoka	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock, small stones.
CuD--- Culleoka	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Du*. Dumps					
ErB--- Ernest	Moderate: percs slowly, wetness.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
ErC--- Ernest	Moderate: slope, wetness.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
ErD--- Ernest	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
EsD--- Ernest	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, large stones.	Severe: slope.
FnA, FnB--- Frenchtown	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
GnB--- Gilpin	Slight	Slight	Moderate: depth to rock, slope.	Slight	Moderate: depth to rock.
GnC--- Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GnD---------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GpB*:					
Gilpin----------	Slight----------	Slight----------	Moderate: depth to rock, slope.	Slight----------	Moderate: depth to rock.
Upshur----------	Moderate: too clayey, percs slowly.	Moderate: too clayey.	Moderate: slope, too clayey.	Moderate: too clayey.	Moderate: too clayey.
GpC*:					
Gilpin----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, depth to rock.
Upshur----------	Moderate: slope, too clayey.	Moderate: slope, too clayey.	Severe: slope.	Moderate: too clayey.	Moderate: slope, too clayey.
GpD*:					
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Upshur----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.
GpF*:					
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GsB*:					
Gilpin----------	Slight----------	Slight----------	Moderate: depth to rock, slope.	Slight----------	Moderate: depth to rock.
Weikert----------	Moderate: small stones.	Moderate: small stones.	Severe: depth to rock, small stones.	Moderate: small stones.	Moderate: small stones, depth to rock.
GsC*:					
Gilpin----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope, depth to rock.
Weikert----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, depth to rock, small stones.	Moderate: small stones.	Moderate: slope, small stones, depth to rock.
GsD*:					
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Weikert----------	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Moderate: slope, small stones.	Severe: slope.
GsF*:					
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GsF*:					
Weikert	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope.
GtB	Moderate: wetness, percs slowly.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
GtC	Moderate: slope, wetness, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
GvB*:					
Guernsey	Moderate: wetness, percs slowly.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
Vandergrift	Moderate: wetness, too clayey.	Moderate: wetness, too clayey.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, too clayey.
GvC*:					
Guernsey	Moderate: slope, wetness, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Vandergrift	Moderate: slope, wetness, too clayey.	Moderate: slope, wetness, too clayey.	Severe: slope, wetness.	Moderate: wetness.	Moderate: slope, wetness, too clayey.
GvD*:					
Guernsey	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Vandergrift	Severe: slope.	Severe: slope.	Severe: slope, wetness.	Moderate: slope, wetness.	Severe: slope.
HaB	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
HaC	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope.	Moderate: small stones.	Moderate: slope, small stones.
HaD	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, small stones.	Severe: slope.
Ho	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
Lb	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
LoB	Slight	Slight	Moderate: slope, depth to rock.	Slight	Moderate: depth to rock.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
LoC--Loudonville	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, depth to rock.
LoD--Loudonville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
LoF--Loudonville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoA--Monongahela	Moderate: wetness.	Moderate: percs slowly.	Moderate: wetness.	Slight	Slight.
MoB--Monongahela	Moderate: wetness.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
MoC--Monongahela	Moderate: wetness, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
Ph--Philo	Severe: floods.	Moderate: floods.	Moderate: floods, wetness.	Slight	Moderate: floods.
Pn*. Pits					
Po--Pope	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Pu--Purdy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
RaA, RaB--Ravenna	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RaC--Ravenna	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
ReB--Rexford	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Sn--Sloan	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
TsB--Tilsit	Moderate: wetness, percs slowly.	Moderate: percs slowly.	Moderate: slope, wetness, percs slowly.	Slight	Slight.
TsC--Tilsit	Moderate: slope, wetness, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.
TyA, TyB--Tyler	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
UAB*, UAD*, UAE*. Udorthents					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ub*:					
Urban land.					
Arents.					
UcB*:					
Urban land.					
Canfield	Moderate: wetness, percs slowly.	Moderate: percs slowly.	Moderate: slope, wetness.	Slight	Slight.
UcD*:					
Urban land.					
Canfield	Severe: slope.	Severe: slope.	Severe: slope.	Slight	Severe: slope.
UfB*:					
Urban land.					
Conotton	Moderate: small stones.	Moderate: small stones.	Moderate: slope, small stones.	Slight	Moderate: small stones.
UfD*:					
Urban land.					
Conotton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope, small stones.
UgB*:					
Urban land.					
Gilpin	Slight	Slight	Moderate: small stones, slope.	Slight	Moderate: depth to rock.
UgD*:					
Urban land.					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
UwB*:					
Urban land.					
Wharton	Moderate: percs slowly, wetness.	Moderate: percs slowly.	Moderate: slope, percs slowly, wetness.	Slight	Slight.
UwD*:					
Urban land.					
Wharton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
VgD*:					
Vandergrift	Severe: slope.	Severe: slope.	Severe: slope, wetness.	Moderate: slope, wetness.	Severe: slope.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
VgD*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WeF*:					
Weikert	Severe: slope.	Severe: slope.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope.
Rock outcrop.					
WhA---------- Wharton	Moderate: percs slowly, wetness.	Moderate: percs slowly.	Moderate: percs slowly, wetness.	Slight----------	Slight.
WhB---------- Wharton	Moderate: percs slowly, wetness.	Moderate: percs slowly.	Moderate: slope, percs slowly, wetness.	Slight----------	Slight.
WhC---------- Wharton	Moderate: slope, percs slowly, wetness.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
WnD*:					
Wharton	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
WoB---------- Wooster	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Slight----------	Moderate: small stones.
WoC---------- Wooster	Moderate: percs slowly, slope.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: small stones, slope.
WoD---------- Wooster	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AgB---- Allegheny	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AgC---- Allegheny	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
At---- Atkins	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
BcB---- Braceville	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
BcC---- Braceville	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
BkA---- Brinkerton	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
BkB---- Brinkerton	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
BkC---- Brinkerton	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ca---- Canadice	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
CdB---- Canfield	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CdC---- Canfield	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CdD---- Canfield	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CeA---- Cavode	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CeB---- Cavode	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CeC---- Cavode	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CeD---- Cavode	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Cg---- Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChB---- Chili	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChC---- Chili	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CmB---- Clymer	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CmC---- Clymer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CmD---- Clymer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CoB, CoC---- Conotton	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CoD---- Conotton	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CoF---- Conotton	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
CuB---- Culleoka	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
CuC---- Culleoka	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
CuD---- Culleoka	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Du*. Dumps										
ErB---- Ernest	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ErC---- Ernest	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ErD---- Ernest	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
EsD---- Ernest	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
FnA---- Frenchtown	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
FnB---- Frenchtown	Poor	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
GnB---- Gilpin	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
GnC---- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GnD---- Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GpB*:										
Gilpin----	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Upshur----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GpC*:										
Gilpin----	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Upshur----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
GpD*:										
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Upshur	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
GpF*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Upshur	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
GsB*:										
Gilpin	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
GsC*:										
Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
GsD*:										
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
GsF*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
GtB---- Guernsey	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GtC---- Guernsey	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GvB*:										
Guernsey	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Vandergrift	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GvC*:										
Guernsey	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Vandergrift	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GvD*:										
Guernsey	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
GvD*: Vandergrift	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HaB---- Hazleton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HaC---- Hazleton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HaD---- Hazleton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ho---- Holly	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Lb---- Lobdell	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
LoB---- Loudonville	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
LoC---- Loudonville	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
LoD---- Loudonville	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
LoF---- Loudonville	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
MoA---- Monongahela	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MoB---- Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoC---- Monongahela	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ph---- Philo	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Pn*. Pits										
Po---- Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pu---- Purdy	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
RaA---- Ravenna	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RaB---- Ravenna	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RaC---- Ravenna	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ReB---- Rexford	Poor	Fair	Fair	Fair	Fair	Fair	Very poor.	Fair	Fair	Poor.
Sn---- Sloan	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
TsB---------- Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
TsC---------- Tilsit	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
TyA---------- Tyler	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
TyB---------- Tyler	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UAB*, UAD*, UAE*. Udorthents										
Ub*: Urban land.										
Arents.										
UcB*: Urban land.										
Canfield----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UcD*: Urban land.										
Canfield----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
UfB*, UfD*: Urban land.										
Conotton----------	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UgB*: Urban land.										
Gilpin----------	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
UgD*: Urban land.										
Gilpin----------	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
UwB*: Urban land.										
Wharton----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UwD*: Urban land.										
Wharton----------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
VgD*: Vandergrift-------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
VgD*:										
Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
WeF*:										
Weikert	Very poor.	Poor	Poor	Very poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Rock outcrop.										
WhA	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Wharton										
WhB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wharton										
WhC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wharton										
WnD*:										
Wharton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
WoB	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wooster										
WoC	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Wooster										
WoD	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Wooster										

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AgB---------- Allegheny	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: low strength.	Slight.
AgC---------- Allegheny	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope.
At---------- Atkins	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness, frost action.	Severe: wetness, floods.
BcB---------- Braceville	Severe: wetness.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: slope, wetness.	Moderate: frost action, low strength.	Slight.
BcC---------- Braceville	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Moderate: slope, low strength, frost action.	Moderate: slope.
BkA, BkB---------- Brinkerton	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
BkC---------- Brinkerton	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: slope, wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
Ca---------- Canadice	Severe: wetness, too clayey.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
CdB---------- Canfield	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
CdC---------- Canfield	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action.	Moderate: slope.
CdD---------- Canfield	Severe: slope.	Severe: slope, frost action.	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, frost action.	Severe: slope.
CeA, CeB---------- Cavode	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: frost action.	Moderate: wetness.
CeC---------- Cavode	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: slope, wetness, frost action.	Severe: frost action.	Moderate: slope, wetness.
CeD---------- Cavode	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, wetness.	Severe: slope, wetness, frost action.	Severe: slope, frost action.	Severe: slope.
Cg---------- Chagrin	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
ChB---------- Chili	Severe: cutbanks cave.	Moderate: frost action.	Slight---------	Moderate: slope.	Moderate: low strength, frost action.	Slight.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ChC---------- Chili	Severe: cutbanks cave.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: low strength, frost action, slope.	Moderate: slope.
CmB---------- Clymer	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Moderate: frost action.	Slight.
CmC---------- Clymer	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
CmD---------- Clymer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CoB---------- Conotton	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: small stones.
CoC---------- Conotton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: small stones.
CoD, CoF---------- Conotton	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
CuB---------- Culleoka	Moderate: depth to rock.	Moderate-------	Moderate: depth to rock.	Moderate: slope.	Moderate: low strength.	Moderate: depth to rock.
CuC---------- Culleoka	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, low strength.	Moderate: slope, depth to rock.
CuD---------- Culleoka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Du*. Dumps						
ErB---------- Ernest	Severe: wetness.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: slope, wetness, frost action.	Moderate: low strength, frost action.	Slight.
ErC---------- Ernest	Severe: wetness.	Moderate: slope, wetness, frost action.	Severe: wetness.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
ErD---------- Ernest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
EsD---------- Ernest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
FnA, FnB---------- Frenchtown	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
GnB---------- Gilpin	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: depth to rock.
GnC---------- Gilpin	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GnD---------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GpB*:						
Gilpin----------	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: depth to rock.
Upshur----------	Severe: too clayey, cutbanks cave.	Severe: shrink-swell, low strength, frost action.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, frost action.	Severe: shrink-swell, low strength, frost action.	Moderate: too clayey.
GpC*:						
Gilpin----------	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
Upshur----------	Severe: too clayey, cutbanks cave.	Severe: shrink-swell, low strength, frost action.	Severe: shrink-swell, low strength.	Severe: shrink-swell, low strength, frost action.	Severe: shrink-swell, low strength, frost action.	Moderate: slope, too clayey.
GpD*, GpF*:						
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Upshur----------	Severe: slope, too clayey, cutbanks cave.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope, shrink-swell, low strength.	Severe: slope.
GsB*:						
Gilpin----------	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: depth to rock.
Weikert----------	Severe: depth to rock.	Moderate: depth to rock, frost action.	Severe: depth to rock.	Moderate: slope, depth to rock, frost action.	Moderate: depth to rock, frost action.	Moderate: small stones, droughty.
GsC*:						
Gilpin----------	Moderate: slope, depth to rock.	Moderate: slope, frost action.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, depth to rock.
Weikert----------	Severe: depth to rock.	Moderate: slope, depth to rock, frost action.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, frost action.	Moderate: slope, small stones, droughty.
GsD*:						
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
GsF*:						
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert----------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GtB---------- Guernsey	Severe: wetness.	Moderate: shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
GtC---------- Guernsey	Severe: wetness.	Moderate: slope, shrink-swell.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
GvB*: Guernsey---------	Severe: wetness.	Moderate: shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell.	Severe: low strength.	Slight.
Vandergrift------	Severe: wetness.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, shrink-swell, low strength.	Severe: low strength. frost action.	Moderate: wetness, too clayey.
GvC*: Guernsey---------	Severe: wetness.	Moderate: slope, shrink-swell.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
Vandergrift------	Severe: wetness.	Severe: wetness, shrink-swell, low strength.	Severe: wetness, shrink-swell, low strength.	Severe: slope, wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: slope, wetness, too clayey.
GvD*: Guernsey---------	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Vandergrift------	Severe: slope, wetness.	Severe: slope, wetness, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope, wetness, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope.
HaB---------- Hazleton	Moderate: small stones.	Moderate: frost action.	Slight---------	Moderate: slope, frost action.	Moderate: frost action.	Severe: small stones.
HaC---------- Hazleton	Moderate: slope, small stones.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Severe: small stones.
HaD---------- Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ho---------- Holly	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: wetness, floods.
Lb---------- Lobdell	Severe: wetness, floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: floods, frost action.	Moderate: floods, wetness.
LoB---------- Loudonville	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
LoC---------- Loudonville	Severe: depth to rock.	Moderate: shrink-swell, depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LoD, LoF---------- Loudonville	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
MoA, MoB---------- Monongahela	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
MoC---------- Monongahela	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action.	Moderate: slope.
Ph---------- Philo	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods.	Moderate: floods.
Pn*. Pits						
Po---------- Pope	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Pu---------- Purdy	Severe: wetness, too clayey.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness.
RaA, RaB---------- Ravenna	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
RaC---------- Ravenna	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: frost action.	Moderate: wetness, slope.
ReB---------- Rexford	Severe: wetness.	Severe: floods, wetness, frost action.	Severe: floods, wetness.	Severe: floods, wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
Sn---------- Sloan	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.	Severe: wetness, floods.
TsB---------- Tilsit	Severe: wetness.	Moderate: wetness, low strength.	Severe: wetness.	Moderate: slope, wetness, low strength.	Severe: low strength.	Slight.
TsC---------- Tilsit	Severe: wetness.	Moderate: slope, wetness, low strength.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
TyA, TyB---------- Tyler	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.	Severe: frost action, low strength, wetness.	Moderate: wetness.
UAB*, UAD*, UAE*. Udorthents						
Ub*: Urban land.						
Arents.						
UcB*: Urban land.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
UcB*:						
Canfield	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action.	Slight.
UcD*:						
Urban land.						
Canfield	Severe: slope, wetness.	Severe: slope, frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action, slope.	Severe: slope.
UfB*:						
Urban land.						
Conotton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: small stones.
UfD*:						
Urban land.						
Conotton	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
UgB*:						
Urban land.						
Gilpin	Moderate: depth to rock.	Moderate: frost action.	Moderate: depth to rock.	Moderate: slope, frost action.	Moderate: frost action.	Moderate: depth to rock.
UgD*:						
Urban land.						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
UwB*:						
Urban land.						
Wharton	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action, low strength.	Slight.
UwD*:						
Urban land.						
Wharton	Severe: wetness, slope.	Severe: frost action, slope.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action, low strength.	Moderate: slope.
VgD*:						
Vandergrift	Severe: slope, wetness.	Severe: slope, wetness, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope, wetness, shrink-swell.	Severe: slope, shrink-swell, low strength.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WeF*:						
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WhA, WhB---------- Wharton	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: frost action.	Severe: frost action, low strength.	Slight.
WhC---------- Wharton	Severe: wetness.	Severe: frost action.	Severe: wetness.	Severe: slope, frost action.	Severe: frost action, low strength.	Moderate: slope.
WnD*: Wharton----------	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, wetness.	Severe: slope, frost action.	Severe: slope, frost action, low strength.	Severe: slope.
Gilpin----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WoB---------- Wooster	Slight---------	Moderate: frost action.	Slight---------	Moderate: slope, frost action.	Moderate: frost action, low strength.	Severe: small stones.
WoC---------- Wooster	Moderate: slope.	Moderate: slope, frost action.	Moderate: slope.	Severe: slope.	Moderate: low strength, slope, frost action.	Severe: small stones.
WoD---------- Wooster	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AgB Allegheny	Slight	Moderate: slope, seepage.	Slight	Slight	Good.
AgC Allegheny	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
At Atkins	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness.
BcB Braceville	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Fair: thin layer.
BcC Braceville	Severe: percs slowly, wetness.	Severe: slope, seepage, wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Fair: slope, thin layer.
BkA Brinkerton	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BkB Brinkerton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BkC Brinkerton	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ca Canadice	Severe: percs slowly, wetness.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
CdB Canfield	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
CdC Canfield	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer.
CdD Canfield	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
CeA Cavode	Severe: percs slowly, wetness.	Moderate: depth to rock.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
CeB Cavode	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.
CeC Cavode	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness, thin layer.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CeD---- Cavode	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
Cg---- Cnagrin	Severe: floods.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Good.
ChB---- Chili	Slight----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
ChC---- Chili	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: small stones, slope.
CmB---- Clymer	Moderate: depth to rock.	Moderate: slope, seepage, depth to rock.	Severe: depth to rock.	Slight----	Fair: small stones.
CmC---- Clymer	Moderate: slope, depth to rock.	Severe: slope.	Severe: depth to rock.	Moderate: slope,	Fair: slope, small stones.
CmD---- Clymer	Severe: slope.	Severe: slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
CoB---- Conotton	Slight----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.
CoC---- Conotton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: small stones.
CoD---- Conotton	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage, slope.	Poor: slope, small stones.
CoF---- Conotton	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope, small stones.
CuB---- Culleoka	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Slight----	Fair: thin layer, small stones.
CuC---- Culleoka	Severe: depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Moderate: slope.	Fair: slope, thin layer, small stones.
CuD---- Culleoka	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: slope.	Poor: slope.
Du*. Dumps					
ErB---- Ernest	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
ErC---- Ernest	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ErD---- Ernest	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
EsD---- Ernest	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
FnA---- Frenchtown	Severe: percs slowly, wetness.	Slight----	Severe: wetness.	Severe: wetness.	Poor: wetness.
FnB---- Frenchtown	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
GnB---- Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----	Fair: thin layer.
GnC---- Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
GnD---- Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
GpB*: Gilpin----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----	Fair: thin layer.
Upshur----	Severe: percs slowly.	Moderate: slope, depth to rock.	Severe: too clayey.	Slight----	Poor: too clayey.
GpC*: Gilpin----	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
Upshur----	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
GpD*: Gilpin----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Upshur----	Severe: slope, percs slowly.	Severe: slope.	Severe: too clayey.	Severe: slope.	Poor: slope, too clayey.
GpF*: Gilpin----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Upshur----	Severe: slope, percs slowly.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey.
GsB*: Gilpin----	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight----	Fair: thin layer.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GsB*:					
Weikert	Severe: depth to rock.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer.
GsC*:					
Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Moderate: slope.	Fair: thin layer.
Weikert	Severe: depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: thin layer.
GsD*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
GsF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
GtB	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
Guernsey					
GtC	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
Guernsey					
GvB*:					
Guernsey	Severe: percs slowly, wetness.	Moderate: slope.	Severe: too clayey.	Severe: wetness.	Poor: too clayey.
Vandergrift	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness, too clayey, depth to rock.	Severe: wetness.	Poor: too clayey.
GvC*:					
Guernsey	Severe: percs slowly, wetness.	Severe: slope.	Severe: too clayey, wetness.	Severe: wetness.	Poor: too clayey.
Vandergrift	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey, depth to rock.	Severe: wetness.	Poor: too clayey.
GvD*:					
Guernsey	Severe: percs slowly, wetness, slope.	Severe: slope.	Severe: too clayey, wetness.	Severe: slope, wetness.	Poor: too clayey, slope.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GvD*: Vandergrift	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey, depth to rock.	Severe: slope, wetness.	Poor: slope, too clayey.
HaB Hazleton	Moderate: depth to rock.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
HaC Hazleton	Moderate: slope, depth to rock.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Fair: slope, small stones.
HaD Hazleton	Severe: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: slope, seepage.	Poor: slope.
Ho Holly	Severe: floods, wetness, percs slowly.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness.
Lb Lobdell	Severe: floods, wetness.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Good.
LoB Loudonville	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Poor: area reclaim.
LoC Loudonville	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Moderate: slope.	Poor: area reclaim.
LoD, LoF Loudonville	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope, area reclaim.
MoA Monongahela	Severe: percs slowly, wetness.	Moderate: seepage.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
MoB Monongahela	Severe: percs slowly, wetness.	Moderate: slope, seepage.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
MoC Monongahela	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer.
Ph Philo	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, wetness, seepage.	Good.
Pn*. Pits					
Po Pope	Severe: floods.	Severe: floods, seepage.	Severe: floods, seepage.	Severe: floods, seepage.	Good.
Pu Purdy	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RaA---------- Ravenna	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Fair: thin layer.
RaB---------- Ravenna	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
RaC---------- Ravenna	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, thin layer.
ReB---------- Rexford	Severe: percs slowly, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
Sn---------- Sloan	Severe: wetness, floods, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
TsB---------- Tilsit	Severe: percs slowly, wetness.	Moderate: slope, seepage, depth to rock.	Severe: depth to rock, wetness.	Severe: wetness.	Fair: thin layer.
TsC---------- Tilsit	Severe: percs slowly, wetness.	Severe: slope.	Severe: depth to rock, wetness.	Severe: wetness.	Fair: slope, thin layer.
TyA---------- Tyler	Severe: percs slowly, wetness.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: wetness.
TyB---------- Tyler	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
UAB*, UAD*, UAE*. Udorthents					
Ub*: Urban land.					
Arents.					
UcB*: Urban land.					
Canfield----------	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: thin layer.
UcD*: Urban land.					
Canfield----------	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: slope.
UfB*: Urban land.					
Conotton----------	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: small stones.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
UfD*: Urban land.					
Conotton	Severe: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage, slope.	Poor: small stones, slope.
UgB*: Urban land.					
Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Fair: thin layer.
UgD*: Urban land.					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
UwB*: Urban land.					
Wharton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
UwD*: Urban land.					
Wharton	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness, slope.	Fair: slope, too clayey.
VgD*: Vandergrift	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness, too clayey, depth to rock.	Severe: slope, wetness.	Poor: slope, too clayey.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
WeF*: Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage.	Poor: slope, thin layer.
Rock outcrop.					
WhA Wharton	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Fair: too clayey.
WhB Wharton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Fair: too clayey.
WhC Wharton	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: wetness.	Fair: slope, too clayey.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WnD*:					
Wharton	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: wetness.	Severe: slope, wetness.	Poor: slope.
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope.	Poor: slope.
WoB	Severe: percs slowly.	Moderate: slope.	Slight	Slight	Fair: small stones.
Wooster					
WoC	Severe: percs slowly.	Severe: slope.	Slight	Moderate: slope.	Fair: slope.
Wooster					
WoD	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Wooster					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AgB Allegheny	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
AgC Allegheny	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
At Atkins	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
BcB Braceville	Fair: frost action, low strength.	Poor: excess fines.	Poor: excess fines.	Fair: small stones, thin layer.
BcC Braceville	Fair: frost action, low strength.	Poor: excess fines.	Poor: excess fines.	Fair: slope, small stones, thin layer.
BkA, BkB, BkC Brinkerton	Poor: wetness, frost action, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ca Canadice	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
CdB Canfield	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, area reclaim.
CdC Canfield	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, small stones, area reclaim.
CdD Canfield	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
CeA, CeB Cavode	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CeC Cavode	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
CeD Cavode	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Cg Chagrin	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Good.
ChB Chili	Fair: frost action.	Fair: excess fines.	Fair: excess fines.	Good.
ChC Chili	Fair: frost action.	Fair: excess fines.	Fair: excess fines.	Fair: slope.
CmB Clymer	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
CmC---------- Clymer	Fair: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
CmD---------- Clymer	Fair: slope, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
CoB, CoC---------- Conotton	Good----------	Good----------	Good----------	Poor: small stones.
CoD---------- Conotton	Fair: slope.	Good----------	Good----------	Poor: slope, small stones.
CoF---------- Conotton	Poor: slope.	Good----------	Good----------	Poor: slope, small stones.
CuB, CuC---------- Culleoka	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CuD---------- Culleoka	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Du*. Dumps				
ErB---------- Ernest	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, small stones.
ErC---------- Ernest	Fair: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
ErD---------- Ernest	Fair: slope, low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
EsD---------- Ernest	Fair: slope, low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, large stones.
FnA, FnB---------- Frenchtown	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
GnB---------- Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, small stones.
GnC---------- Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
GnD---------- Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
GpB*: Gilpin----------	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, small stones.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GpB*:				
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
GpC*:				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
GpD*:				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
GpF*:				
Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Upshur	Poor: slope, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope, thin layer.
GsB*:				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, small stones.
Weikert	Poor: depth to rock.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, thin layer.
GsC*:				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer, small stones.
Weikert	Poor: depth to rock.	Unsuited: excess fines.	Poor: excess fines.	Poor: small stones, thin layer.
GsD*:				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Weikert	Poor: depth to rock.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones, thin layer.
GsF*:				
Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GsF*:				
Weikert	Poor: slope, depth to rock.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones, thin layer.
GtB Guernsey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
GtC Guernsey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, slope.
GvB*:				
Guernsey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones.
Vandergrift	Poor: low strength, shrink-swell, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
GvC*:				
Guernsey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, slope.
Vandergrift	Poor: low strength, shrink-swell, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey.
GvD*:				
Guernsey	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Vandergrift	Poor: low strength, shrink-swell, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
HaB, HaC Hazleton	Fair: frost action.	Poor: excess fines.	Poor: excess fines.	Poor: small stones.
HaD Hazleton	Fair: slope, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: slope, small stones.
Ho Holly	Poor: wetness, frost action.	Poor: excess fines.	Poor: excess fines.	Poor: wetness.
Lb Lobdell	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
LoB Loudonville	Poor: area reclaim, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim, small stones.
LoC Loudonville	Poor: area reclaim, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LoD, LoF---------- Loudonville	Poor: area reclaim, low strength, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
MoA, MoB---------- Monongahela	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MoC---------- Monongahela	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Ph---------- Philo	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Good.
Pn*. Pits				
Po---------- Pope	Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Good.
Pu---------- Purdy	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
RaA, RaB---------- Ravenna	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
RaC---------- Ravenna	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: area reclaim.
ReB---------- Rexford	Poor: wetness, frost action.	Poor: excess fines, small stones.	Poor: excess fines.	Poor: wetness.
Sn---------- Sloan	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
TsB---------- Tilsit	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
TsC---------- Tilsit	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
TyA, TyB---------- Tyler	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness, area reclaim.
UAB*, UAD*, UAE*. Udorthents				
Ub*: Urban land.				
Arents.				
UcB*: Urban land.				
Canfield----------	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: small stones, area reclaim.
UcD*: Urban land.				

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
UcD*:				
Canfield	Poor: frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, small stones, area reclaim.
UfB*, UfD*: Urban land.				
Conotton	Good	Good	Good	Poor: small stones.
UgB*: Urban land.				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, small stones.
UgD*: Urban land.				
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
UwB*: Urban land.				
Wharton	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
UwD*: Urban land.				
Wharton	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
VgD*:				
Vandergrift	Poor: low strength, shrink-swell, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Gilpin	Poor: thin layer, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WeF*:				
Weikert	Poor: slope, depth to rock.	Unsuited: excess fines.	Poor: excess fines.	Poor: slope, small stones, thin layer.
Rock outcrop.				
WhA, WhB: Wharton	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
WhC: Wharton	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WnD*:				
Wharton	Poor: low strength, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Gilpin	Poor: thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
WoB, WoC Wooster	Fair: low strength.	Poor: excess fines.	Unsuited: excess fines.	Poor: small stones.
WoD Wooster	Fair: slope, low strength.	Poor: excess fines.	Unsuited: excess fines.	Poor: small stones, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AgB, AgC---------- Allegheny	Seepage--------	Piping---------	No water-------	Not needed-----	Slope----------	Slope.
At---------- Atkins	Seepage, wetness.	Piping, wetness.	Favorable------	Floods, wetness.	Not needed-----	Wetness.
BcB, BcC---------- Braceville	Seepage--------	Low strength, piping.	Slow refill----	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.
BkA, BkB, BkC----- Brinkerton	Slope----------	Piping, low strength, wetness.	Favorable------	Wetness, percs slowly.	Percs slowly, erodes easily, wetness.	Percs slowly, wetness, erodes easily.
Ca---------- Canadice	Favorable------	Low strength, wetness.	Favorable------	Wetness, percs slowly, poor outlets.	Not needed-----	Wetness, percs slowly, erodes easily.
CdB---------- Canfield	Slope----------	Piping.	Slow refill, deep to water.	Percs slowly, frost action.	Wetness, rooting depth.	Erodes easily, rooting depth.
CdC, CdD---------- Canfield	Slope----------	Piping.	Slow refill, deep to water.	Percs slowly, frost action, slope.	Slope, wetness, rooting depth.	Slope, erodes easily, rooting depth.
CeA, CeB, CeC, CeD---------- Cavode	Slope, depth to rock.	Low strength, wetness.	Deep to water	Wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
Cg---------- Chagrin	Seepage--------	Piping, seepage.	Deep to water, slow refill.	Not needed-----	Not needed-----	Favorable.
ChB---------- Chili	Slope, seepage.	Seepage--------	No water-------	Not needed-----	Favorable------	Favorable.
ChC---------- Chili	Slope, seepage.	Seepage--------	No water-------	Not needed-----	Slope----------	Slope.
CmB, CmC, CmD----- Clymer	Slope, depth to rock, seepage.	Piping---------	No water-------	Not needed-----	Slope, small stones.	Slope.
CoB---------- Conotton	Seepage--------	Seepage--------	No water-------	Not needed-----	Too sandy, slope, soil blowing.	Droughty.
CoC---------- Conotton	Slope, seepage.	Seepage--------	No water-------	Not needed-----	Too sandy, slope.	Droughty, slope.
CoD, CoF---------- Conotton	Slope, seepage.	Seepage--------	No water-------	Not needed-----	Slope, too sandy.	Droughty, slope.
CuB, CuC, CuD----- Culleoka	Seepage--------	Thin layer-----	No water-------	Not needed-----	Depth to rock, slope.	Depth to rock, slope.
Du*. Dumps						
ErB, ErC, ErD----- Ernest	Slope----------	Low strength---	Deep to water	Slope, percs slowly.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
EsD---------- Ernest	Slope----------	Large stones, low strength.	Large stones, deep to water.	Slope, percs slowly.	Slope, large stones, percs slowly.	Slope, large stones, percs slowly.
FnA---------- Frenchtown	Favorable------	Wetness--------	Slow refill----	Frost action, percs slowly.	Wetness, percs slowly, rooting depth.	Wetness, erodes easily, rooting depth.
FnB---------- Frenchtown	Slope----------	Wetness--------	Slow refill----	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Wetness, erodes easily, rooting depth.
GnB, GnC, GnD----- Gilpin	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
GpB*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Upshur----------	Slope----------	Low strength, compressible.	No water, cutbanks cave.	Not needed, cutbanks cave.	Erodes easily, slope.	Erodes easily, slope.
GpC*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Upshur----------	Slope----------	Low strength, compressible.	No water, cutbanks cave.	Not needed, cutbanks cave.	Erodes easily, slope.	Erodes easily, slope.
GpD*, GpF*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Upshur----------	Slope----------	Low strength, compressible.	No water, cutbanks cave.	Not needed, cutbanks cave.	Erodes easily, slope.	Erodes easily, slope.
GsB*, GsC*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Weikert---------	Seepage, slope, depth to rock.	Thin layer, seepage.	No water-------	Not needed-----	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
GsD*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Weikert---------	Seepage, slope, depth to rock.	Thin layer, seepage.	No water-------	Not needed-----	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
GsF*:						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
Weikert---------	Seepage, slope, depth to rock.	Thin layer, seepage.	No water-------	Not needed-----	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
GtB---------- Guernsey	Slope----------	Hard to pack---	Slow refill, deep to water.	Slope, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
GtC---------- Guernsey	Slope----------	Hard to pack---	Slow refill, deep to water.	Slope, percs slowly.	Slope, erodes easily, wetness.	Erodes easily, slope, percs slowly.
GvB*:						
Guernsey---------	Slope----------	Hard to pack---	Slow refill, deep to water.	Slope, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
Vandergrift------	Slope, depth to rock.	Low strength, compressible, shrink-swell.	Slope, slow refill.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness.
GvC*, GvD*:						
Guernsey---------	Slope----------	Hard to pack---	Slow refill, deep to water.	Slope, percs slowly.	Slope, erodes easily, wetness.	Erodes easily, slope, percs slowly.
Vandergrift------	Slope, depth to rock.	Low strength, compressible, shrink-swell.	Slope, slow refill.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.
HaB, HaC, HaD----- Hazleton	Slope, depth to rock, seepage.	Low strength, piping.	No water-------	Not needed-----	Slope, depth to rock.	Slope.
Ho---------- Holly	Seepage--------	Piping, wetness.	Favorable------	Floods, frost action.	Not needed-----	Wetness.
Lb---------- Lobdell	Seepage--------	Piping, seepage.	Deep to water, slow refill.	Floods, frost action.	Not needed-----	Erodes easily.
LoB---------- Loudonville	Slope, seepage, depth to rock.	Thin layer-----	No water-------	Not needed-----	Depth to rock	Depth to rock.
LoC, LoD, LoF----- Loudonville	Slope, seepage, depth to rock.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
MoA, MoB, MoC----- Monongahela	Slope, seepage.	Low strength, piping.	No water-------	Slope, percs slowly.	Percs slowly, piping, rooting depth.	Slope, percs slowly, erodes easily.
Ph---------- Philo	Seepage--------	Piping---------	Deep to water	Floods, poor outlets.	Not needed-----	Not needed.
Pn*. Pits						
Po---------- Pope	Seepage--------	Piping---------	No water-------	Not needed-----	Not needed-----	Favorable.
Pu---------- Purdy	Slope----------	Low strength, compressible.	Slow refill----	Percs slowly---	Wetness--------	Wetness, percs slowly.
RaA---------- Ravenna	Favorable------	Wetness, piping.	Slow refill----	Percs slowly, frost action.	Wetness, rooting depth.	Wetness, erodes easily.
RaB---------- Ravenna	Slope----------	Wetness, piping.	Slow refill----	Percs slowly, frost action, slope.	Wetness, rooting depth.	Wetness, erodes easily.
RaC---------- Ravenna	Slope----------	Wetness, piping.	Slow refill----	Percs slowly, frost action, slope.	Slope, wetness, rooting depth.	Slope, wetness, erodes easily.
ReB---------- Rexford	Seepage--------	Piping, low strength, wetness.	Slow refill----	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.	Percs slowly, wetness, slope.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Sn---------- Sloan	Seepage--------	Piping, wetness.	Slow refill----	Floods, frost action.	Not needed-----	Wetness, erodes easily.
TsB, TsC---------- Tilsit	Depth to rock	Thin layer-----	No water-------	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
TyA---------- Tyler	Favorable------	Wetness, piping.	Slow refill----	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
TyB---------- Tyler	Slope----------	Wetness, piping.	Slow refill----	Percs slowly, slope, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
UAB*, UAD*, UAE*. Udorthents						
Ub*: Urban land.						
Arents.						
UcB*: Urban land.						
Canfield---------	Slope----------	Piping---------	Slow refill, deep to water.	Percs slowly, frost action.	Wetness, rooting depth.	Erodes easily, rooting depth.
UcD*: Urban land.						
Canfield---------	Slope----------	Piping---------	Slow refill, deep to water.	Percs slowly, frost action, slope.	Slope, wetness, rooting depth.	Slope, erodes easily, rooting depth.
UfB*: Urban land.						
Conotton---------	Seepage--------	Seepage--------	No water-------	Not needed-----	Too sandy------	Droughty.
UfD*: Urban land.						
Conotton---------	Slope, seepage.	Seepage--------	No water-------	Not needed-----	Too sandy------	Droughty, slope.
UgB*, UgD*: Urban land.						
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.
UwB*, UwD*: Urban land.						
Wharton----------	Slope----------	Low strength, hard to pack.	Slow refill, deep to water.	Slope, percs slowly.	Slope, percs slowly, erodes easily.	Slope, percs slowly, erodes easily.
VgD*: Vandergrift------	Slope, depth to rock.	Low strength, compressible, shrink-swell.	Slope, slow refill.	Percs slowly, wetness.	Percs slowly, wetness.	Percs slowly, wetness.
Gilpin----------	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Slope, depth to rock.	Slope, depth to rock.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
WeF*: Weikert	Seepage, slope.	Thin layer, low strength, seepage.	No water	Not needed	Depth to rock, rooting depth.	Depth to rock, rooting depth, droughty.
Rock outcrop.						
WhA, WhB, WhC Wharton	Slope	Low strength, hard to pack.	Slow refill, deep to water.	Slope, percs slowly.	Slope, percs slowly, erodes easily.	Slope, percs slowly, erodes easily.
WnD*: Wharton	Slope	Low strength, hard to pack.	Slow refill deep to water.	Slope, percs slowly.	Slope, percs slowly, erodes easily.	Slope, percs slowly, erodes easily.
Gilpin	Slope, depth to rock, seepage.	Thin layer	No water	Not needed	Slope, depth to rock.	Slope, depth to rock.
WoB Wooster	Slope	Favorable	No water	Not needed	Rooting depth, erodes easily.	Erodes easily, rooting depth.
WoC, WoD Wooster	Slope	Favorable	No water	Not needed	Slope, rooting depth, erodes easily.	Slope, erodes easily, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AgB, AgC---------- Allegheny	0-7	Silt loam-------	ML, CL, CL-ML	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	7-30	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	30-60	Clay loam, sandy loam, gravelly sandy loam.	SM, GC, ML, CL	A-4, A-6, A-2, A-1	0-35	65-100	45-100	35-95	20-75	<35	NP-15
At---------- Atkins	0-6	Silt loam-------	ML, CL	A-4, A-6	0-10	90-100	80-100	75-100	60-95	25-40	2-25
	6-32	Silty clay loam, loam, sandy loam.	SM, SC, ML, CL	A-2, A-4, A-6	0-15	85-100	80-100	50-100	25-85	20-40	1-25
	32-60	Stratified silty clay loam to sandy loam.	SM, SC, GM, ML	A-2, A-4, A-6	0-15	60-100	60-100	50-95	15-85	20-40	1-15
BcB, BcC---------- Braceville	0-8	Loam----------	ML, CL, SM	A-4, A-2	0-15	95-100	80-100	75-100	30-90	---	---
	8-20	Gravelly sandy loam, silt loam, gravelly silt loam.	ML, SM, GM-GC, CL-ML	A-2, A-4, A-1	0-10	65-100	60-100	40-100	20-90	15-40	4-10
	20-38	Gravelly sandy loam, gravelly silt loam.	ML, SM, GM-GC, CL-ML	A-2, A-4, A-1	0-10	65-100	40-75	25-75	15-65	15-40	4-10
	38-60	Stratified sand and gravel.	GM, SM, GW-GM, GP-GM	A-1, A-2, A-4	0-15	40-100	35-100	25-90	10-50	<30	NP-5
BkA, BkB, BkC------ Brinkerton	0-9	Silt loam-------	ML	A-4, A-6	0-10	90-100	85-100	85-100	75-100	---	---
	9-29	Silty clay loam, silt loam.	ML	A-4, A-6, A-7	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	29-50	Silt loam, shaly loam, channery silty clay loam.	ML	A-4, A-6, A-7	0-10	75-100	70-100	65-100	55-100	30-45	5-15
	50-60	Silt loam, shaly loam, channery silt loam.	ML, GM, SM, CL	A-4, A-6, A-2	0-40	70-90	35-85	30-85	25-75	30-40	5-15
Ca---------- Canadice	0-11	Silt loam-------	ML, MH, OL, OH	A-7	0	100	95-100	85-100	65-95	40-65	10-25
	11-42	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	70-95	45-65	20-30
	42-68	Silty clay, clay, silty clay loam.	CL, CH, MH, ML	A-7	0	100	95-100	85-100	70-95	45-65	20-30
CdB, CdC, CdD------ Canfield	0-9	Silt loam-------	ML	A-4	0-2	90-100	75-100	70-100	55-90	25-35	2-10
	9-21	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SC	A-4, A-6	0-3	80-100	70-95	60-90	45-85	20-38	3-16
	21-50	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SM	A-4, A-6	0-3	80-95	70-90	60-85	45-80	20-35	3-14
	50-60	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SM	A-4, A-6	0-5	80-95	70-90	60-85	45-80	20-35	2-12

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CeA, CeB, CeC, CeD-- Cavode	0-8	Silt loam-------	ML, CL	A-4	0-5	90-100	80-100	80-95	75-95	---	---
	8-46	Silty clay loam, silty clay, clay.	ML, CL, CL-ML	A-4, A-7, A-6	0-5	85-100	80-100	80-95	70-95	25-50	4-20
	46-50	Shaly silty clay loam, silty clay, clay.	ML, CL, GC, GM	A-2, A-4, A-6	0-45	50-100	35-100	30-80	25-75	25-45	2-15
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cg---------- Chagrin	0-12	Silt loam-------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	70-90	20-35	2-10
	12-43	Silt loam, loam, sandy loam.	ML, SM	A-4	0	90-100	85-100	75-90	45-85	20-40	NP-10
	43-65	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	85-100	80-100	55-85	30-80	20-40	NP-10
ChB, ChC---------- Chili	0-14	Silt loam-------	ML, CL-ML	A-4	0-10	85-100	80-100	70-85	50-75	25-35	4-10
	14-38	Loam, gravelly clay loam, gravelly sandy loam.	ML, SM, SC, CL	A-4, A-2, A-6	0-10	65-100	50-80	35-70	20-65	<30	NP-12
	38-52	Very gravelly sandy loam, very gravelly loam, gravelly sandy loam.	SM, GM	A-1, A-2	0-5	45-80	35-75	25-55	15-35	---	NP
	52-60	Sand and gravel	GW, GM, SP, SM	A-1	5-10	30-60	25-55	10-30	2-15	---	NP
CmB, CmC, CmD------ Clymer	0-8	Loam----------	ML, SM	A-4	0-5	85-100	75-95	60-90	35-85	---	---
	8-38	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	14-32	NP-9
	38-70	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	14-32	NP-9
	70	Weathered bedrock.	---	---	---	---	---	---	---	---	---
CoB, CoC, CoD, CoF- Conotton	0-11	Gravelly loam---	SM, ML, GM	A-2, A-4	0	65-90	55-85	50-70	25-55	<30	NP-6
	11-56	Very gravelly sandy loam, very gravelly loam, gravelly sandy loam.	GM, SM, GM-GC, SW-SM	A-1, A-2	0-5	30-70	20-65	20-50	10-30	<25	NP-6
	56-60	Sand and gravel	GW, GM, SM, SW	A-1	0-10	25-65	15-60	10-40	0-20	---	NP
CuB, CuC, CuD------ Culleoka	0-7	Silt loam-------	ML, CL, CL-ML	A-4	0-10	90-100	85-100	70-100	55-95	<35	NP-10
	7-27	Shaly silt loam, flaggy loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4	5-25	80-95	75-95	65-95	55-90	20-40	2-20
	27-32	Very flaggy silty clay loam, shaly loam.	ML, CL, GC, SM	A-6, A-4, A-2	10-60	50-95	40-90	35-90	30-85	20-40	2-20
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Du*. Dumps											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ErB, ErC, ErD------ Ernest	0-8	Silt loam-------	ML, CL	A-4, A-6	0-15	85-100	80-100	70-95	60-95	25-40	2-15
	8-24	Silty clay loam, silt loam, channery silt loam.	ML, CL	A-4, A-6, A-7	0-15	75-95	70-95	65-90	55-90	25-50	2-25
	24-44	Channery silt loam, channery loam, silty clay loam.	ML, CL, GM, SM	A-4, A-6, A-7	0-20	70-95	55-95	55-90	45-90	20-45	2-25
	44-60	Channery silt loam, silt loam, silty clay loam.	ML, CL, GM, SM	A-4, A-6, A-7	0-20	70-95	55-95	45-90	40-90	25-50	2-25
EsD---------- Ernest	0-8	Very stony silt loam.	ML, CL	A-4, A-6	3-20	65-80	60-80	55-75	55-70	15-40	2-15
	8-24	Silty clay loam, silt loam, channery silt loam.	ML, CL	A-4, A-6, A-7	0-15	75-95	70-95	65-90	55-90	25-50	2-25
	24-44	Channery silt loam, channery loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	55-95	55-90	45-90	20-45	2-25
	44-60	Channery silt loam, silt loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	55-95	45-90	40-90	25-50	2-25
FnA, FnB---------- Frenchtown	0-8	Silt loam-------	CL-ML, ML, CL	A-4, A-6	0	95-100	85-100	80-90	70-85	22-35	3-12
	8-18	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-4	0	90-100	85-95	80-90	65-85	25-40	4-15
	18-44	Loam, silt loam, clay loam.	CL, CL-ML, SC, SM-SC	A-6, A-4	0	85-100	75-95	60-85	45-75	20-35	4-12
	44-60	Loam, silt loam, clay loam.	SC, CL, SM-SC, CL-ML	A-4, A-6	0-5	85-95	70-95	60-85	45-75	20-35	4-14
GnB, GnC, GnD------ Gilpin	0-27	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GpB*:											
Gilpin----------	0-27	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur----------	0-5	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	5-40	Silty clay, clay	MH, CH, CL, ML	A-7	0-10	85-100	75-100	70-100	65-100	45-70	18-40
	40-60	Silty clay loam, silty clay, shaly clay.	CL, ML, MH, GC	A-6, A-7	0-20	70-100	60-90	55-90	50-85	35-55	11-25

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GpC*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur	0-5	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	5-40	Silty clay, clay	MH, CH, CL, ML	A-7	0-10	85-100	75-100	70-100	65-100	45-70	18-40
	40-60	Silty clay loam, silty clay, shaly clay.	CL, ML, MH, GC	A-6, A-7	0-20	70-100	60-90	55-90	50-85	35-55	11-25
GpD*, GpF*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Upshur	0-5	Silty clay loam	CL, ML	A-6, A-7	0	95-100	95-100	90-100	80-95	35-50	11-25
	5-40	Silty clay, clay	MH, CH, CL, ML	A-7	0-10	85-100	75-100	90-100	75-100	45-70	18-40
	40-60	Silty clay loam, silty clay, shaly clay.	CL, ML, MH, GC	A-6, A-7	0-20	70-100	60-90	55-90	50-85	35-55	11-25
GsB*, GsC*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert	0-7	Shaly silt loam	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Shaly loam, very shaly silt loam, channery loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GsD*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
GsD*:											
Weikert	0-7	Shaly silt loam	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Shaly loam, very shaly silt loam, channery loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GsF*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert	0-7	Shaly silt loam	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Shaly loam, very shaly silt loam, channery loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GtB, GtC Guernsey	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-95	70-90	25-40	4-14
	7-26	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0-2	80-100	70-100	65-100	60-95	35-54	11-26
	26-44	Silty clay, clay, silty clay loam.	CH, CL, ML, MH	A-7	0-10	75-100	65-100	60-100	55-95	45-65	18-35
	44-60	Clay, silty clay, shaly clay.	CH, MH, ML, CL	A-7	2-20	70-100	60-90	55-85	55-80	40-70	15-35
GvB*, GvC*, GvD*:											
Guernsey	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0-2	90-100	80-100	75-95	70-90	25-40	4-14
	7-26	Silt loam, silty clay loam.	CL, CH	A-6, A-7	0-2	80-100	70-100	65-100	60-95	35-54	11-26
	26-44	Silty clay, clay, silty clay loam.	CH, CL, ML, MH	A-7	0-10	75-100	65-100	60-100	55-95	45-65	18-35
	44-60	Clay, silty clay, shaly clay.	CH, MH, ML, CL	A-7	2-20	70-100	60-90	55-85	55-80	40-70	15-35
Vandergrift	0-8	Silty clay loam	CL	A-4, A-6	0	95-100	90-100	85-100	80-90	---	---
	8-58	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-4, A-6, A-5	0-5	90-100	85-100	70-95	65-90	25-55	9-30
	58-71	Silty clay loam, shaly clay loam, very shaly clay loam.	CH, CL, GC, SC	A-7, A-6, A-4, A-2	0-35	35-100	25-100	25-95	20-90	25-55	9-30

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HaB, HaC, HaD------ Hazleton	0-7	Channery loam---	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	---	---
	7-32	Channery sandy loam, loam, very channery loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	32-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	0-60	55-80	35-75	25-65	15-50	<30	NP-8
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ho---------- Holly	0-10	Silt loam-------	ML	A-4	0	90-100	85-100	80-100	70-90	25-35	NP-10
	10-63	Silt loam, loam, silty clay loam.	ML, SM	A-4, A-6	0	85-100	80-100	75-95	45-85	20-40	NP-14
Lb---------- Lobdell	0-10	Silt loam-------	ML, CL-ML, CL	A-4	0	95-100	95-100	80-100	65-90	20-30	NP-8
	10-39	Loam, silt loam	ML	A-4	0	90-100	80-100	70-95	55-85	20-35	NP-10
	39-60	Stratified sandy loam to silt loam.	ML, SM, CL-ML, CL	A-4	0	90-100	85-100	65-85	40-80	15-35	NP-10
LoB, LoC, LoD, LoF- Loudonville	0-6	Gravelly silt loam.	ML, CL-ML, CL	A-4	0-1	95-100	70-90	65-95	55-90	20-35	2-10
	6-23	Loam, silt loam, silty clay gravelly loam.	CL, CL-ML	A-4, A-6, A-7	0-2	90-100	70-90	65-90	50-85	25-42	6-18
	23-34	Loam, silt loam, channery loam.	ML, SM, GM	A-4	2-35	55-90	45-80	40-75	35-60	20-35	NP-8
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MoA, MoB, MoC------ Monongahela	0-8	Silt loam-------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	8-23	Loam, silt loam, clay loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	23-48	Loam, silt loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	75-100	70-95	45-95	20-40	1-15
	48-60	Stratified sandy clay loam, clay loam.	ML, CL, SM, SC	A-4, A-6	5-20	75-100	60-100	60-95	40-95	20-40	1-15
Ph---------- Philo	0-60	Silt loam, loam.	ML, SM	A-4	0-5	85-100	65-100	60-90	45-80	20-40	1-10
Pn*. Pits											
Po---------- Pope	0-22	Silt loam-------	ML, CL, SM, CL-ML	A-4	0-5	75-100	65-100	55-95	40-90	<30	NP-10
	22-41	Fine sandy loam, sandy loam, gravelly fine sandy loam.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-5	55-100	50-100	35-95	15-70	<30	NP-7
	41-60	Fine sandy loam, sandy loam, gravelly fine sandy loam.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pu---------- Purdy	0-8	Silt loam-------	ML, CL	A-4, A-6, A-7	0	95-100	90-100	90-100	90-100	25-50	2-25
	8-36	Silty clay, clay, clay loam.	ML, CL, CH	A-4, A-6, A-7	0	95-100	90-100	85-100	75-85	25-75	2-45
	36-60	Silty clay, clay loam, clay.	ML, CL, CH	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	25-75	2-45
RaA, RaB, RaC------ Ravenna	0-8	Silt loam-------	ML, CL-ML	A-4	0-1	90-100	80-100	70-95	60-90	25-35	4-10
	8-20	Loam, silt loam	CL-ML, CL, ML	A-4, A-6	0-1	85-100	80-95	70-90	60-90	25-40	6-15
	20-60	Loam, silt loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	85-95	75-90	65-85	50-80	20-35	3-15
	60-62	Loam, silt loam, sandy loam.	ML, CL, SM, SC	A-4, A-6	0-5	80-95	70-90	60-80	45-60	20-32	3-12
ReB---------- Rexford	0-18	Silt loam-------	ML, CL, SM, SC	A-4, A-2	0-5	95-100	80-100	75-95	30-90	15-35	NP-10
	18-44	Gravelly sandy loam, loam, silt loam.	ML, SM, GM	A-2, A-4	0-10	60-95	50-90	40-85	25-70	15-35	NP-5
	44-60	Stratified sand to gravel.	GP-GM, SP-SM, GW, SP	A-1	0-20	40-55	30-50	10-40	4-12	<10	NP
Sn---------- Sloan	0-18	Silt loam-------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	18-43	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	43-60	Stratified loam to silty clay loam.	ML, CL	A-4, A-6	0	85-100	70-100	65-95	60-90	25-40	3-15
TsB, TsC---------- Tilsit	0-8	Silt loam-------	ML, CL, CL-ML	A-4	0	90-100	85-100	75-100	60-100	20-35	NP-10
	8-21	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	21-48	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	48-60	Silt loam, silty clay loam, silty clay.	CL, CH, CL-ML	A-4, A-6, A-7	0-30	70-100	65-85	60-85	55-80	25-60	5-35
TyA, TyB---------- Tyler	0-13	Silt loam-------	ML	A-4	0	100	100	95-100	80-95	30-40	4-10
	13-24	Silty clay loam, silt loam.	CL	A-6, A-7, A-4, A-5	0	100	100	95-100	85-100	25-45	8-20
	24-48	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7, A-4, A-5	0	100	100	80-100	70-95	25-45	8-20
	48-60	Stratified loam to silty clay loam.	CL, ML, CL-ML	A-6, A-4, A-7, A-5	0	95-100	90-100	75-100	60-90	20-45	4-18
UAB*, UAD*, UAE*. Udorthents											
Ub*: Urban land.											
Arents.											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
UcB*, UcD*: Urban land.											
Canfield----------	0-9	Silt loam-------	ML	A-4	0-2	90-100	75-100	70-100	55-90	25-35	2-10
	9-21	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SC	A-4, A-6	0-3	80-100	70-95	60-90	45-85	20-38	3-16
	21-50	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SM	A-4, A-6	0-3	80-95	70-90	60-85	45-80	20-35	3-14
	50-60	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, SM	A-4, A-6	0-5	80-95	70-90	60-85	45-80	20-35	2-12
UfB*, UfD*: Urban land.											
Conotton----------	0-11	Gravelly loam---	SM, ML, GM	A-2, A-4	0	65-90	55-85	50-70	25-55	<30	NP-6
	11-56	Very gravelly sandy loam, very gravelly loam, gravelly sandy loam.	GM, SM, GM-GC, SW-SM	A-1, A-2	0-5	30-70	20-65	20-50	10-30	<25	NP-6
	56-60	Sand and gravel	GW, GM, SM, SW	A-1	0-10	25-65	15-60	10-40	0-20	---	NP
UgB*, UgD*: Urban land.											
Gilpin----------	0-27	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
UwB*, UwD*: Urban land.											
Wharton----------	0-10	Silt loam-------	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	70-90	---	---
	10-46	Clay loam, shaly silty clay loam, shaly silt loam.	ML, CL	A-7, A-6	0-10	75-100	70-100	65-95	60-90	35-45	10-30
	46-60	Silt loam, shaly clay, very shaly silt loam.	ML, GM, SM	A-4, A-6, A-7, A-2	0-50	45-100	30-100	25-95	25-90	30-45	5-15
VgD*: Vandergrift-------	0-8	Silty clay loam	CL	A-4, A-6	0	95-100	90-100	85-100	80-90	---	---
	8-58	Silty clay loam, silty clay, clay.	CL, CH	A-7, A-4, A-6, A-5	0-5	90-100	85-100	70-95	65-90	25-55	9-30
	58-71	Silty clay loam, shaly clay loam, very shaly clay loam.	CH, CL, GC, SC	A-7, A-6, A-4, A-2	0-35	35-100	25-100	25-95	20-90	25-55	9-30

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
VgD*:											
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WeF*:											
Weikert	0-7	Shaly silt loam	GM, ML	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	7-18	Shaly loam, very shaly silt loam, cherty loam.	GM, GP	A-1, A-2	0-20	15-60	10-45	5-35	5-35	28-36	3-9
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
WhA, WhB, WhC	0-10	Silt loam	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	70-90	---	---
Wharton	10-40	Clay loam, shaly silty clay loam, shaly silt loam.	ML, CL	A-7, A-6	0-10	75-100	70-100	65-95	60-90	35-45	10-30
	40-60	Silt loam, shaly clay, very shaly silt loam.	ML, GM, SM	A-4, A-6, A-7, A-2	0-50	45-100	30-100	25-95	25-90	30-45	5-15
WnD*:											
Wharton	0-10	Silt loam	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	70-90	---	---
	10-40	Clay loam, shaly silty clay loam, shaly silt loam.	ML, CL	A-7, A-6	0-10	75-100	70-100	65-95	60-90	35-45	10-30
	40-60	Silt loam, shaly clay, very shaly silt loam.	ML, GM, SM	A-4, A-6, A-7, A-2	0-50	45-100	30-100	25-95	25-90	30-45	5-15
Gilpin	0-27	Silt loam	ML, CL, CL-ML	A-4, A-6	0-15	80-95	75-90	70-85	65-80	20-40	4-15
	27-30	Channery loam, shaly silt loam, silty clay loam.	GM, ML, CL, CL-ML	A-2, A-4, A-6	0-60	50-95	40-90	35-85	30-80	20-40	4-15
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WoB, WoC, WoD	0-12	Gravelly silt loam.	CL, CL-ML, ML, GM	A-6, A-4	0	75-95	65-80	60-80	45-70	25-40	4-14
Wooster	12-22	Loam, gravelly loam, silt loam.	ML, CL	A-4, A-6	0	85-100	75-100	65-95	50-90	30-40	6-15
	22-59	Loam, silt loam, gravelly loam.	CL, CL-ML	A-6, A-4	0-5	80-100	70-95	65-90	50-75	25-40	4-15
	59-72	Loam, gravelly loam, sandy loam.	ML, CL, SM, SC	A-4, A-6, A-2	0-5	75-100	60-95	45-85	30-70	20-35	3-12

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
AgB, AgC----------	0-7	15-27	1.2-1.4	0.6-2.0	0.12-0.22	3.6-5.5	Low----------	0.32	4	1-4
Allegheny	7-30	18-35	1.2-1.5	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
	30-60	10-35	1.2-1.4	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.28		
At----------	0-6	15-35	1.20-1.40	0.6-2.0	0.14-0.22	4.5-5.5	Low----------	0.28	5	2-5
Atkins	6-32	18-35	1.20-1.50	0.06-2.0	0.14-0.18	4.5-5.5	Low----------	0.28		
	32-60	10-35	1.20-1.50	0.2-6.0	0.08-0.18	4.5-5.5	Low----------	0.28		
BcB, BcC----------	0-8	10-25	1.20-1.40	0.2-2.0	0.08-0.16	4.5-6.0	Low----------	0.24	3-2	1-3
Braceville	8-20	10-25	1.20-1.50	0.2-2.0	0.08-0.12	4.5-6.0	Low----------	0.20		
	20-38	10-25	1.30-1.60	0.06-0.6	0.06-0.10	5.1-6.5	Low----------	0.28		
	38-60	5-25	1.20-1.40	2.0-20	0.03-0.06	5.1-6.5	Low----------	0.17		
BkA, BkB, BkC----	0-9	15-30	1.20-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.43	3-2	1-4
Brinkerton	9-29	15-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.32		
	29-50	15-35	1.30-1.50	0.06-0.2	0.08-0.12	4.5-6.0	Moderate-----	0.32		
	50-60	15-25	1.20-1.60	0.06-0.6	0.14-0.18	5.1-6.5	Low----------	0.20		
Ca----------	0-11	20-40	1.00-1.25	0.2-2.0	0.17-0.21	4.5-6.5	Moderate-----	0.49	3	3-11
Canadice	11-42	35-60	1.20-1.40	<0.06	0.12-0.17	5.1-7.8	Moderate-----	0.28		
	42-68	35-60	1.15-1.40	<0.06	0.13-0.17	6.6-8.4	Moderate-----	0.28		
CdB, CdC, CdD----	0-9	10-22	1.20-1.40	0.6-2.0	0.18-0.23	4.5-5.5	Low----------	0.37	4	1-3
Canfield	9-21	18-30	1.25-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Low----------	0.37		
	21-50	15-27	1.50-1.75	0.06-0.2	0.07-0.10	4.5-7.3	Low----------	0.37		
	50-60	15-25	1.40-1.70	0.06-0.2	0.07-0.10	5.1-7.3	Low----------	0.37		
CeA, CeB, CeC, CeD----------	0-8	15-35	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.43	3-2	2-4
Cavode	8-46	35-45	1.20-1.50	0.06-0.2	0.10-0.14	4.5-5.5	Moderate-----	0.28		
	46-50	35-45	1.20-1.50	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.28		
	50	---	---	---	---	---	----------	----		
Cg----------	0-12	10-20	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.32	5	1-4
Chagrin	12-43	10-20	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low----------	0.32		
	43-65	10-18	1.20-1.50	0.6-2.0	0.08-0.20	5.6-7.3	Low----------	0.32		
ChB, ChC----------	0-14	10-25	1.20-1.40	0.6-2.0	0.14-0.18	4.5-6.0	Low----------	0.32	4	1-4
Chili	14-38	10-25	1.20-1.50	2.0-6.0	0.10-0.16	4.5-6.0	Low----------	0.32		
	38-52	10-25	1.20-1.50	2.0-6.0	0.08-0.12	5.1-6.5	Low----------	0.17		
	52-60	5-20	1.35-1.65	6.0-20	0.04-0.08	5.1-7.3	Low----------	0.10		
CmB, CmC, CmD----	0-8	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28	3	1-4
Clymer	8-38	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.17		
	38-70	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low----------	0.17		
	70	---	---	---	---	---	----------	----		
CoB, CoC, CoD, CoF----------	0-11	5-15	1.20-1.40	2.0-6.0	0.10-0.14	4.5-5.5	Low----------	0.24	3	1-3
Conotton	11-56	5-15	1.25-1.50	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.24		
	56-60	5-15	1.35-1.65	6.0-20	0.04-0.08	5.6-7.8	Low----------	0.10		
CuB, CuC, CuD----	0-7	15-27	1.2-1.4	0.6-2.0	0.14-0.20	5.1-6.0	Low----------	0.32	3	1-4
Culleoka	7-27	18-35	1.2-1.5	0.6-2.0	0.12-0.20	5.1-6.0	Low----------	0.28		
	27-32	18-35	1.2-1.5	0.6-2.0	0.05-0.14	5.1-6.5	Low----------	0.17		
	32	---	---	---	---	---	----------	----		
Du*. Dumps										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
ErB, ErC, ErD----	0-8	16-20	1.20-1.40	0.6-2.0	0.14-0.20	4.5-5.5	Low----------	0.43	3	2-4
Ernest	8-24	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	24-44	18-30	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.28		
	44-60	20-35	1.20-1.50	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.28		
EsD----------	0-8	15-20	1.20-1.40	0.6-2.0	0.12-0.18	4.5-5.5	Low----------	0.32	3	2-4
Ernest	8-24	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	24-44	18-30	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.28		
	44-60	20-35	1.20-1.50	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.28		
FnA, FnB---------	0-8	15-26	1.20-1.40	0.6-2.0	0.18-0.20	4.5-6.0	Low----------	0.37	3	2-4
Frenchtown	8-18	22-35	1.25-1.60	0.6-2.0	0.16-0.18	4.5-6.0	Low----------	0.37		
	18-44	16-35	1.50-1.75	<0.2	0.08-0.10	5.1-6.0	Low----------	0.37		
	44-60	15-30	1.35-1.65	0.06-0.6	0.10-0.12	5.6-8.4	Low----------	0.37		
GnB, GnC, GnD----	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
Gilpin	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
GpB*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
Upshur----------	0-5	27-35	1.20-1.50	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-----	0.43	3	.5-4
	5-40	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-7.3	High---------	0.28		
	40-60	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-7.3	Moderate-----	0.28		
GpC*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
Upshur----------	0-5	27-35	1.20-1.50	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-----	0.43	3	.5-4
	5-40	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-7.3	High---------	0.28		
	40-60	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-7.3	Moderate-----	0.28		
GpD*, GpF*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
Upshur----------	0-5	27-35	1.20-1.50	0.2-0.6	0.12-0.16	4.5-6.5	Moderate-----	0.43	3	.5-4
	5-40	40-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-7.3	High---------	0.28		
	40-60	27-45	1.30-1.60	0.06-0.2	0.08-0.12	5.1-7.3	Moderate-----	0.28		
GsB*, GsC*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
Weikert---------	0-7	15-27	1.20-1.40	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.28	2	1-3
	7-18	15-27	1.20-1.40	2.0-6.0	0.04-0.12	4.5-6.0	Low----------	0.28		
	18	---	---	---	---	---	----------	----		
GsD*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
Weikert---------	0-7	15-27	1.20-1.40	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.28	2	1-3
	7-18	15-27	1.20-1.40	2.0-6.0	0.04-0.12	4.5-6.0	Low----------	0.28		
	18	---	---	---	---	---	----------	----		
GsF*:										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
GsF*:										
Weikert---------	0-7	15-27	1.20-1.40	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.28	2	1-3
	7-18	15-27	1.20-1.40	2.0-6.0	0.04-0.12	4.5-6.0	Low----------	0.28		
	18	---	---	---	---	---	----------	----		
GtB, GtC---------	0-7	13-26	1.20-1.40	0.6-2.0	0.19-0.24	4.5-6.0	Low----------	0.43	3	2-4
Guernsey	7-26	22-38	1.30-1.50	0.2-2.0	0.15-0.21	4.5-6.0	Low----------	0.43		
	26-44	35-60	1.40-1.70	0.06-0.6	0.10-0.15	5.1-7.8	Moderate-----	0.32		
	44-60	40-60	1.50-1.80	0.06-0.6	0.06-0.10	5.1-7.8	Moderate-----	0.32		
GvB*, GvC*, GvD*:										
Guernsey--------	0-7	13-26	1.20-1.40	0.6-2.0	0.19-0.24	4.5-6.0	Low----------	0.43	3	2-4
	7-26	22-38	1.30-1.50	0.2-2.0	0.10-0.21	4.5-6.0	Low----------	0.43		
	26-44	35-60	1.40-1.70	0.06-0.6	0.10-0.15	5.1-7.8	Moderate-----	0.32		
	44-60	40-60	1.50-1.80	0.06-0.6	0.06-0.10	5.1-7.8	Moderate-----	0.32		
Vandergrift-----	0-8	15-27	1.30-1.40	0.6-2.0	0.16-0.20	4.5-6.0	Low----------	0.28	3-2	2-4
	8-58	27-50	1.50-1.80	0.06-0.2	0.10-0.16	4.5-7.3	High---------	0.28		
	58-71	27-40	1.40-1.60	0.06-0.6	0.04-0.14	5.1-7.8	High---------	0.28		
HaB, HaC, HaD----	0-7	7-18	1.20-1.40	2.0-6.0	0.10-0.14	3.6-5.5	Low----------	0.24	3-2	2-4
Hazleton	7-32	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.17		
	32-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low----------	0.17		
	55	---	---	---	---	---	----------	----		
Ho----------	0-10	5-20	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.28	5	2-4
Holly	10-63	5-30	1.20-1.50	0.2-2.0	0.17-0.21	5.6-7.3	Low----------	0.28		
Lb----------	0-10	15-27	1.20-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.37	5	1-4
Lobdell	10-39	18-35	1.20-1.60	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.37		
	39-60	15-35	1.10-1.60	0.6-6.0	0.12-0.18	5.6-7.3	Low----------	0.37		
LoB, LoC, LoD,										
LoF----------	0-6	13-24	1.20-1.40	0.6-2.0	0.16-0.20	4.5-6.0	Low----------	0.32	3	1-4
Loudonville	6-23	20-34	1.25-1.60	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.32		
	23-34	12-27	1.20-1.50	0.6-2.0	0.08-0.14	4.5-6.0	Low----------	0.32		
	34	---	---	---	---	---	----------	----		
MoA, MoB, MoC----	0-8	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low----------	0.43	3	2-4
Monongahela	8-23	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low----------	0.43		
	23-48	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
	48-60	10-35	1.20-1.40	0.2-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
Ph----------	0-60	10-18	1.20-1.40	0.2-2.0	0.12-0.20	4.5-6.0	Low----------	0.28	5	2-4
Philo										
Pn*.										
Pits										
Po----------	0-22	5-15	1.20-1.40	0.6-2.0	0.10-0.20	3.6-5.5	Low----------	0.28	5	1-4
Pope	22-41	5-18	1.20-1.50	0.6-6.0	0.07-0.15	3.6-5.5	Low----------	0.28		
	41-60	5-20	1.20-1.50	0.6-6.0	0.06-0.15	3.6-5.5	Low----------	0.28		
Pu----------	0-8	18-35	1.30-1.50	0.2-0.6	0.18-0.24	3.6-5.5	Moderate-----	0.43	3	2-4
Purdy	8-36	25-90	1.30-1.60	<0.2	0.12-0.18	3.6-5.5	Moderate-----	0.28		
	36-60	35-30	1.30-1.60	<0.2	0.10-0.16	3.6-5.5	Moderate-----	0.28		
RaA, RaB, RaC----	0-8	12-24	1.20-1.45	0.6-2.0	0.17-0.21	3.6-6.0	Low----------	0.37	3	1-4
Ravenna	8-20	18-27	1.25-1.65	0.6-2.0	0.14-0.18	3.6-6.0	Low----------	0.37		
	20-60	16-27	1.50-1.85	0.06-0.2	0.06-0.10	4.5-6.5	Low----------	0.37		
	60-62	15-27	1.40-1.80	0.06-0.6	0.06-0.10	6.1-7.8	Low----------	0.37		
ReB----------	0-18	10-20	1.20-1.40	0.6-2.0	0.14-0.18	4.5-6.0	Low----------	0.24	3-2	1-3
Rexford	18-44	10-18	1.20-1.50	0.06-0.2	0.04-0.08	5.1-6.5	Low----------	0.28		
	44-60	5-15	1.20-1.40	>2.0	0.03-0.06	5.1-6.5	Low----------	0.17		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
Sn----------	0-18	15-32	1.20-1.40	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	3-5
Sloan	18-43	18-32	1.20-1.50	0.2-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.37		
	43-60	10-30	1.20-1.40	0.2-2.0	0.13-0.18	6.6-8.4	Low----------	0.37		
TsB, TsC----------	0-8	10-25	1.20-1.40	0.6-2.0	0.16-0.22	4.5-5.5	Low----------	0.43	3	1-3
Tilsit	8-21	18-35	1.20-1.50	0.6-2.0	0.16-0.22	4.5-5.5	Low----------	0.43		
	21-48	18-35	1.30-1.60	0.06-0.2	0.08-0.12	4.5-5.5	Low----------	0.43		
	48-60	10-50	1.25-1.40	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
TyA, TyB----------	0-13	14-26	1.20-1.40	0.6-2.0	0.18-0.22	3.6-6.5	Low----------	0.43	3	1-4
Tyler	13-24	20-33	1.25-1.60	0.2-0.6	0.16-0.20	3.6-5.5	Moderate-----	0.43		
	24-48	18-33	1.50-1.85	<0.2	0.04-0.12	3.6-5.5	Low----------	0.43		
	48-60	12-30	1.30-1.70	0.2-0.6	0.04-0.12	4.5-6.0	Low----------	0.43		
UAB*, UAD*, UAE*.										
Udorthents										
Ub*:										
Urban land.										
Arents.										
UcB*, UcD*:										
Urban land.										
Canfield--------	0-9	10-22	1.20-1.40	0.6-2.0	0.18-0.23	4.5-5.5	Low----------	0.37	4	1-3
	9-21	18-30	1.25-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Low----------	0.37		
	21-50	15-27	1.50-1.75	0.06-0.2	0.07-0.10	4.5-7.3	Low----------	0.37		
	50-60	15-25	1.40-1.70	0.06-0.2	0.07-0.10	5.1-7.3	Low----------	0.37		
UfB*, UfD*:										
Urban land.										
Conotton--------	0-11	5-15	1.20-1.40	2.0-6.0	0.10-0.14	4.5-5.5	Low----------	0.24	3	1-3
	11-56	5-15	1.25-1.50	6.0-20	0.06-0.10	4.5-7.3	Low----------	0.24		
	56-60	5-15	1.35-1.65	6.0-20	0.04-0.08	5.6-7.8	Low----------	0.10		
UgB*, UgD*:										
Urban land.										
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
UwB*, UwD*:										
Urban land.										
Wharton---------	0-10	15-25	1.10-1.30	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.32	3	1-4
	10-46	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	46-60	20-45	1.20-1.60	0.06-0.6	0.08-0.12	3.6-5.0	Moderate-----	0.17		
VgD*:										
Vandergrift-----	0-8	15-27	1.30-1.40	0.6-2.0	0.16-0.20	4.5-7.3	Low----------	0.28	3-2	2-4
	8-58	27-50	1.50-1.80	0.06-0.2	0.10-0.16	4.5-7.3	High---------	0.28		
	58-71	27-40	1.40-1.60	0.06-0.6	0.04-0.14	5.1-7.8	High---------	0.28		
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
WeF*:										
Weikert---------	0-7	15-27	1.20-1.40	2.0-6.0	0.08-0.18	4.5-6.0	Low----------	0.28	2	1-3
	7-18	15-27	1.20-1.40	2.0-6.0	0.04-0.12	4.5-6.0	Low----------	0.28		
	18	---	---	---	---	---	----------	----		
Rock outcrop.										

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay <2mm	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm3	In/hr	In/in	pH				Pct
WhA, WhB, WhC---- Wharton	0-10	15-25	1.10-1.30	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.32	3	1-4
	10-40	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	40-60	20-45	1.20-1.60	0.06-0.6	0.08-0.12	3.6-5.8	Moderate-----	0.17		
WnD*:										
Wharton---------	0-10	15-25	1.10-1.30	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.32	3	1-4
	10-40	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.5-5.5	Moderate-----	0.28		
	40-60	20-45	1.20-1.60	0.06-0.6	0.08-0.12	3.6-5.0	Moderate-----	0.17		
Gilpin----------	0-27	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low----------	0.32	3	1-4
	27-30	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.28		
	30	---	---	---	---	---	----------	----		
WoB, WoC, WoD---- Wooster	0-12	11-19	1.10-1.30	0.6-2.0	0.15-0.20	4.5-6.0	Low----------	0.28	4	1-4
	12-22	18-28	1.20-1.55	0.6-2.0	0.14-0.18	4.5-6.0	Low----------	0.37		
	22-59	18-28	1.45-1.75	0.2-0.6	0.08-0.12	4.5-6.0	Low----------	0.37		
	59-72	12-22	1.35-1.65	0.2-2.0	0.08-0.14	4.5-7.3	Low----------	0.37		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare, "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AgB, AgC---------- Allegheny	B	None to rare	Very brief	Nov-May	>6.0	---	---	>48	Hard	Moderate	Low------	High.
At---------- Atkins	D	Frequent	Very brief	Sep-Jul	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Moderate.
BcB, BcC---------- Braceville	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	Moderate	Moderate.
BkA, BkB, BkC----- Brinkerton	D	None--------	---	---	0.0-0.5	Perched	Sep-Jun	>60	---	High-----	High-----	High.
Ca---------- Canadice	D	None--------	---	---	0-1.0	Apparent	Dec-Jun	>60	---	Moderate	High-----	Low.
CdB, CdC, CdD----- Canfield	C	None--------	---	---	1.5-3.0	Perched	Nov-May	>60	---	High-----	Moderate	Moderate.
CeA, CeB, CeC, CeD---------- Cavode	C	None--------	---	---	0.5-1.5	Perched	Oct-May	40-72	Rippable	High-----	High-----	High.
Cg---------- Cnagrin	B	Occasional	Brief-----	Nov-May	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low------	Moderate.
ChB, ChC---------- Chili	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
CmB, CmC, CmD----- Clymer	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
CoB, CoC, CoD, CoF---------- Conotton	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
CuB, CuC, CuD----- Culleoka	B	None--------	---	---	>6.0	---	---	20-40	Rippable	Low------	Low------	Moderate.
Du*. Dumps												
ErB, ErC, ErD, EsD---------- Ernest	C	None--------	---	---	1.5-2.5	Perched	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
FnA, FnB---------- Frenchtown	D	None--------	---	---	0-1.0	Perched	Oct-May	>60	---	High-----	High-----	High.
GnB, GnC, GnD----- Gilpin	C	None--------	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low------	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
GpB*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Upshur	C	None	---	---	>6.0	---	---	>40	Rippable	Moderate	High	Moderate.
GpC*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Upshur	C	None	---	---	>6.0	---	---	>40	Rippable	Moderate	High	Moderate.
GpD*, GpF*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Upsnur	C	None	---	---	>6.0	---	---	>40	Rippable	Moderate	High	Moderate.
GsB*, GsC*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate	Moderate	Moderate.
GsD*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate	Moderate	Moderate.
GsF*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate	Moderate	Moderate.
GtB, GtC Guernsey	C	None	---	---	2.0-3.5	Perched	Jan-Apr	>40	Rippable	Moderate	High	Moderate.
GvB*, GvC*, GvD*:												
Guernsey	C	None	---	---	2.0-3.0	Perched	Jan-Apr	>40	Rippable	Moderate	High	Moderate.
Vandergrift	C	None	---	---	0.5-3.0	Perched	Nov-Mar	40-80	Rippable	High	High	Moderate.
HaB, HaC, HaD Hazleton	B	None	---	---	>6.0	---	---	>40	Rippable	Moderate	Low	High.
Ho Holly	B/D	Frequent	Brief	Nov-May	0-0.5	Apparent	Dec-May	>60	---	High	High	Moderate.
Lb Lobdell	B	Common	Brief	Jan-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Low	Moderate.
LoB, LoC, LoD, LoF Loudonville	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate	High.
MoA, MoB, MoC Monongahela	C	None	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	High	High	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ph---------- Philo	B	Common------	Very brief	Nov-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	Moderate	Low------	High.
Pn*. Pits												
Po---------- Pope	B	Common------	Very brief	Nov-Apr	>6.0	---	---	>60	---	Moderate	Low------	High.
Pu---------- Purdy	D	None--------	---	---	0-0.5	Apparent	Nov-Jun	>60	---	High-----	High-----	High.
RaA, RaB, RaC----- Ravenna	C	None--------	---	---	0.5-1.5	Perched	Nov-Jun	>60	---	High-----	High-----	High.
ReB---------- Rexford	C	Rare--------	---	---	0.0-1.5	Perched	Oct-May	>60	---	High-----	High-----	High.
Sn---------- Sloan	B/D	Frequent----	Very brief	Nov-Jun	0-0.5	Apparent	Nov-Jun	>60	---	High-----	High-----	Low.
TsB, TsC---------- Tilsit	C	None--------	---	---	1.5-2.5	Perched	Jan-Apr	>40	Hard	Moderate	High-----	High.
TyA, TyB---------- Tyler	D	None--------	---	---	0.5-1.5	Perched	Nov-May	>60	---	High-----	High-----	High.
UAB*, UAD*, UAE*. Udorthents												
Ub*: Urban land.												
Arents.												
UcB*, UcD*: Urban land.												
Canfield----------	C	None--------	---	---	1.5-3.0	Perched	Nov-May	>60	---	High-----	Moderate	Moderate.
UfB*, UfD*: Urban land.												
Conotton----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
UgB*, UgD*: Urban land.												
Gilpin----------	C	None--------	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low------	High.
UwB*, UwD*: Urban land.												
Wharton----------	C	None--------	---	---	1.5-3.0	Apparent	Nov-Mar	>40	Rippable	High-----	High-----	High.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
VgD*:												
Vandergrift	C	None	---	---	0.5-3.0	Perched	Nov-Mar	40-80	Rippable	High	High	Moderate.
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
WeF*:												
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Rippable	Moderate	Moderate	Moderate.
Rock outcrop.												
WhA, WhB, WhC---- Wharton	C	None	---	---	1.5-3.0	Apparent	Nov-Mar	>40	Rippable	High	High	High.
WnD*:												
Wharton	C	None	---	---	1.5-3.0	Apparent	Nov-Mar	>40	Rippable	High	High	High.
Gilpin	C	None	---	---	>6.0	---	---	20-40	Rippable	Moderate	Low	High.
WoB, WoC, WoD---- Wooster	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Atkins	Fine-loamy, mixed, acid, mesic Typic Fluvaquents
Braceville	Coarse-loamy, mixed, mesic Typic Fragiochrepts
Brinkerton	Fine-silty, mixed, mesic Typic Fragiaqualfs
Canadice	Fine, illitic, mesic Typic Ochraqualfs
Canfield	Fine-loamy, mixed, mesic Aquic Fragiudalfs
Cavode	Clayey, mixed, mesic Aeric Ochraquults
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Chili	Fine-loamy, mixed, mesic Typic Hapludalfs
Clymer	Fine-loamy, mixed, mesic Typic Hapludults
Conotton	Loamy-skeletal, mixed, mesic Typic Hapludalfs
Culleoka	Fine-loamy, mixed, mesic Ultic Hapludalfs
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults
Frenchtown	Fine-loamy, mixed, mesic Typic Fragiaqualfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Guernsey	Fine, mixed, mesic Aquic Hapludalfs
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Holly	Fine-loamy, mixed, nonacid, mesic Typic Fluvaquents
Lobdell	Fine-loamy, mixed, mesic Fluvaquentic Eutrochrepts
Loudonville	Fine-loamy, mixed, mesic Ultic Hapludalfs
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Purdy	Clayey, mixed, mesic Typic Ochraquults
Ravenna	Fine-loamy, mixed, mesic Aeric Fragiaqualfs
Rexford	Coarse-loamy, mixed, mesic Aeric Fragiaquepts
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Tyler	Fine-silty, mixed, mesic Aeric Fragiaquults
Upshur	Fine, mixed, mesic Typic Hapludalfs
Vandergrift	Fine, mixed, mesic Aquic Hapludalfs
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wharton	Fine-loamy, mixed, mesic Aquic Hapludults
Wooster	Fine-loamy, mixed, mesic Typic Fragiudalfs

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