United States Department of Agriculture

Natural Resources Conservation Service

and

Forest Service

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

Soil Survey of Vinton County, Ohio

How To Use This Soil Survey

General Soil Map

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

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

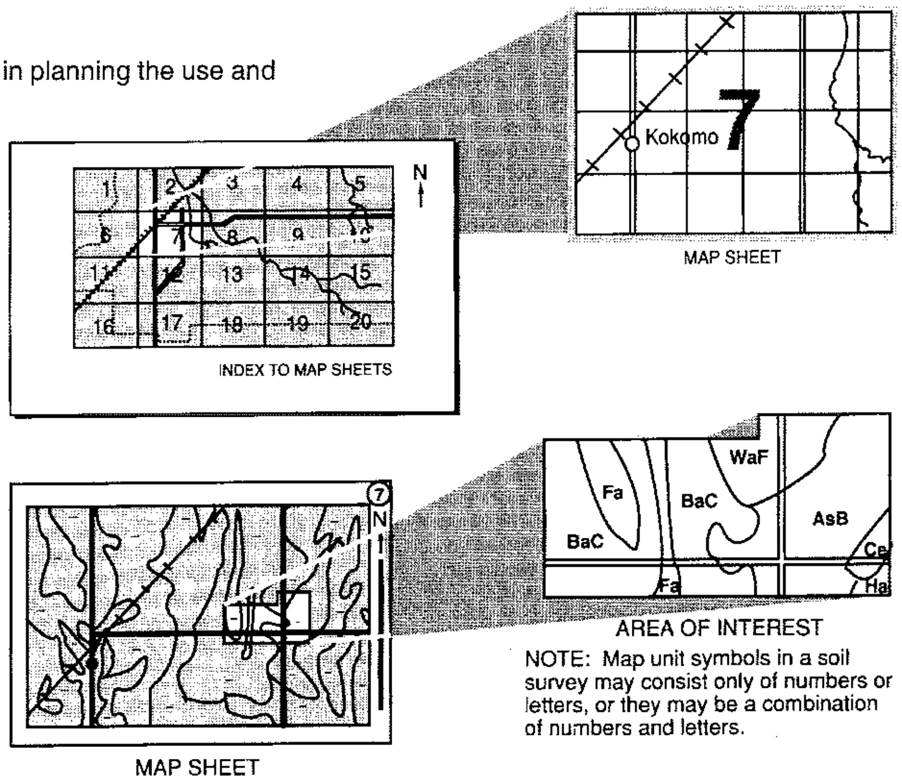
Detailed Soil Maps

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

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

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

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



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1998. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the U.S. Department of Agriculture, Natural Resources Conservation Service and Forest Service; the Ohio Department of Natural Resources, Division of Soil and Water Conservation; the Ohio Agricultural Research and Development Center; the Ohio State University Extension; and the Vinton County Commissioners. Financial support was provided by the Vinton County Commissioners, Vinton Soil and Water Conservation District, and numerous businesses in the county. The survey is part of the technical assistance furnished to the Vinton Soil and Water Conservation District.

Cover: This gently sloping Omulga soil is a good building site for homes and farm buildings. It is well suited to most crops grown in Vinton County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is http://www.nrcs.usda.gov.

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Issued 2004

Foreword

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

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

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

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

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

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State Conservationist
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Soil Survey of Vinton County, Ohio

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Fieldwork by D.D. Lemaster, S.E. Antes, G.M. Gilmore, P.C. Jenny, D.N. McClure, and J.R. Steiger, Natural Resources Conservation Service

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

Vinton County is in the south-central part of Ohio (fig. 1). It has a total area of 265,548 acres, or about 415 square miles. In 1990, the population of the county was 11,098 and that of the village of McArthur, the county seat, was 1,541 (U.S. Department of Commerce 1991). The county is bounded on the north by Hocking County, on the west by Ross County, on the south by Jackson and Gallia Counties, and on the east by Athens and Meigs Counties.

Vinton County is in the central hardwood forest region. About 77 percent of the county is forested (USDA 1997). Oaks and hickories are the dominant tree species. White ash, black cherry, yellow-poplar, sugar maple, and white pine also are common. Sassafras, persimmon, and red maple have reestablished naturally in many abandoned farm fields.

The major industries are strip mining for coal in the central part of the county and logging for forestry products throughout the county. The manufacture of explosives or limestone products and tourism are other important industries in the county.

About 14 percent of the county is used as pasture or hayland (USDA 1997). Red clover, alfalfa, bluegrass, orchardgrass, tall fescue, and timothy are the most commonly grown forage plants. Only about 4 percent of the county is used for cultivated crops. The major crops are corn, soybeans, and winter wheat.

This soil survey updates the survey of Vinton County published in 1938 (Paschall and others 1938). It provides additional information and has larger maps, which show the soils in greater detail.

Figure 1.—Location of Vinton County in Ohio.

General Nature of the County

This section provides general information about the county. It describes climate, history, geology, natural resources, and industry and transportation facilities.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Carpenter in Meigs County, Ohio, in the period 1965 to 1990. 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 32 degrees F and the average daily minimum temperature is 22 degrees. The lowest temperature on record, which occurred on January 17, 1977, is -24 degrees. In summer, the average temperature is 71 degrees and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 26, 1964, is 102 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 about 40.3 inches. Of this, about 23.8 inches, or 59 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 3.39 inches on September 21, 1966. Thunderstorms occur on about 41 days each year, and most occur in July.

The average seasonal snowfall is about 21 inches. The greatest snow depth at any one time during the period of record was 20 inches. On the average, 8 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 58 percent. Humidity is higher at night, and the average at dawn is about 83 percent. The sun shines 60 percent of the time possible in summer and 36 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 8 miles per hour, in March.

History

The earliest inhabitants of Vinton County were the Mound Builders, a tribe of prehistoric Indians who built earthen or stone mounds in areas throughout the county. Several of these mounds remain to the present day. The area was later inhabited by the Delaware, Shawnee, and Wyandot Indians, who all claimed the land as part of their territory.

The early European settlers were chiefly of German or Anglo-Saxon origin. These people generally came from states to the east, mostly Pennsylvania, Virginia, and the Carolinas. Several groups immigrated to the area directly from Europe. The first settlers in the village of Zaleski were railroad workers, who immigrated to this country from Ireland or Germany. The village of Zaleski served as a railroad and mining center (Biggs 1950).

Farming became increasingly important in the area as markets for farm produce became available along the Ohio and Mississippi Rivers. These produce markets became more accessible after the first railroad line was completed in 1857 and the second line in 1880.

Iron ore was discovered in the county, and eventually, six iron ore furnaces were constructed. Oreton, Orland, and Creola developed as communities from which iron ore was shipped (Hixon and Quenan 1996).

Vinton County was formed by the Ohio Legislature in 1850 from parts of Ross, Gallia, Jackson, and Athens Counties. It was named after Samuel Vinton, a nationally known Whig congressional leader. McArthur, the county seat, was established in 1815 and named for Duncan McArthur, an army general in the War of 1812.

Geology

The bedrock of Vinton County consists of sedimentary rock from the Mississippian and Pennsylvanian Systems. The Mississippian System, which formed 325 million to 345 million years ago, is comprised of the Cuyahoga and Logan members. The Cuyahoga member consists of Cuyahoga shale overlain by Blackhand sandstone. The Logan member consists of sandstone, shale, and conglomerate. It overlies the Cuyahoga member. The Mississippian System outcrops roughly west of a line that runs from the village of Hue to Richland. East of this line, the Logan Formation is overlain by the Pottsville, Allegheny, and Conemaugh Formations of the Pennsylvanian System. These formations, which are about 280 million to 325 million years old, consist of sandstone, shale, and coal.

The bedrock in Vinton County dips gently to the southeast, exposing the older Mississippian rock in the western part of the county and the younger Pennsylvanian rock in the eastern part. The dominant rock in the county is the Pennsylvanian, and the least extensive of the Pennsylvanian is the Conemaugh, which is exposed in small areas of Brown, Madison, Knox, Vinton, and Wilkesville Townships.

Vinton County lies wholly in the unglaciated section of Ohio; however, the glaciers that entered Ohio from the north brought about major changes to the geology, soils, and drainage patterns of the county. Before the glaciation, Ohio was drained by the Teays River and its tributaries, which flowed north through Ohio. As the glaciers moved into Ohio, they blocked the Teays River, forming a giant lake that covered large areas of southeastern Ohio. As the water level in the lake rose, the water overtopped the confining hills and a new drainage system developed. This process occurred at least twice in Vinton County, the last time during the Illinoian Glaciation. The present drainage pattern in Vinton County developed after this glacial event, or about 100,000 to 300,000 years ago.

Remnants of these glacially produced lakes are numerous in the county. Though the lakes have long since drained, the old lakebeds are still evident throughout the county. Generally, the level to rolling, broad flats that are several tens of feet above the current flood plains are remnants of these old lakes. The villages of McArthur, Hamden, and Wilkesville are located in areas of these landforms. The landforms also are visible along State Route 50, from Ratcliffsburg to the Ross County line.

Vinton County is currently drained by two major stream systems. The Salt Creek and Middle Fork of Salt Creek and their tributaries drain the western third of the county into the Scioto River, and the Raccoon and Little Raccoon Creeks and their tributaries drain the rest of the county into the Ohio River.

Natural Resources

Woodland makes up a major portion of Vinton County. The timber is harvested commercially in scattered areas throughout the county. Lumber, veneer, pulpwood, cooperage, post, poles, Christmas trees, maple syrup, and firewood are the main woodland products.

Coal is an important natural resource in the county. It has been extensively mined in the past and is still economically important. The most important and extensively mined coalbed in Vinton County is Middle Kittaning (No. 6). The Quakertown (No. 2) and Sharon (No. 1) coalbeds were deep mined to a small extent, while the Brookville (No. 4), Clarion (No. 4a), Lower Kittaning (No. 5), Middle Kittaning (No. 6), and Freeport (No. 7) coalbeds have been surface mined. All of the mining in the central and eastern parts of the county has been in areas of the Pottsville and Allegheny Formations.

Gas and oil are other important natural resources in Vinton County. Since the early 1900s, gas and oil wells in the county have been drilled in Clinton Sandstone, which is of Silurian age. These wells are primarily drilled for oil but also for a combination of gas and oil. The average depth of these wells is 2,700 feet. Wells drilled into Berea Sandstone, which is of Mississippian age, are primarily for gas only. They range from 500 to 800 feet deep. The wells drilled in the Clinton Sandstone are far more productive than those drilled in Berea Sandstone.

The Middle Mercer and Flint Ridge Clays have been mined in the central part of Vinton County for use in the clay product industry. The clay was primarily used in the production of clay tile and bricks. Because the demand for clay products has decreased in recent years, clay mining has ceased in Vinton County and the brick and tile companies have closed down.

Industry and Transportation Facilities

The dominant industries in Vinton County are those related to coal mining, forestry, oil and natural gas, explosives, crushed limestone, and tourism.

Coal is mined in the eastern half of the county. It is generally strip mined. Explosives used in the coal-mining industry are manufactured locally. Local limestone quarries produce road aggregate and crushed limestone for agricultural use.

Tourism is becoming an increasingly important part of the local economy. Three large lakes, two State parks, and tens of thousands of acres of publicly owned forest land attract thousands of people each year. These areas provide opportunities for hunting, hiking, camping, fishing, riding, and other recreational activities.

The main transportation routes in the county are U.S. Highway 50 and the many State highways. In addition, an extensive county and township road system offers year-round access to all parts of the county.

The Vinton County Airport has a paved runway that is 3,850 feet long. It includes a control tower, fueling facilities, hangars, and parking ramps.

A railroad line runs through the county. The number of trains passing through the county has decreased to only a few per month.

How This Survey Was Made

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

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

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

Miscellaneous areas, such as dumps, are identified in areas where the naturally occurring soils have been altered by human activities. They are identified from aerial photo interpretation. Soil scientists make field observations to confirm photo interpretations and adjust boundary lines to show recent changes in the extent of the miscellaneous areas.

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

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

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

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

Survey Procedures

The general procedures followed in making this survey are described in the "National Soil Survey Handbook" (Soil Survey Staff 1996) of the Natural Resources Conservation Service and the "Soil Survey Manual" (Soil Survey Division Staff 1993). The soil maps made for conservation planning on individual farms prior to the start of the project soil survey were among the references used.

Before the actual fieldwork began, preliminary boundaries of slopes and landforms were plotted stereoscopically on aerial photographs that were taken in 1982 at a scale of 1:38,000 and then enlarged to a scale of 1:15,840. U.S. Geological Survey topographic maps, at a scale of 1:15,840, were used to relate land and image features.

A reconnaissance was made by vehicle before the soil scientists traversed the surface on foot, examining the soils. In some areas, such as those in the Rarden-Wharton complexes where the soil pattern is very intricate, traverses were as close as 100 yards (Miller, McCormack, and Talbot 1979). In other areas, such as those in Chavies silt loam where the soil pattern is relatively simple, traverses were about an eighth of a mile apart.

As they traversed the surface, the soil scientists divided the landscape into segments based on the landform and position of the soils on the landform. For example, a hillside would be separated from a swale, and a gently sloping ridgetop would be separated from a very steep side slope. In most areas soil examinations along the traverses were made at points 50 to 100 yards apart, depending upon the landscape and soil pattern (Miller, McCormack, and Talbot 1979).

Observations of such items as landforms, blown-down trees, vegetation, roadbanks, and animal burrows were made continuously without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. The soil material was examined with the aid of a hand auger, soil sampling tube, or spade to a depth of about 4 feet or to bedrock if the bedrock was at a depth of less than 4 feet. The pedons described as typical were observed and studied in pits that were dug with shovels and spades to a depth of 80 inches or more.

Soil mapping was recorded on mylars of film positives of the 1982 photobase maps. Surface drainage was mapped in the field. Cultural features were recorded from observations of the maps and the landscape.

At the beginning of the survey, sample blocks were selected to represent the major landscapes in the county. These areas were mapped at a rate of roughly half that used in the remainder of the county. Extensive notes were taken about the composition of map units in these preliminary study areas. These preliminary notes were modified as mapping progressed, and a final assessment of the composition of the individual map units was made. Soil transects were made to determine the composition of soil complexes.

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

General Soil Map Units

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

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

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

Moderately deep to very deep soils formed in residuum and colluvium; on hills

1. Shelocta-Brownsville-Germano

Sloping to very steep

Setting

Landform: Hills (fig. 2)
Slope range: 6 to 70 percent

Composition

Percent of survey area: 20 percent
Extent of components in the map unit:
Shelocta soils—35 percent
Brownsville soils—25 percent
Germano soils—10 percent
Minor soils—30 percent

Soil Properties and Qualities

Shelocta

Depth class: Deep and very deep
Drainage class: Well drained
Position on the landform: Backslopes
Parent material: Colluvium
Surface texture: Silt loam
Slope: Steep and very steep

Brownsville

Depth class: Deep and very deep
Drainage class: Well drained
Position on the landform: Backslopes
Parent material: Colluvium and residuum derived from sandstone and siltstone
Surface texture: Channery silt loam
Slope: Steep and very steep

Germano

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Backslopes and summits
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Sloping to steep

Minor Soils

- Ernest
- Gilpin
- Latham
- Pope
- Philo
- Wharton

Use and Management

Major uses: Woodland
Management concerns: Erosion
Management measures: Water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas

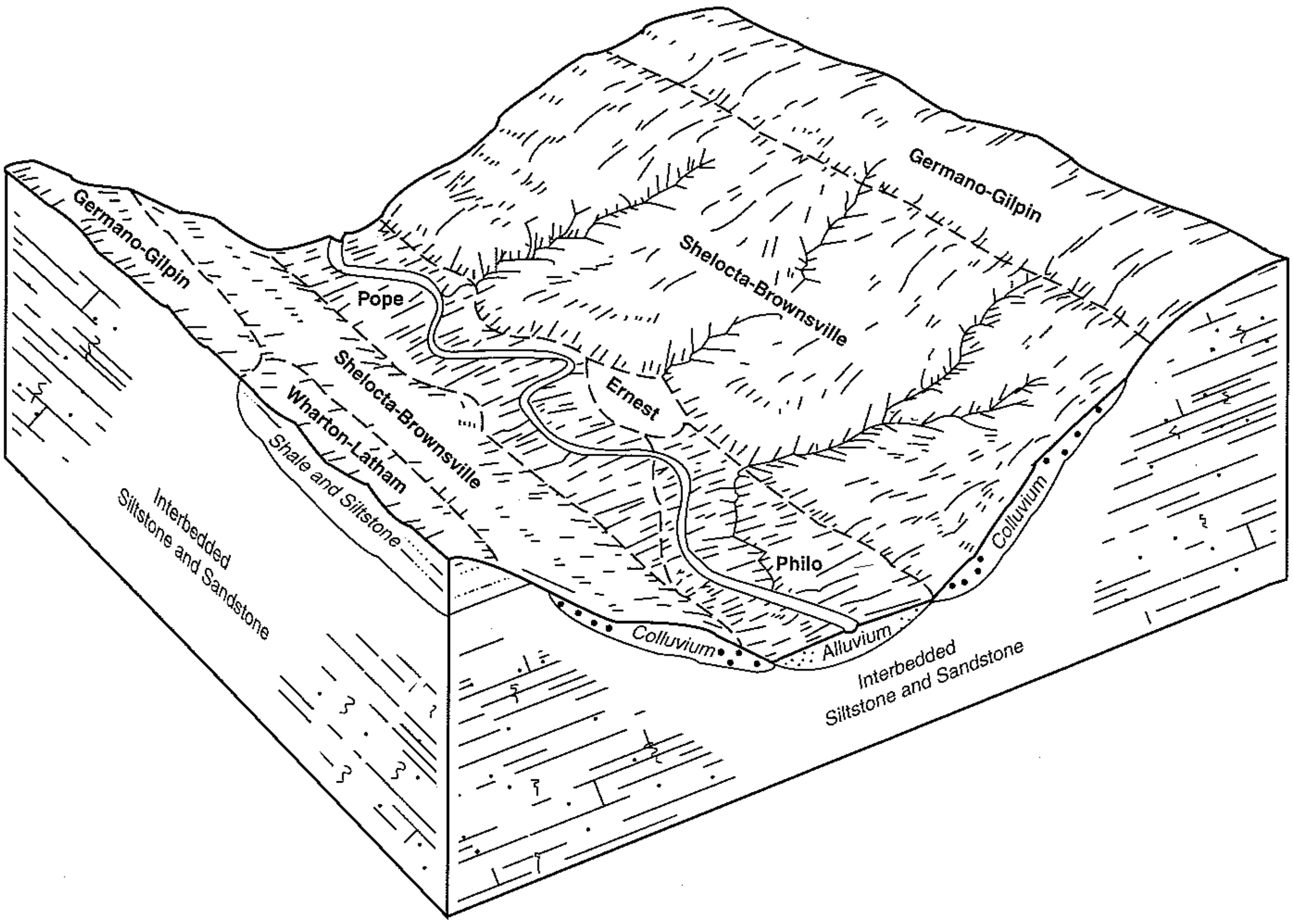

Figure 2.—Typical pattern of soils and parent material in the Shelocta-Brownsville-Germano general soil map unit.

2. Wharton-Latham-Germano

Sloping to steep

Setting

Landform: Hills
Slope range: 6 to 40 percent

Composition

Percent of survey area: 26 percent
Extent of components in the map unit:
Wharton soils—40 percent
Latham soils—25 percent
Germano soils—10 percent
Minor soils—25 percent

Soil Properties and Qualities

Wharton

Depth class: Deep and very deep
Drainage class: Moderately well drained
Position on the landform: Backslopes, shoulders, and summits
Parent material: Residuum derived from siltstone, shale, or sandstone
Surface texture: Silt loam
Slope: Sloping to steep

Latham

Depth class: Moderately deep
Drainage class: Moderately well drained
Position on the landform: Backslopes, shoulders, and summits
Parent material: Shale residuum
Surface texture: Silt loam
Slope: Sloping to steep

Germano

Depth class: Moderately deep
Drainage class: Well drained

Position on the landform: Backslopes and summits
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Sloping to steep

Minor Soils

- Bethesda
- Gilpin

Use and Management

Major uses: Woodland, pasture
Management concerns: Erosion
Management measures: Water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas, no-till reseeding in pastured areas

3. Rarden-Germano-Wharton

Sloping to steep

Setting

Landform: Hills
Slope range: 6 to 40 percent

Composition

Percent of survey area: 3 percent
Extent of components in the map unit:
Rarden soils—25 percent
Germano soils—20 percent
Wharton soils—20 percent
Minor soils—35 percent

Soil Properties and Qualities

Rarden

Depth class: Moderately deep
Drainage class: Moderately well drained
Position on the landform: Summits, shoulders, and backslopes
Parent material: Shale residuum
Surface texture: Silt loam
Slope: Sloping to steep

Germano

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Backslopes and summits
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Sloping to steep

Wharton

Depth class: Deep and very deep
Drainage class: Moderately well drained
Position on the landform: Backslopes and shoulders
Parent material: Residuum derived from siltstone, shale, or sandstone
Surface texture: Silt loam
Slope: Sloping to steep

Minor Soils

- Bethesda
- Fairpoint
- Gilpin

Use and Management

Major uses: Pasture, woodland
Management concerns: Erosion
Management measures: No-till reseeding in pastured areas, water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas

4. Gilpin-Steinsburg-Guernsey

Sloping to very steep

Setting

Landform: Hills
Slope range: 6 to 70 percent

Composition

Percent of survey area: 3 percent
Extent of components in the map unit:
Gilpin soils—45 percent
Steinsburg soils—15 percent
Guernsey soils—15 percent
Minor soils—25 percent

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Parent material: Residuum derived from sandstone, siltstone, and shale
Surface texture: Silt loam
Slope: Sloping to very steep

Steinsburg

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Backslopes
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Steep and very steep

Guernsey

Depth class: Deep and very deep
Drainage class: Moderately well drained
Position on the landform: Backslopes and shoulders
Parent material: Colluvium and residuum derived from shale, siltstone, and sandstone
Surface texture: Silt loam
Slope: Moderately steep to very steep

Minor Soils

- Aaron
- Germano
- Wellston

Use and Management

Major uses: Woodlands, pasture
Management concerns: Erosion, available water capacity
Management measures: Water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas, no-till reseeding in pastured areas

5. Gilpin-Germano-Steinsburg

Sloping to very steep

Setting

Landform: Hills
Slope range: 6 to 70 percent

Composition

Percent of survey area: 30 percent
Extent of components in the map unit:
Gilpin soils—35 percent
Germano soils—25 percent
Steinsburg soils—20 percent
Minor soils—20 percent

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes
Parent material: Residuum derived from sandstone, siltstone, and shale
Surface texture: Silt loam
Slope: Sloping to very steep

Germano

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Backslopes and summits
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Sloping to steep

Steinsburg

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Backslopes
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Steep and very steep

Minor Soils

- Bethesda
- Rarden
- Wharton

Use and Management

Major uses: Woodlands (fig. 3)
Management concerns: Erosion
Management measures: Water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas

6. Gilpin-Rarden-Germano

Sloping to very steep

Setting

Landform: Hills
Slope range: 6 to 70 percent

Composition

Percent of survey area: 6 percent
Extent of components in the map unit:
Gilpin soils—60 percent
Rarden soils—30 percent
Germano soils—5 percent
Minor soils—5 percent

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep
Drainage class: Well drained
Position on the landform: Summits, shoulders, and backslopes

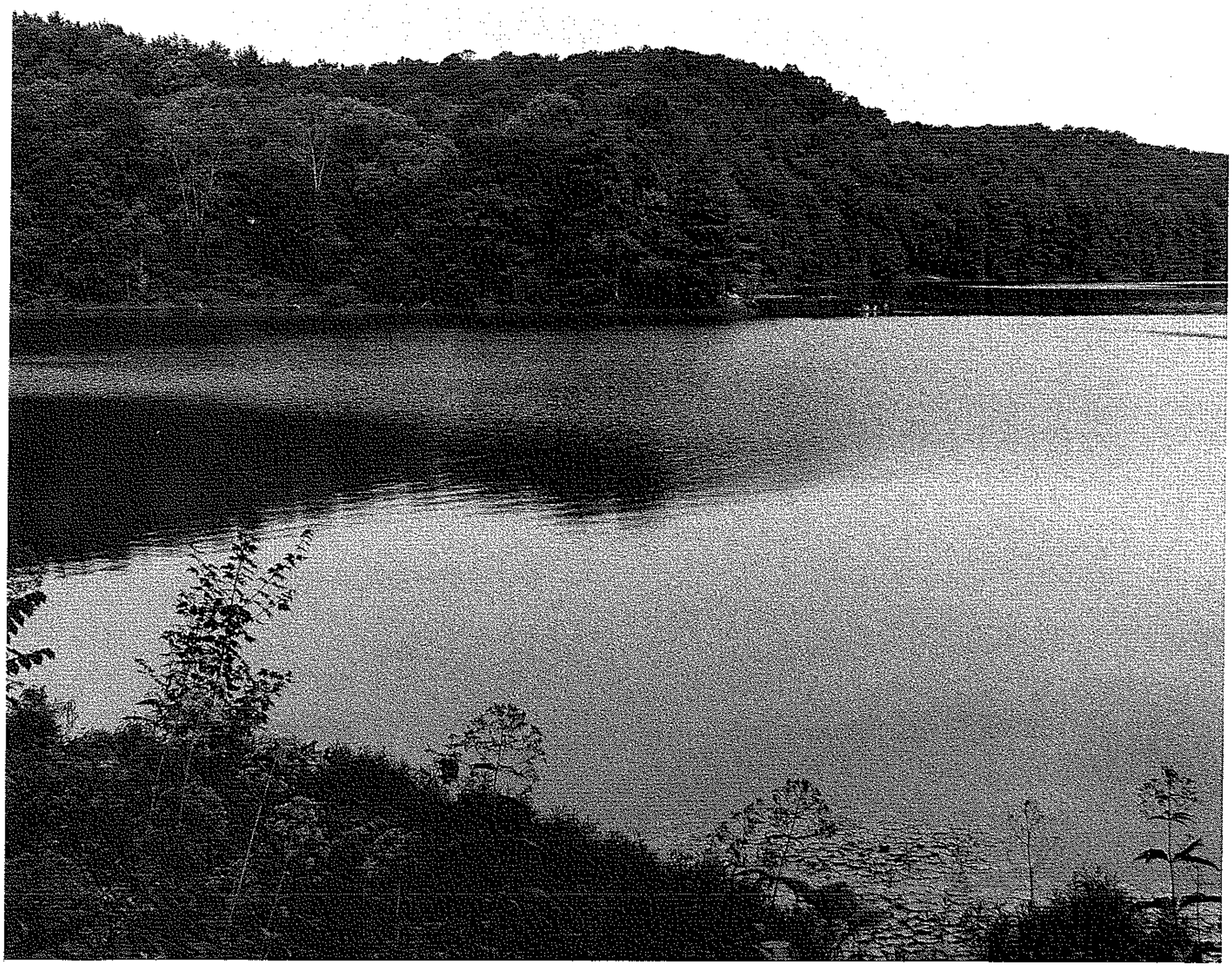

Figure 3.—A scenic area of the Gilpin-Germano-Steinsburg general soil map unit in Lake Hope State Park.

Parent material: Residuum derived from sandstone, siltstone, and shale
Surface texture: Silt loam
Slope: Sloping to very steep

Rarden

Depth class: Moderately deep
Drainage class: Moderately well drained
Position on the landform: Summits, shoulders, and backslopes
Parent material: Shale residuum
Surface texture: Silt loam
Slope: Sloping to steep

Germano

Depth class: Moderately deep

Drainage class: Well drained
Position on the landform: Backslopes
Parent material: Sandstone residuum
Surface texture: Sandy loam
Slope: Sloping to steep

Minor Soils

- Bethesda
- Philo
- Steinsburg

Use and Management

Major uses: Pasture, woodland
Management concerns: Erosion, available water capacity
Management measures: No-till reseeding in pastured areas, water bars on haul roads and skid trails, a protective cover of grasses in disturbed areas

Very deep soils formed in alluvium, lacustrine sediments, loess, and colluvium; on flood plains, stream terraces, and lake plains

7. Tioga-Chavies-Glenford

Nearly level to sloping

Setting

Landform: Flood plains, stream terraces, and lake plains
Slope range: 0 to 15 percent

Composition

Percent of survey area: 1 percent
Extent of components in the map unit:
Tioga soils—50 percent
Chavies soils—15 percent
Glenford soils—10 percent
Minor soils—25 percent

Soil Properties and Qualities

Tioga

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Flood plain
Parent material: Alluvium
Surface texture: Fine sandy loam
Slope: Nearly level

Chavies

Depth class: Very deep
Drainage class: Well drained
Position on the landform: Treads
Parent material: Alluvium
Surface texture: Silt loam
Slope: Nearly level to sloping

Glenford

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Treads
Parent material: Lacustrine sediments
Surface texture: Silt loam
Slope: Nearly level and gently sloping

Minor Soils

- Fitchville
- Pope

Use and Management

Major uses: Cropland
Management concerns: Flooding
Management measures: Delayed planting until after spring flooding

8. Omulga-Philo

Nearly level to sloping

Setting

Landform: Stream terraces and flood plains (fig. 4)
Slope range: 0 to 15 percent

Composition

Percent of survey area: 11 percent
Extent of components in the map unit:
Omulga soils—35 percent
Philo soils—35 percent
Minor soils—30 percent

Soil Properties and Qualities

Omulga

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Treads and risers
Parent material: Teays-age loess over colluvium or alluvium
Surface texture: Silt loam
Slope: Gently sloping and sloping

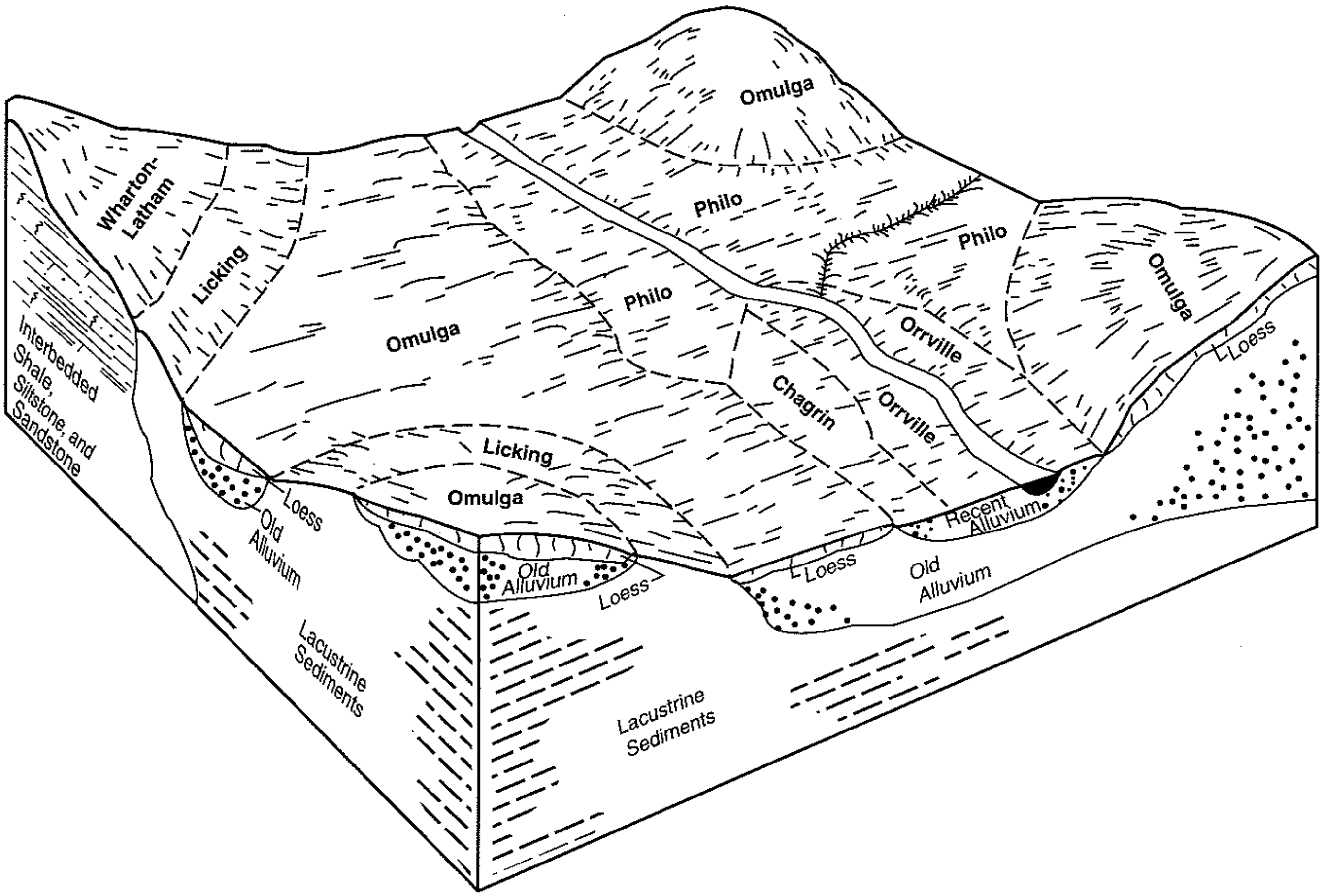

Figure 4.—Typical pattern of soils and parent material in the Omulga-Philo general soil map unit.

Philo

Depth class: Very deep
Drainage class: Moderately well drained
Position on the landform: Steps of flood plains
Parent material: Alluvium
Surface texture: Silt loam
Slope: Nearly level

Minor Soils

- Bonnie
- Chagrin
- Orrville
- Latham
- Licking
- Wharton

Use and Management

Major uses: Cropland, pasture
Management concerns: Erosion, flooding
Management measures: Delayed planting until after spring flooding, no-till planting, crop residue management

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

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

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

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

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

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

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

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

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Gilpin-Guernsey complex, 15 to 25 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Steinsburg-Gilpin association, steep, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Dumps, mine, is an example.

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

AbC—Aaron silt loam, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 1 to 5 acres
Note: Broad ridgetops

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 19 inches—yellowish brown, mottled, firm silty clay
19 to 31 inches—yellowish brown, mottled, firm silty clay
31 to 44 inches—yellowish brown, mottled, firm silty clay
Substratum:
44 to 48 inches—yellowish brown, mottled, firm silty clay
Bedrock:
48 to 51 inches—weathered siltstone

Soil Properties and Qualities

Depth class: Deep (40 to 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from limestone, siltstone, or shale
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 6 to 17 centimoles per kilogram

Composition

Aaron soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that are moderately deep to bedrock
Contrasting components:
• Germano soils in the higher positions on the landscape
• Gilpin soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BgC—Berks-Tarhollow complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Berks—summits, shoulders; Tarhollow—summits
Slope range: 6 to 15 percent
Size of areas: 25 to 100 acres
Note: Narrow ridgetops

Typical Profile

Berks

Surface layer:
0 to 1 inch—very dark grayish brown, friable channery loam
Subsurface layer:
1 to 3 inches—brown, friable channery loam
Subsoil:
3 to 15 inches— yellowish brown, friable channery and extremely channery loam

Substratum:
15 to 24 inches—yellowish brown, friable extremely channery loam
Bedrock:
24 to 27 inches—fractured, fine grained sandstone

Tarhollow

Surface layer:
0 to 1 inch—brown, friable silt loam
Subsurface layer:
1 to 3 inches—brown, friable silt loam
Subsoil:
3 to 15 inches—strong brown, firm silty clay loam
15 to 44 inches—strong brown, firm silty clay and silty clay loam
Bedrock:
44 to 47 inches—weathered siltstone

Soil Properties and Qualities

Berks

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate or moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: Very low (generally 1.8 inches)
Cation-exchange capacity: 5 to 15 centimoles per kilogram

Tarhollow

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Loess over residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 7 to 21 centimoles per kilogram

Composition

Berks soil and similar components: 55 percent
Tarhollow soil and similar components: 30 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Berks soil:
• Soils that are deep or very deep to bedrock
• Moderately well drained soils
Contrasting components:
• Shelocta soils in landscape positions similar to those of the Berks soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BhB—Bethesda silty clay loam, 0 to 8 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 0 to 8 percent
Size of areas: 10 to 250 acres
Note: Graded surface; resoiled surface layer

Typical Profile

Surface layer:
0 to 6 inches—yellowish brown, firm silty clay loam
Substratum:
6 to 11 inches—gray, firm gravelly silty clay loam
11 to 17 inches—dark gray, firm very channery silty clay loam
17 to 26 inches—light olive brown and gray, firm extremely channery silty clay loam
26 to 80 inches—yellowish brown, very friable extremely flaggy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained

Dominant parent material: Noncalcareous regolith from surface mining (reclaimed areas)
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.7 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Bethesda soil and similar components: 90 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Soils that are less acid than the Bethesda soil
- Soils that have a thicker surface layer than that of the Bethesda soil

Contrasting components:
- Ultra acid soils that are in landscape positions similar to those of the Bethesda soil
- Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BhC—Bethesda silty clay loam, 8 to 20 percent slopes

Setting

Landform: Hills
Position on the landform: Shoulders, summits
Slope range: 8 to 20 percent
Size of areas: 10 to 250 acres
Note: Graded surface; resoiled surface layer

Typical Profile

Surface layer:
0 to 3 inches—yellowish brown and gray, firm silty clay loam
Substratum:
3 to 9 inches—yellowish brown and gray, firm silty clay loam
9 to 16 inches—yellowish brown, grayish brown, and gray, firm channery silty clay loam
16 to 80 inches—dark grayish brown and gray, firm channery loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained
Dominant parent material: Noncalcareous regolith from surface mining (reclaimed areas)
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.7 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Bethesda soil and similar components: 90 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Soils that are less acid than the Bethesda soil
- Soils that have a thicker surface layer than that of the Bethesda soil

Contrasting components:
- Ultra acid soils that are bare of vegetation and in landscape positions similar to those of the Bethesda soil
- Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BhE—Bethesda silty clay loam, 20 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes

Slope range: 20 to 40 percent
Size of areas: 10 to 250 acres
Note: Graded surface; resoiled surface layer

Typical Profile

Surface layer:
0 to 6 inches—yellowish brown, friable silty clay loam
Substratum:
6 to 36 inches—yellowish brown and very dark grayish brown, firm channery and very channery clay loam
36 to 42 inches—yellowish brown and grayish brown, firm channery clay loam
42 to 80 inches—black, firm extremely channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained
Dominant parent material: Noncalcareous regolith from surface mining (reclaimed areas)
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.7 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Bethesda soil and similar components: 90 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Soils that are less acid than the Bethesda soil
- Soils that have less clay in the subsoil than the Bethesda soil

Contrasting components:
- Ultra acid soils that are bare of vegetation and in landscape positions similar to those of the Bethesda soil
- Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BmC—Bethesda channery clay loam, 8 to 20 percent slopes

Setting

Landform: Hills (fig. 5)
Position on the landform: Shoulders, summits
Slope range: 8 to 20 percent
Size of areas: 5 to 50 acres
Note: Ungraded surface

Typical Profile

Surface layer:
0 to 5 inches—yellowish brown, firm channery clay loam
Substratum:
5 to 24 inches—yellowish brown, light brown, and brown, firm very channery clay loam
24 to 39 inches—yellowish brown, brown, and reddish yellow, firm very channery clay loam
39 to 80 inches—yellowish brown, strong brown, and light gray, firm very channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained
Dominant parent material: Noncalcareous regolith from surface mining
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Very low (0.0 to 0.5 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Bethesda soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more sand in the substratum than the Bethesda soil

Figure 5.—An area of Bethesda channery clay loam, 8 to 20 percent slopes. This soil, which is in areas of reclaimed strip mine spoil, provides good habitat for upland wildlife.

• Soils that have less sand in the surface layer than the Bethesda soil
Contrasting components:
• Fairpoint soils in the higher positions on the landscape
• Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BmE—Bethesda channery clay loam, 20 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 20 to 40 percent
Size of areas: 5 to 35 acres
Note: Ungraded surface

Typical Profile

Surface layer:
0 to 3 inches—brown and yellowish brown, friable channery clay loam
Substratum:
3 to 80 inches—yellowish brown and gray, firm very channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained
Dominant parent material: Noncalcareous regolith from surface mining
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Very low (0.0 to 0.5 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Bethesda soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less sand in the surface layer than the Bethesda soil
• Soils that have more sand in the substratum than the Bethesda soil
Contrasting components:
• Fairpoint soils in the higher positions on the landscape
• Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

BmF—Bethesda channery clay loam, 40 to 70 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 40 to 70 percent
Size of areas: 5 to 20 acres
Note: Ungraded surface

Typical Profile

Surface layer:
0 to 4 inches—brown and yellowish brown, friable channery clay loam
Substratum:
4 to 32 inches—yellowish brown and gray, firm very channery clay loam
32 to 80 inches—yellowish brown and gray, firm very channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending upon the density of the substratum
Drainage class: Well drained
Dominant parent material: Noncalcareous regolith from surface mining
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Very low (0.0 to 0.5 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Bethesda soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less sand in the surface layer than the Bethesda soil
• Soils that have more sand in the substratum than the Bethesda soil
Contrasting components:
• Fairpoint soils in the higher positions on the landscape

• Undisturbed soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Bo—Bonnie silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Narrow flood plains; hydric soil

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable silt loam
Substratum:
7 to 38 inches—gray and olive gray, friable silt loam
38 to 80 inches—grayish brown, friable silt loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained and very poorly drained
Dominant parent material: Alluvium
Permeability: Moderately slow
Flooding: Frequent
Kind of water table: Apparent
Seasonal high water table: Within a depth of 1 foot
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: Very high (generally 12.7 inches)
Cation-exchange capacity: 13 to 20 centimoles per kilogram

Composition

Bonnie soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that are subject to ponding
Contrasting components:
• Newark soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Bp—Bonnie silt loam, ponded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains, depressions
Slope range: 0 to 2 percent
Size of areas: 5 to 40 acres
Note: Hydric soil

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown, friable silt loam
Substratum:
8 to 12 inches—gray, friable silt loam
12 to 80 inches—olive gray, friable silt loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained and very poorly drained
Dominant parent material: Alluvium
Permeability: Moderately slow
Flooding: Frequent
Kind of water table: Apparent
Seasonal high water table: 0.5 foot above the surface to 0.5 foot below the surface
Duration of ponding: Long
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: High

Available water capacity: Very high (generally 12.8 inches)
Cation-exchange capacity: 13 to 20 centimoles per kilogram

Composition

Bonnie soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that are not subject to ponding

Contrasting components:
- Bonnie soils in the higher positions on the landscape
- Sandbars in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Cg—Chagrin silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Oxbows; areas of hydric soils included

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsurface layer:
8 to 13 inches—dark yellowish brown, friable silt loam
Subsoil:
13 to 45 inches—dark yellowish brown and yellowish brown, friable loam
Substratum:
45 to 70 inches—dark yellowish brown, loose loamy fine sand
70 to 80 inches—yellowish brown, loose loamy sand

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderate
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 4 to 6 feet
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: High (generally 10.4 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Chagrin soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have less clay in the subsoil than the Chagrin soil
- Soils that have more acid in the subsoil than the Chagrin soil

Contrasting components:
- Bonnie soils in enclosed depressions and oxbows
- Orrville soils in swales and depressions
- Philo soils in swales

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

ChA—Chavies silt loam, 0 to 2 percent slopes, rarely flooded

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 0 to 2 percent
Size of areas: 10 to 50 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 10 inches—brown, friable silt loam
10 to 15 inches—brown, friable silt loam

Subsoil:
15 to 70 inches—yellowish brown, friable and very friable fine sandy loam
Substratum:
70 to 80 inches—yellowish brown, loose loamy sand

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderately rapid
Flooding: Rare
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: High (generally 10.0 inches)
Cation-exchange capacity: 4 to 13 centimoles per kilogram

Composition

Chavies soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have slopes of 2 to 6 percent in tread positions of this landform

Contrasting components:
- Glenford soils in the higher positions on the landscape
- Soils that have slopes of as much as 10 percent in riser positions of this landform

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

ChB—Chavies silt loam, 2 to 6 percent slopes, rarely flooded

Setting

Landform: Stream terraces (fig. 6)
Position on the landform: Treads
Slope range: 2 to 6 percent
Size of areas: 10 to 150 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 17 inches—yellowish brown, firm silt loam
17 to 41 inches—yellowish brown, firm and friable loam
41 to 53 inches—yellowish brown, friable sandy loam
Substratum:
53 to 80 inches—yellowish brown, friable and loose sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderately rapid
Flooding: Rare
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: High (generally 10.0 inches)
Cation-exchange capacity: 4 to 13 centimoles per kilogram

Composition

Chavies soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have slopes of 6 to 12 percent in tread positions of this landform

Contrasting components:
- Licking soils in the higher positions on the landscape
- Somewhat poorly drained soils in swales and depressions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Figure 6.—Cattle grazing in a pastured area of Chavies silt loam, 2 to 6 percent slopes, rarely flooded. This soil is well suited to most forage crops.

CmC—Chavies silt loam, 6 to 15 percent slopes

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 6 to 15 percent
Size of areas: 5 to 20 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 18 inches—yellowish brown, friable loam
18 to 30 inches—yellowish brown, friable sandy loam
30 to 45 inches—strong brown, friable sandy loam
Substratum:
45 to 80 inches—light yellowish brown, loose sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: High (generally 10.6 inches)

Cation-exchange capacity: 4 to 13 centimoles per kilogram

Composition

Chavies soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have a surface layer of loam
- Moderately well drained soils

Contrasting components:
- Licking soils in the higher positions on the landscape
- Germano soils on slope breaks to the uplands

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Cp—Clifty silt loam, occasionally flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Narrow flood plains; extremely gravelly substratum

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 32 inches—yellowish brown, friable silt loam and fine sandy loam
Substratum:
32 to 48 inches—yellowish brown, friable very gravelly sandy loam
48 to 80 inches—yellowish brown, friable extremely gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderately rapid
Flooding: Occasional
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: Moderate (generally 6.4 inches)
Cation-exchange capacity: 7 to 18 centimoles per kilogram

Composition

Clifty soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils

Contrasting components:
- Pope soils in landscape positions similar to those of the Clifty soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

CwD—Cruze silt loam, 12 to 20 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 12 to 20 percent
Size of areas: 10 to 30 acres
Note: Clayey subsoil; hillside slippage

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 18 inches—yellowish brown, friable and firm silty clay loam and channery silty clay loam
18 to 48 inches—yellowish brown, mottled, firm silty clay and channery silty clay loam
Bedrock:
48 to 51 inches—brown, soft shale

Soil Properties and Qualities

Depth class: Deep and very deep (48 to 80 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium and residuum derived from shale
Permeability: Moderately slow or slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 6.9 inches)
Cation-exchange capacity: 8 to 22 centimoles per kilogram

Composition

Cruze soil and similar components: 90 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Well drained soils
- Soils that are eroded
- Soils that are moderately deep to bedrock

Contrasting components:
- Brownsville soils in the higher positions on the landscape
- Shelocta soils on slight rises

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

CwE—Cruze silt loam, 20 to 35 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 20 to 35 percent
Size of areas: 5 to 10 acres
Note: Clayey subsoil; hillside slippage

Typical Profile

Surface layer:
0 to 2 inches—dark brown, friable silt loam
Subsurface layer:
2 to 9 inches—yellowish brown, friable silt loam
Subsoil:
9 to 20 inches—yellowish brown, firm silty clay loam
20 to 37 inches—yellowish brown, mottled, firm silty clay
37 to 48 inches—light olive brown, mottled, firm silty clay
Bedrock:
48 to 53 inches—light olive brown, soft siltstone

Soil Properties and Qualities

Depth class: Deep and very deep (48 to 80 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium and residuum derived from shale
Permeability: Moderately slow or slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 6.9 inches)
Cation-exchange capacity: 8 to 22 centimoles per kilogram

Composition

Cruze soil and similar components: 90 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Soils that are eroded
- Well drained soils
- Soils that are moderately deep to bedrock

Contrasting components:
- Brownsville soils in the higher positions on the landscape
- Shelocta soils on slight rises

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Woodland” section
- “Crops” and “Pasture and Hayland” sections
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

Cy—Cuba silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 20 acres
Note: Oxbows

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 34 inches—dark yellowish brown and yellowish brown, friable silt loam
Substratum:
34 to 60 inches—yellowish brown, friable silt loam that has thin strata of loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderate
Flooding: Frequent
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: High (generally 11.5 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Cuba soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have more sand in the subsoil than the Cuba soil

Contrasting components:
- Orrville soils in swales and depressions
- Philo soils in swales

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- “Woodland” section
- “Crops” and “Pasture and Hayland” sections
- “Recreation” section
- “Wildlife Habitat” section
- “Engineering” and “Soil Properties” sections

DoA—Doles silt loam, 0 to 2 percent slopes

Setting

Landform: Terraces
Position on the landform: Treads
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Broad terraces; fragipan

Typical Profile

Surface layer:
0 to 7 inches—grayish brown, friable, mottled silt loam
Subsoil:
7 to 18 inches—light yellowish brown, friable, mottled silt loam
18 to 24 inches—light brownish gray, friable, mottled silty clay loam
24 to 54 inches—a fragipan of yellowish brown, very firm and brittle silty clay loam
54 to 72 inches—yellowish brown and light yellowish brown, firm, mottled silty clay loam
Substratum:
72 to 80 inches—brownish yellow, firm, mottled silty clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Somewhat poorly drained
Dominant parent material: Loess over colluvium and alluvium
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1 to 2 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High

Available water capacity: Moderate (generally 7.6 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Doles soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more sand in the surface layer than the Doles soil
- Soils that do not have a dense layer

Contrasting components:
- Fitchville soils in the higher positions on the landscape
- Glenford soils in the higher positions on the landscape
- McGary soils in landscape positions similar to those of the Doles soil
- Poorly drained soils in enclosed, more depressional areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Dy—Dumps, mine

Setting

Landform: Toeslopes, flood plains, stream terraces
Slope range: 0 to 8 percent
Size of areas: 2 to 20 acres
Note: Waste deposited from coal mining operations

Soil Properties and Qualities

Onsite investigation is needed to determine the limitations affecting any proposed use.

Composition

Dumps, mine: 90 percent
Inclusions: 10 percent

Contrasting Inclusions

- Philo soils in the lower positions on the landscape
- Germano soils in the higher positions on the landscape
- Gilpin soils in the higher positions on the landscape

ErC—Ernest silt loam, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 6 to 15 percent
Size of areas: 5 to 30 acres
Note: Fragipan

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 20 inches—strong brown, firm silt loam
20 to 31 inches—yellowish brown, firm channery silt loam
31 to 48 inches—a fragipan of yellowish brown, mottled, very firm and brittle channery loam
48 to 62 inches—yellowish brown, mottled, very firm and brittle channery silt loam
Substratum:
62 to 70 inches—yellowish brown, mottled, firm loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Colluvium
Permeability: Moderate above the fragipan; moderately slow or slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 18 to 25 centimoles per kilogram

Composition

Ernest soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less sand in the subsoil than the Ernest soil
Contrasting components:
• Brownsville soils on the steeper part of slopes
• Shelocta soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

ErD—Ernest silt loam, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 15 to 25 percent
Size of areas: 5 to 30 acres
Note: Fragipan

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 30 inches—yellowish brown, friable and firm channery silt loam
30 to 52 inches—a fragipan of yellowish brown, mottled, very firm and brittle channery silt loam and channery clay loam
Substratum:
52 to 70 inches—yellowish brown, mottled, firm channery silt loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Colluvium
Permeability: Moderate above the fragipan; moderately slow or slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 18 to 25 centimoles per kilogram

Composition

Ernest soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less sand in the subsoil than the Ernest soil
Contrasting components:
• Shelocta soils on the steeper part of slopes
• Brownsville soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

FaB—Fairpoint clay loam, 0 to 8 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 0 to 8 percent
Size of areas: 10 to 100 acres
Note: Graded surface; resoiled surface layer

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown, firm, mottled clay loam
Substratum:
8 to 80 inches—brown and gray, mottled, very firm channery and extremely channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending on the density of the substratum

Drainage class: Well drained
Dominant parent material: Regolith from surface mining (reclaimed areas)
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Low or moderately low (0.5 to 2.0 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Low (generally 4.6 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Fairpoint soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that are more acid than the Fairpoint soil
- Soils that have less clay in the surface layer than the Fairpoint soil

Contrasting components:
- Ultra acid soils that are bare of vegetation and in landscape positions similar to those of the Fairpoint soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

FaC—Fairpoint clay loam, 8 to 20 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 8 to 20 percent
Size of areas: 10 to 30 acres
Note: Graded surface; resoiled surface layer

Typical Profile

Surface layer:
0 to 4 inches—yellowish brown clay loam
Substratum:
4 to 8 inches—grayish brown and gray, firm clay loam
8 to 40 inches—grayish brown and gray, firm very channery clay loam
40 to 80 inches—grayish brown and gray, firm extremely channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Shallow to moderately deep, depending on the density of the substratum
Drainage class: Well drained
Dominant parent material: Regolith from surface mining (reclaimed areas)
Permeability: Moderately slow
Flooding: None
Content of organic matter in the surface layer: Low or moderately low (0.5 to 2.0 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Low (generally 4.6 inches)
Cation-exchange capacity: 10 to 24 centimoles per kilogram

Composition

Fairpoint soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that are more acid than the Fairpoint soil
- Soils that have less clay in the surface layer than the Fairpoint soil

Contrasting components:
- Ultra acid soils that are bare of vegetation and in landscape positions similar to those of the Fairpoint soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

FcA—Fitchville silt loam, 0 to 2 percent slopes

Setting

Landform: Stream terraces
Position on the landform: Treads
Slope range: 0 to 2 percent

Size of areas: 5 to 30 acres
Note: Broad terraces; areas of hydric soils possibly included

Typical Profile

Surface layer:
0 to 8 inches—grayish brown, mottled, friable silt loam
Subsoil:
8 to 34 inches—dark yellowish brown and strong brown, mottled, friable silt loam
34 to 62 inches—strong brown and yellowish brown, mottled, firm and very firm silt loam
Substratum:
62 to 80 inches—yellowish brown and light brownish gray, mottled, firm silt loam and loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Glaciolacustrine deposits
Permeability: Moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.0 to 2.5 feet
Content of organic matter in the surface layer: Moderate (2 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: High (generally 10.4 inches)
Cation-exchange capacity: 14 to 22 centimoles per kilogram

Composition

Fitchville soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have slopes of more than 2 percent

Contrasting components:
- Licking soils in the higher positions on the landscape
- McGary soils in the higher positions on the landscape
- Doles soils in depressions and drainageways
- Poorly drained soils in depressions and drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GaC—Germano-Gilpin complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Narrow ridgetops

Typical Profile

Germano

Surface layer:
0 to 3 inches—very dark grayish brown, friable sandy loam
Subsurface layer:
3 to 7 inches—brown, friable sandy loam
Subsoil:
7 to 15 inches—yellowish brown, friable sandy loam
15 to 31 inches—yellowish brown, firm sandy loam
Bedrock:
31 to 34 inches—yellowish brown sandstone

Gilpin

Surface layer:
0 to 6 inches—very dark grayish brown, friable silt loam
Subsoil:
6 to 11 inches—brown, friable silty clay loam
11 to 16 inches—yellowish brown, firm channery silty clay loam
16 to 30 inches—yellowish brown, firm very channery silty clay loam
Bedrock:
30 to 33 inches—light olive brown siltstone

Soil Properties and Qualities

Germano

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate

Available water capacity: Low (generally 4.2 inches)
Cation-exchange capacity: 5 to 10 centimoles per kilogram

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.9 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Germano soil and similar components: 50 percent
Gilpin soil and similar components: 40 percent
Inclusions: 10 percent

Inclusions

Similar components:
- Moderately well drained soils

Contrasting components:
- Guernsey soils in the flatter landscape positions
- Rarden soils in the flatter landscape positions
- Tarhollow soils in the flatter landscape positions
- Wellston soils on slight rises and low knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GaD—Germano-Gilpin complex, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 15 to 25 percent
Size of areas: 10 to 100 acres
Note: Upper part of hillsides

Typical Profile

Germano

Surface layer:
0 to 4 inches—dark grayish brown, friable sandy loam
Subsurface layer:
4 to 8 inches—brown, friable sandy loam
Subsoil:
8 to 15 inches—yellowish brown, friable sandy loam
15 to 30 inches—yellowish brown, firm sandy loam
Bedrock:
30 to 33 inches—yellowish brown sandstone

Gilpin

Surface layer:
0 to 9 inches—brown, friable silt loam
Subsoil:
9 to 24 inches—yellowish brown, friable and firm silt loam
24 to 30 inches—yellowish brown, firm channery silt loam
Substratum:
30 to 36 inches—light olive brown, firm very channery silt loam
Bedrock:
36 to 39 inches—hard, thinly bedded siltstone

Soil Properties and Qualities

Germano

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.2 inches)
Cation-exchange capacity: 5 to 10 centimoles per kilogram

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low

Potential for frost action: Moderate
Available water capacity: Low (generally 4.9 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Germano soil and similar components: 40 percent
Gilpin soil and similar components: 35 percent
Inclusions: 25 percent

Inclusions

Soils similar to the Germano soil:
• Soils that have less clay in the subsoil
Soils similar to the Gilpin soil:
• Moderately well drained soils
Contrasting components:
• Guernsey soils in the less sloping areas
• Latham soils in the less sloping areas
• Wellston soils in the less sloping areas
• Wharton soils in concave areas on slopes and in areas near the base of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GaE—Germano-Gilpin complex, 25 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 25 to 40 percent
Size of areas: 25 to 150 acres
Note: Hillsides

Typical Profile

Germano

Surface layer:
0 to 2 inches—very dark grayish brown, very friable sandy loam
Subsurface layer:
2 to 4 inches—brown, very friable sandy loam
Subsoil:
4 to 17 inches—dark yellowish brown and yellowish brown, friable sandy loam
17 to 37 inches—strong brown, friable and firm coarse sandy loam
Bedrock:
37 to 40 inches—weathered sandstone

Gilpin

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 7 inches—dark grayish brown, friable silt loam
Subsoil:
7 to 15 inches—yellowish brown, firm silt loam
15 to 35 inches—strong brown, firm channery clay loam and channery loam
35 to 39 inches—strong brown and pale brown, very firm clay loam
Bedrock:
39 to 42 inches—light olive brown sandstone

Soil Properties and Qualities

Germano

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.2 inches)
Cation-exchange capacity: 5 to 10 centimoles per kilogram

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.9 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Germano soil and similar components: 65 percent
Gilpin soil and similar components: 15 percent
Inclusions: 20 percent

Inclusions

Soils similar to the Germano soil:
- Soils that have less clay in the subsoil

Soils similar to the Gilpin soil:
- Moderately well drained soils

Contrasting components:
- Rarden soils in the less sloping areas
- Tarhollow soils in the less sloping areas
- Areas of rock outcrop on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GbC2—Gilpin silt loam, 6 to 15 percent slopes, eroded

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: About 4 acres
Note: Narrow ridgetops; erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material

Typical Profile

Surface layer:
0 to 4 inches—dark brown, friable silt loam
Subsoil:
4 to 34 inches—yellowish brown and olive brown, friable and firm silt loam and channery loam
Bedrock:
34 to 37 inches—sandstone

Soil Properties and Qualities

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.8 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Gilpin soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils

Contrasting components:
- Rarden soils in the flatter landscape positions
- Tarhollow soils in the flatter landscape positions

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GcC—Gilpin-Aaron complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Broad ridgetops; Aaron—clayey subsoil

Typical Profile

Gilpin

Surface layer:
0 to 1 inch—dark grayish brown, friable silt loam
Subsurface layer:
1 to 3 inches—yellowish brown, friable silt loam
Subsoil:
3 to 23 inches—yellowish brown, firm channery silty clay loam

Substratum:
23 to 28 inches—yellowish brown, firm extremely channery silty clay loam
Bedrock:
28 to 31 inches—coarse grained, weathered sandstone

Aaron

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 19 inches—yellowish brown, mottled, firm silty clay
19 to 37 inches—light yellowish brown, mottled, firm silty clay loam
Substratum:
37 to 46 inches—light yellowish brown, mottled, firm silty clay loam
Bedrock:
46 to 49 inches—weathered siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 3.8 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Aaron

Depth class: Deep (40 to 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from limestone, siltstone, or shale
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 7.5 inches)

Composition

Gilpin soil and similar components: 50 percent
Aaron soil and similar components: 25 percent
Inclusions: 25 percent

Inclusions

Soils similar to the Gilpin soil:
- Moderately well drained soils

Soils similar to the Aaron soil:
- Soils that are moderately deep to bedrock

Contrasting components:
- Germano soils in the higher positions on the landscape
- Wharton soils in saddles
- Tarhollow soils in the less sloping areas
- Zanesville soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GgD—Gilpin-Guernsey complex, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Gilpin—summits, shoulders, backslopes; Guernsey—backslopes, shoulders
Slope range: 15 to 25 percent
Size of areas: 5 to 50 acres
Note: Upper part of hillsides; clayey subsoil

Typical Profile

Gilpin

Surface layer:
0 to 4 inches—very dark grayish brown, friable silt loam
Subsoil:
4 to 20 inches—yellowish brown, firm silty clay loam
20 to 30 inches—yellowish brown, firm channery silty clay loam
Bedrock:
30 to 33 inches—weathered siltstone

Guernsey

Surface layer:
0 to 4 inches—dark brown, friable silt loam
Subsoil:
4 to 11 inches—yellowish brown, friable silt loam
11 to 21 inches—yellowish brown, mottled, firm silty clay
21 to 45 inches—light olive brown, mottled, firm silty clay
Substratum:
45 to 56 inches—light olive brown, mottled, firm silty clay
Bedrock:
56 to 59 inches—weathered, interbedded shale and siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.3 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Guernsey

Depth class: Deep and very deep (50 to 80 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium and residuum derived from shale, siltstone, or limestone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 7.3 inches)
Cation-exchange capacity: 12 to 25 centimoles per kilogram

Composition

Gilpin soil and similar components: 50 percent
Guernsey soil and similar components: 30 percent
Inclusions: 20 percent

Inclusions

Soils similar to the Gilpin soil:
• Soils that have more sand in the subsoil than the Gilpin soil
Soils similar to the Guernsey soil:
• Soils that are moderately deep to bedrock
Contrasting components:
• Latham soils on shoulders
• Tarhollow soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GgE—Gilpin-Guernsey complex, 25 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 25 to 40 percent
Size of areas: 25 to 100 acres
Note: Long slopes; clayey subsoil

Typical Profile

Gilpin

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 4 inches—brown, friable silt loam
Subsoil:
4 to 20 inches—yellowish brown, firm silt loam
20 to 39 inches—yellowish brown, firm silty clay loam
Bedrock:
39 to 42 inches—weathered siltstone

Guernsey

Surface layer:
0 to 1 inch—very dark grayish brown, friable silt loam
Subsurface layer:
1 to 5 inches—brown, friable silt loam

Subsoil:
5 to 19 inches—yellowish brown, firm channery silty clay loam
19 to 24 inches—brown, mottled, firm silty clay
24 to 36 inches—yellowish brown, mottled, firm silty clay
Substratum:
36 to 52 inches—yellowish brown, mottled, firm silty clay
Bedrock:
52 to 55 inches—weathered siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.3 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Guernsey

Depth class: Deep and very deep (50 to 80 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium and residuum derived from shale, siltstone, or limestone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 7.3 inches)
Cation-exchange capacity: 12 to 25 centimoles per kilogram

Composition

Gilpin soil and similar components: 50 percent
Guernsey soil and similar components: 35 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Gilpin soil:
• Moderately well drained soils
Contrasting components:
• Wharton soils in concave areas on slopes and in areas near the base of slopes
• Latham soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GgF—Gilpin-Guernsey complex, 40 to 70 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 40 to 70 percent
Size of areas: 25 to 100 acres
Note: Hillside slippage; Guernsey—clayey subsoil

Typical Profile

Gilpin

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 4 inches—brown, friable silt loam
Subsoil:
4 to 18 inches—yellowish brown, firm silt loam
18 to 33 inches—yellowish brown, firm channery silty clay loam
Bedrock:
33 to 36 inches—weathered siltstone

Guernsey

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 5 inches—brown, friable silt loam

Subsoil:
5 to 17 inches—yellowish brown, firm silty clay loam
17 to 36 inches—yellowish brown, mottled, firm silty clay
Substratum:
36 to 50 inches—grayish brown and yellowish brown, firm silty clay
Bedrock:
50 to 53 inches—weathered siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.3 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Guernsey

Depth class: Deep and very deep (50 to 80 inches)
Drainage class: Moderately well drained
Dominant parent material: Colluvium and residuum derived from shale, siltstone, or limestone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 12 to 25 centimoles per kilogram

Composition

Gilpin soil and similar components: 50 percent
Guernsey soil and similar components: 35 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Gilpin soil:
- Moderately well drained soils

Contrasting components:
- Steinsburg soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GhC—Gilpin-Rarden complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Narrow ridgetops

Typical Profile

Gilpin

Surface layer:
0 to 4 inches—brown, friable silt loam
Subsurface layer:
4 to 7 inches—brown, friable silt loam
Subsoil:
7 to 14 inches—yellowish brown, firm silty clay loam
14 to 29 inches—yellowish brown, firm channery silty clay loam
Bedrock:
29 to 32 inches—weathered siltstone

Rarden

Surface layer:
0 to 5 inches—brown, friable silt loam
Subsoil:
5 to 15 inches—yellowish red, firm silty clay loam
15 to 28 inches—yellowish red, mottled, firm silty clay
Substratum:
28 to 36 inches—yellowish brown, firm silty clay
Bedrock:
36 to 39 inches—light olive brown siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained

Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Rarden

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Composition

Gilpin soil and similar components: 50 percent
Rarden soil and similar components: 35 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Gilpin soil:
- Moderately well drained soils

Soils similar to the Rarden soil:
- Soils that do not have red colors like those of the Rarden soil

Contrasting components:
- Aaron soils in the less sloping areas
- Wharton soils in saddles
- Tarhollow soils in the lower positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GhD—Gilpin-Rarden complex, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 15 to 25 percent
Size of areas: 5 to 100 acres
Note: Upper part of hillsides

Typical Profile

Gilpin

Surface layer:
0 to 2 inches—brown, friable silt loam
Subsurface layer:
2 to 5 inches—brown, friable silt loam
Subsoil:
5 to 18 inches—yellowish brown, firm silty clay loam
18 to 30 inches—light olive brown, firm channery silty clay loam
Bedrock:
30 to 33 inches—fractured siltstone

Rarden

Surface layer:
0 to 5 inches—brown, friable silt loam
Subsoil:
5 to 9 inches—yellowish red, firm silty clay loam
9 to 25 inches—yellowish red and red, firm silty clay and clay
25 to 30 inches—yellowish brown, firm channery silty clay loam
Bedrock:
30 to 33 inches—weathered, interbedded shale and siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low

Potential for frost action: Moderate
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Rarden

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Composition

Gilpin soil and similar components: 55 percent
Rarden soil and similar components: 35 percent
Inclusions: 10 percent

Inclusions

Soils similar to the Rarden soil:
- Soils that do not have red colors like those of the Rarden soil

Contrasting components:
- Germano soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GhE—Gilpin-Rarden complex, 25 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 25 to 40 percent
Size of areas: 25 to 150 acres
Note: Long slopes

Typical Profile

Gilpin

Surface layer:
0 to 2 inches—dark grayish brown, friable silt loam
Subsurface layer:
2 to 5 inches—brown, friable silt loam
Subsoil:
5 to 34 inches—yellowish brown, firm channery silty clay loam
Bedrock:
34 to 37 inches—fractured siltstone

Rarden

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 4 inches—brown, friable silt loam
Subsoil:
4 to 19 inches—yellowish brown, firm silty clay loam
19 to 31 inches—yellowish brown, firm silty clay with yellowish red mottles
Bedrock:
31 to 34 inches—weathered, interbedded shale and siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.8 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Rarden

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet

Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Composition

Gilpin soil and similar components: 60 percent
Rarden soil and similar components: 25 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Rarden soil:
- Soils that do not have red colors like those of the Rarden soil

Contrasting components:
- Germano soils on the steeper part of slopes
- Steinsburg soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GmC—Gilpin-Tarhollow complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Broad ridgetops; Tarhollow—clayey subsoil

Typical Profile

Gilpin

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 4 inches—brown, friable silt loam
Subsoil:
4 to 26 inches—yellowish brown, firm silty clay loam
26 to 33 inches—yellowish brown and light olive brown, firm channery silty clay loam
Bedrock:
33 to 36 inches—weathered siltstone

Tarhollow

Surface layer:
0 to 3 inches—brown, friable silt loam
Subsoil:
3 to 10 inches—light yellowish brown, friable silt loam
10 to 27 inches—strong brown, friable silty clay loam
27 to 34 inches—light olive brown, firm silty clay
34 to 45 inches—yellowish brown, firm silty clay loam
Bedrock:
45 to 48 inches—weathered siltstone

Soil Properties and Qualities

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.8 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Tarhollow

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Loess over residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Apparent
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 7 to 21 centimoles per kilogram

Composition

Gilpin soil and similar components: 45 percent
Tarhollow soil and similar components: 30 percent
Inclusions: 25 percent

Inclusions

Soils similar to the Gilpin soil:
• Soils that have more sand in the subsoil than the Gilpin soil
Soils similar to the Tarhollow soil:
• Well drained soils
Contrasting components:
• Guernsey soils in saddles
• Zanesville soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GnA—Glenford silt loam, 0 to 2 percent slopes

Setting

Landform: Lake plains
Position on the landform: Treads
Slope range: 0 to 2 percent
Size of areas: 5 to 30 acres
Note: Narrow terraces; lacustrine silts

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 50 inches—yellowish brown, firm silt loam with brownish gray mottles
Substratum:
50 to 80 inches—yellowish brown, mottled, firm silt loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Permeability: Moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: High (generally 9.5 inches)
Cation-exchange capacity: 10 to 18 centimoles per kilogram

Composition

Glenford soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more clay in the subsoil than the Glenford soil
Contrasting components:
• Doles soils in landscape positions similar to those of the Glenford soil
• Fitchville soils in the lower positions on the landscape
• Licking soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

GnB—Glenford silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains
Position on the landform: Treads
Slope range: 2 to 6 percent
Size of areas: 5 to 50 acres
Note: Narrow terraces; lacustrine silt

Typical Profile

Surface layer:
0 to 11 inches—brown, friable silt loam
Subsoil:
11 to 17 inches—yellowish brown, mottled, friable silt loam
17 to 47 inches—yellowish brown, mottled, firm silt loam
Substratum:
47 to 80 inches—yellowish brown, mottled, firm silt loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Glaciolacustrine deposits
Permeability: Moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: High (generally 9.5 inches)
Cation-exchange capacity: 10 to 18 centimoles per kilogram

Composition

Glenford soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Eroded soils
- Soils that have more clay in the subsoil than the Glenford soil
- Well drained soils

Contrasting components:
- Fitchville soils in depressions and drainageways
- Omulga soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

LcB—Licking silt loam, 2 to 6 percent slopes

Setting

Landform: Lake plains, terraces
Position on the landform: Treads
Slope range: 2 to 6 percent
Size of areas: 5 to 30 acres
Note: Narrow terraces; clayey subsoil

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 13 inches—yellowish brown, friable silt loam
13 to 25 inches—yellowish brown, mottled, firm silty clay loam
25 to 70 inches—yellowish brown, mottled, firm silty clay
Substratum:
70 to 80 inches—brown, mottled, firm silty clay

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: High (generally 9.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Licking soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have less clay in the subsoil than the Licking soil

Contrasting components:
- Omulga soils in the higher positions on the landscape
- Chavies soils in the lower positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

LcC2—Licking silt loam, 6 to 15 percent slopes, eroded

Setting

Landform: Lake plains, terraces
Position on the landform: Treads, risers
Slope range: 6 to 15 percent
Size of areas: 5 to 30 acres
Note: Clayey subsoil; erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 21 inches—yellowish brown, firm silty clay loam
21 to 67 inches—yellowish brown, mottled, firm silty clay
Substratum:
67 to 80 inches—yellowish brown, mottled, firm silty clay

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: High (generally 9.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Licking soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less clay in the subsoil than the Licking soil
Contrasting components:
• Omulga soils in the higher positions on the landscape
• Chavies soils in the lower positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

LcD2—Licking silt loam, 15 to 25 percent slopes, eroded

Setting

Landform: Lake plains, terraces
Position on the landform: Risers
Slope range: 15 to 25 percent
Size of areas: 5 to 25 acres
Note: Clayey subsoil; erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material

Typical Profile

Surface layer:
0 to 5 inches—brown, friable silt loam
Subsoil:
5 to 18 inches—yellowish brown, firm silty clay loam
18 to 62 inches—yellowish brown, mottled, firm silty clay
Substratum:
62 to 80 inches—yellowish brown, mottled, firm silty clay

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: High (generally 9.4 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Licking soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less clay in the subsoil than the Licking soil
Contrasting components:
• Omulga soils in the higher positions on the landscape
• Chavies soils in the lower positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

McA—McGary silty clay loam, 0 to 2 percent slopes

Setting

Landform: Lake plains, terraces
Position on the landform: Treads
Slope range: 0 to 2 percent
Size of areas: 5 to 25 acres
Note: Broad terraces; clayey subsoil

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silty clay loam
Subsoil:
8 to 35 inches—yellowish brown, mottled, firm silty clay
35 to 45 inches—brown, mottled, firm silty clay
45 to 56 inches—gray, mottled, firm silty clay loam
Substratum:
56 to 66 inches—yellowish brown, mottled, firm silty clay
66 to 80 inches—brown, mottled, firm silty clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Lacustrine deposits
Permeability: Slow or very slow
Flooding: None
Kind of water table: Apparent
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Potential for frost action: Moderate
Shrink-swell potential: High
Available water capacity: High (generally 9.1 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

McGary soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have less clay in the subsoil than the McGary soil
• Soils that have a dense layer in the subsoil
Contrasting components:
• Glenford soils in the higher positions on the landscape
• Licking soils in landscape positions similar to those of the McGary soil
• Poorly drained soils in depressions and drainageways

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Nw—Newark silt loam, frequently flooded

Setting

Landform: Flood plain (fig. 7)
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 100 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 10 inches—brown, mottled, friable silt loam
Subsoil:
10 to 16 inches—brown, mottled, friable silt loam
16 to 38 inches—grayish brown, mottled, friable silt loam

Figure 7.—A hayfield in a nearly level area of Newark silt loam, frequently flooded. Wharton and Latham soils are on the steeper wooded hillside in the background.

Substratum:
38 to 52 inches—light brownish gray, mottled, friable silt loam
52 to 58 inches—yellowish brown, mottled, friable stratified silt loam and loam
58 to 80 inches—grayish brown, mottled, friable stratified silt loam and sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Permeability: Moderate
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 0.5 foot to 1.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: High (generally 11.7 inches)
Cation-exchange capacity: 5 to 18 centimoles per kilogram

Composition

Newark soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more sand in the subsoil than the Newark soil
Contrasting components:
• Bonnie soils in swales and depressions
• Philo soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

OmA—Omulga silt loam, 0 to 2 percent slopes

Setting

Landform: Terraces
Position on the landform: Treads
Slope range: 0 to 2 percent
Size of areas: 4 acres
Note: Broad terraces; fragipan

Typical Profile

Surface layer:
0 to 11 inches—brown, friable silt loam
Subsoil:
11 to 27 inches—yellowish brown, friable and very firm silt loam
27 to 49 inches—a fragipan of yellowish brown, very firm and brittle silt loam
49 to 65 inches—yellowish brown, very firm silty clay loam
65 to 71 inches—yellowish brown, very firm clay
71 to 79 inches—yellowish brown, firm sandy clay loam
Substratum:
79 to 80 inches—yellowish brown, friable sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Loess over colluvium or alluvium
Permeability: Moderate above the fragipan; slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 8.1 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Omulga soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more sand in the subsoil than the Omulga soil
Contrasting components:
• Doles soils in the lower positions on the landscape
• Wyatt soils in drainageways
• Poorly drained soils in the more depressional, enclosed areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

OmB—Omulga silt loam, 2 to 6 percent slopes

Setting

Landform: Terraces
Position on the landform: Treads
Slope range: 2 to 6 percent
Size of areas: 5 to 100 acres
Note: Broad terraces; fragipan

Typical Profile

Surface layer:
0 to 6 inches—brown, friable silt loam
Subsurface layer:
6 to 10 inches—yellowish brown, friable silt loam
Subsoil:
10 to 23 inches—yellowish brown, firm and very firm silt loam
23 to 42 inches—a fragipan of yellowish brown, mottled, extremely firm and brittle silt loam
42 to 54 inches—a fragipan of yellowish brown, mottled, very firm and brittle silty clay loam
54 to 62 inches—yellowish brown, mottled, very firm silty clay loam
Substratum:
62 to 80 inches—brown, mottled, very firm clay

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep

Drainage class: Moderately well drained
Dominant parent material: Loess over colluvium or alluvium
Permeability: Moderate above the fragipan; slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 8.1 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Omulga soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more sand in the subsoil than the Omulga soil
Contrasting components:
• Doles soils in the lower positions on the landscape
• Licking soils in the higher positions on the landscape
• Glenford soils in the lower positions on the landscape
• McGary soils in landscape positions similar to those of the Omulga soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

OmC—Omulga silt loam, 6 to 15 percent slopes

Setting

Landform: Terraces
Position on the landform: Treads, risers
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Broad terraces; fragipan

Typical Profile

Surface layer:
0 to 10 inches—brown, friable silt loam
Subsoil:
10 to 15 inches—yellowish brown, very firm silt loam
15 to 21 inches—yellowish brown, very firm and brittle silt loam
21 to 37 inches—a fragipan of strong brown, very firm and brittle silty clay loam
37 to 74 inches—yellowish brown, firm clay loam
Substratum:
74 to 80 inches—gray, firm clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Loess over colluvium or alluvium
Permeability: Moderate above the fragipan; slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 2.0 to 3.5 feet
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 8.1 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Omulga soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more sand in the subsoil than the Omulga soil
Contrasting components:
• Chavies soils in landscape positions similar to those of the Omulga soil
• Licking soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section

- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Or—Orrville silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 16 inches—brown, mottled, friable silt loam
16 to 33 inches—light brownish gray, mottled, friable loam
Substratum:
33 to 80 inches—grayish brown, mottled, friable stratified loam and sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat poorly drained
Dominant parent material: Alluvium
Permeability: Moderate
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 1.0 to 2.5 feet
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: High (generally 9.0 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Orrville soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have less sand in the subsoil than the Orrville soil

Contrasting components:
- Bonnie soils in enclosed depressions and oxbows
- Philo soils on slight rises
- Pope soils on slight rises

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Ph—Philo silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 100 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 12 inches—brown, friable silt loam
Subsoil:
12 to 19 inches—dark yellowish brown, friable loam
19 to 34 inches—yellowish brown, mottled, firm loam
34 to 48 inches—dark yellowish brown and brown, mottled, friable sandy loam
Substratum:
48 to 68 inches—brown, mottled, friable loamy sand
68 to 80 inches—brown and gray, friable gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Alluvium
Permeability: Moderate
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate (2 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Moderate (generally 8.4 inches)
Cation-exchange capacity: 8 to 20 centimoles per kilogram

Composition

Philo soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Well drained soils
- Soils that have more clay in the subsoil than the Philo soil

Contrasting components:
- Bonnie soils in enclosed depressions and oxbows
- Orrville soils in enclosed depressions and oxbows

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Pm—Piopolis silt loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 25 acres
Note: Narrow flood plains

Typical Profile

Surface layer:
0 to 7 inches—grayish brown, friable silt loam
Substratum:
7 to 40 inches—gray, mottled, friable and firm silty clay loam
40 to 60 inches—light gray, mottled, firm silty clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Poorly drained or very poorly drained
Dominant parent material: Alluvium
Permeability: Slow
Flooding: Frequent
Kind of water table: Apparent
Seasonal high water table: 1 foot above the surface to 1 foot below the surface
Duration of ponding: Long
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: High (generally 11.7 inches)
Cation-exchange capacity: 4 to 11 centimoles per kilogram

Composition

Piopolis soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more clay in the surface layer than the Piopolis soil
- Soils that have less clay in the substratum than the Piopolis soil

Contrasting components:
- Doles soils in the higher positions on the landscape
- Orrville soils on slight rises

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Pn—Pope loam, occasionally flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 50 acres
Note: Natural levees

Typical Profile

Surface layer:
0 to 7 inches—dark yellowish brown, friable loam
Subsoil:
7 to 48 inches—yellowish brown, friable sandy loam
Substratum:
48 to 80 inches—yellowish brown, friable sandy loam and fine sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderate or moderately rapid

Flooding: Occasional
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Moderate (generally 8.9 inches)
Cation-exchange capacity: 4 to 12 centimoles per kilogram

Composition

Pope soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have more sand in the surface layer than the Pope soil
- Soils that have less acid in the subsoil and substratum than the Pope soil

Contrasting components:
- Clifty soils in landscape positions similar to those of the Pope soil
- Orrville soils in enclosed depressions and oxbows

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Po—Pope loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 100 acres
Note: Natural levees

Typical Profile

Surface layer:
0 to 12 inches—dark yellowish brown, friable loam

Subsoil:
12 to 45 inches—dark yellowish brown, friable fine sandy loam

Substratum:
45 to 67 inches—yellowish brown and brown, mottled, friable fine sandy loam and sandy loam
67 to 80 inches—yellowish brown, mottled, very friable very gravelly sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderate or moderately rapid
Flooding: Frequent
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Moderate (generally 8.9 inches)
Cation-exchange capacity: 4 to 12 centimoles per kilogram

Composition

Pope soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils
- Soils that have more sand in the surface layer than the Pope soil
- Soils that have less acid in the subsoil than the Pope soil

Similar components:
- Clifty soils in landscape positions similar to those of the Pope soil
- Orrville soils in enclosed depressions and oxbows
- Poorly drained soils in enclosed depressions and oxbows

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section

- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

RaC2—Rarden silt loam, 6 to 15 percent slopes, eroded

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 6 to 15 percent
Size of areas: 5 to 25 acres
Note: Narrow ridgetops; clayey subsoil; erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material

Typical Profile

Surface layer:
0 to 6 inches—brown, friable silt loam
Subsoil:
6 to 17 inches—strong brown and yellowish red, firm silty clay loam and silty clay
17 to 34 inches—yellowish red and yellowish brown, mottled, firm silty clay
Bedrock:
34 to 37 inches—weathered shale

Soil Properties and Qualities

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Composition

Rarden soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that do not have red colors
- Soils that have more clay in the surface layer than the Rarden soil

Contrasting components:
- Gilpin soils in saddles
- Germano soils on the crest of knolls
- Wharton soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

RbC2—Rarden-Wharton complex, 6 to 15 percent slopes, eroded

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 100 acres
Note: Erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material; hillside slippage

Typical Profile

Rarden

Surface layer:
0 to 5 inches—brown, friable silt loam
Subsoil:
5 to 14 inches—strong brown, mottled, firm silty clay loam
14 to 20 inches—yellowish red and light gray, firm silty clay
Substratum:
20 to 27 inches—strong brown and light gray, firm channery silty clay
Bedrock:
27 to 30 inches—weathered, soft clay shale

Wharton

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 6 inches—brown, friable silt loam
Subsoil:
6 to 20 inches—yellowish brown, mottled, friable silt loam

20 to 50 inches—yellowish brown, mottled, firm channery silty clay loam
Substratum:
50 to 58 inches—yellowish brown, mottled, firm channery silty clay loam
Bedrock:
58 to 63 inches—weathered siltstone

Soil Properties and Qualities

Rarden

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Wharton

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 9 to 17 centimoles per kilogram

Composition

Rarden soil and similar components: 45 percent
Wharton soil and similar components: 30 percent
Inclusions: 25 percent

Inclusions

Soils similar to the Rarden soil:
- Soils that do not have red colors in the subsoil like those in the Rarden soil

Soils similar to the Wharton soil:
- Well drained soils

Contrasting components:
- Aaron soils in the less sloping areas
- Gilpin soils on shoulders

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

RbD2—Rarden-Wharton complex, 15 to 25 percent slopes, eroded

Setting

Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope range: 15 to 25 percent
Size of areas: 5 to 150 acres
Note: Erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material; hillside slippage

Typical Profile

Rarden

Surface layer:
0 to 5 inches—brown, friable silt loam
Subsoil:
5 to 13 inches—strong brown, mottled, firm silty clay loam
13 to 20 inches—strong brown, mottled, firm silty clay
Substratum:
20 to 31 inches—yellowish brown, mottled, firm channery silty clay
Bedrock:
31 to 34 inches—weathered siltstone

Wharton

Surface layer:
0 to 4 inches—brown, friable silt loam
Subsoil:
4 to 12 inches—yellowish brown, firm silt loam
12 to 31 inches—yellowish brown, mottled, firm silty clay loam

Substratum:
31 to 46 inches—yellowish brown and grayish brown, mottled, firm channery silty clay loam
Bedrock:
46 to 49 inches—weathered siltstone

Soil Properties and Qualities

Rarden

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Shale residuum
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1 to 2 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Low (generally 4.1 inches)
Cation-exchange capacity: 8 to 15 centimoles per kilogram

Wharton

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 9 to 17 centimoles per kilogram

Composition

Rarden soil and similar components: 45 percent
Wharton soil and similar components: 40 percent
Inclusions: 15 percent

Inclusions

Soils similar to the Rarden soil:
- Soils that do not have red colors in the subsoil like those in the Rarden soil

Soils similar to the Wharton soil:
- Well drained soils

Contrasting components:
- Germano soils in saddles
- Gilpin soils in saddles
- Guernsey soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

RcD—Richland loam, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 15 to 25 percent
Size of areas: 5 to 50 acres
Note: Hillside slippage

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable loam
Subsoil:
7 to 13 inches—yellowish brown, friable loam
13 to 28 inches—yellowish brown, friable silt loam
28 to 43 inches—dark yellowish brown, friable channery silt loam
Substratum:
43 to 60 inches—yellowish brown, firm channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Permeability: Moderate
Flooding: None
Kind of water table: Apparent
Depth to the water table: 3 to 6 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Richland soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils

Contrasting components:
- Germano soils on the steeper part of slopes
- Steinsburg soils on the steeper part of slopes
- Chagrin soils on flood plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

RcE—Richland loam, 25 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Footslopes
Slope range: 25 to 40 percent
Size of areas: 5 to 50 acres
Note: Hillside slippage

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable loam
Subsoil:
7 to 18 inches—yellowish brown, friable loam
18 to 32 inches—yellowish brown, friable silt loam
32 to 43 inches—dark yellowish brown, friable channery silt loam
Substratum:
43 to 60 inches—yellowish brown, firm channery clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Permeability: Moderate
Flooding: None
Kind of water table: Apparent
Depth to the water table: 3 to 6 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: Moderate
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Richland soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Moderately well drained soils

Contrasting components:
- Germano soils on the steeper part of slopes
- Steinsburg soils on the steeper part of slopes
- Chagrin soils on flood plains

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

SbE—Sewell channery fine sandy loam, 20 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 20 to 40 percent
Size of areas: 5 to 50 acres
Note: Ungraded surface; substratum of mine spoil

Typical Profile

Surface layer:
0 to 2 inches—brown, friable channery fine sandy loam
Substratum:
2 to 48 inches—yellowish brown, friable very channery fine sandy loam
48 to 80 inches—yellowish brown, friable very channery loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Somewhat excessively drained

Dominant parent material: Noncalcareous regolith from surface mining
Permeability: Moderately rapid and rapid
Flooding: None
Content of organic matter in the surface layer: Very low or low (0 to 1 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 5.1 inches)

Composition

Sewell soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more clay in the substratum than the Sewell soil

Contrasting components:
- Germano soils on the crest of knolls
- Gilpin soils on the crest of knolls

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

SdE—Shelocta-Brownsville association, steep

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 25 to 40 percent
Size of areas: 25 to 500 acres
Note: Long slopes; Brownsville—low water-holding capacity

Typical Profile

Shelocta

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 6 inches—yellowish brown, friable silt loam
Subsoil:
6 to 36 inches—light yellowish brown, friable gravelly loam
36 to 50 inches—light yellowish brown and light olive brown, friable silt loam
Substratum:
50 to 72 inches—yellowish brown, firm very channery silt loam
Bedrock:
72 to 75 inches—thinly bedded sandstone

Brownsville

Surface layer:
0 to 4 inches—very dark grayish brown, friable channery silt loam
Subsoil:
4 to 9 inches—dark brown, friable channery silt loam
9 to 15 inches—yellowish brown, friable channery silt loam
15 to 46 inches—yellowish brown, friable extremely channery silt loam
Bedrock:
46 to 49 inches—sandstone and siltstone

Soil Properties and Qualities

Shelocta

Depth class: Deep and very deep (48 to 80 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or high (1 to 5 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: High (generally 9.1 inches)
Cation-exchange capacity: 5 to 16 centimoles per kilogram

Brownsville

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Well drained
Dominant parent material: Colluvium and residuum derived from siltstone and sandstone
Permeability: Moderate or moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 5.1 inches)

Cation-exchange capacity: 8 to 20 centimoles per kilogram

Composition

Shelocta soil and similar components: 50 percent
Brownsville soil and similar components: 30 percent
Inclusions: 20 percent

Inclusions

Soils similar to the Shelocta soil:
- Moderately well drained soils
- Soils that have a dense layer in the subsoil

Soils similar to the Brownsville soil:
- Soils in the more sloping areas

Contrasting components:
- Berks soils on shoulders
- Gilpin soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

SdF—Shelocta-Brownsville association, very steep

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 40 to 70 percent
Size of areas: 25 to 500 acres
Note: Long slopes; Brownsville—low water-holding capacity

Typical Profile

Shelocta

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 7 inches—yellowish brown, friable silt loam
Subsoil:
7 to 27 inches—light yellowish brown, friable and firm gravelly and channery loam
27 to 46 inches—light yellowish brown and light olive brown, firm silt loam
46 to 55 inches—yellowish brown, mottled, firm channery silt loam
Substratum:
55 to 75 inches—yellowish brown, mottled, firm very channery silt loam
Bedrock:
75 to 78 inches—thinly bedded sandstone

Brownsville

Surface layer:
0 to 2 inches—very dark grayish brown, friable channery silt loam
Subsoil:
2 to 5 inches—dark brown, friable channery silt loam
5 to 42 inches—yellowish brown, friable channery, very channery, and extremely channery loam
Substratum:
42 to 49 inches—yellowish brown, friable very flaggy loam
Bedrock:
49 to 52 inches—yellowish brown sandstone and siltstone

Soil Properties and Qualities

Shelocta

Depth class: Deep and very deep (48 to 80 inches)
Drainage class: Well drained
Dominant parent material: Colluvium
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or high (1 to 5 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: High (generally 9.1 inches)
Cation-exchange capacity: 5 to 16 centimoles per kilogram

Brownsville

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Well drained
Dominant parent material: Colluvium and residuum derived from siltstone and sandstone
Permeability: Moderate or moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 5.1 inches)
Cation-exchange capacity: 8 to 20 centimoles per kilogram

Composition

Shelocta soil and similar components: 50 percent
Brownsville soil and similar components: 30 percent
Inclusions: 20 percent

Inclusions

Soils similar to the Shelocta soil:
- Moderately well drained soils
- Soils that have a dense layer in the subsoil
- Soils in the less sloping areas

Soils similar to the Brownsville soil:
- Soils in the less sloping areas

Contrasting components:
- Berks soils on shoulders
- Gilpin soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Sk—Skidmore gravelly loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 5 to 10 acres
Note: Narrow flood plains; very gravelly subsoil

Typical Profile

Surface layer:
0 to 5 inches—brown, friable gravelly loam
Subsoil:
5 to 12 inches—yellowish brown, friable gravelly loam
12 to 20 inches—strong brown, very friable very gravelly sandy loam
Substratum:
20 to 36 inches—yellowish brown, very friable very gravelly sandy loam
36 to 60 inches—light yellowish brown, loose extremely gravelly loamy sand

Soil Properties and Qualities

Depth class: Deep or very deep (40 to 80 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderately rapid
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 3 to 4 feet
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: Low (generally 4.6 inches)
Cation-exchange capacity: 4 to 11 centimoles per kilogram

Composition

Skidmore soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more sand in the surface layer than the Skidmore soil
- Soils that are subject to occasional flooding

Contrasting components:
- Orrville soils in enclosed depressions and oxbows
- Pope soils in landscape positions similar to those of the Skidmore soil

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

StE—Steinsburg-Gilpin association, steep

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 25 to 40 percent
Size of areas: 25 to 500 acres
Note: Rock outcrop

Typical Profile

Steinsburg

Surface layer:
0 to 1 inch—very dark grayish brown, friable sandy loam

Subsurface layer:
1 to 4 inches—brown, friable sandy loam
Subsoil:
4 to 13 inches—yellowish brown, friable channery sandy loam
Substratum:
13 to 22 inches—yellowish brown, friable channery sandy loam
Bedrock:
22 to 25 inches—coarse grained sandstone

Gilpin

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam
Subsurface layer:
2 to 7 inches—brown, friable silt loam
Subsoil:
7 to 18 inches—yellowish brown, firm channery silt loam
Substratum:
18 to 23 inches—yellowish brown, massive, firm channery silt loam
Bedrock:
23 to 26 inches—fractured siltstone

Soil Properties and Qualities

Steinsburg

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Sandstone
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: Very low (generally 2.6 inches)
Cation-exchange capacity: 8 to 12 centimoles per kilogram

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.3 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Steinsburg soil and similar components: 55 percent
Gilpin soil and similar components: 15 percent
Inclusions: 30 percent

Inclusions

Soils similar to the Steinsburg soil:
- Soils that have more clay in the subsurface layer than the Steinsburg soil

Contrasting components:
- Latham soils in the less sloping areas
- Rarden soils in the less sloping areas
- Areas of rock outcrop near the base of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

StF—Steinsburg-Gilpin association, very steep

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: 40 to 70 percent
Size of areas: 25 to 500 acres
Note: Rock outcrop

Typical Profile

Steinsburg

Surface layer:
0 to 2 inches—very dark grayish brown, friable sandy loam
Subsurface layer:
2 to 6 inches—brown, friable sandy loam
Subsoil:
6 to 18 inches—yellowish brown, friable channery sandy loam
Substratum:
18 to 22 inches—yellowish brown, massive, friable very channery sandy loam

Bedrock:
22 to 25 inches—yellowish brown, coarse grained sandstone

Gilpin

Surface layer:
0 to 3 inches—dark brown, friable silt loam
Subsoil:
3 to 21 inches—yellowish brown, friable and firm silt loam and channery silt loam
21 to 26 inches—light olive brown, firm channery silt loam
Substratum:
26 to 32 inches—light olive brown, firm extremely channery silt loam
Bedrock:
32 to 35 inches—fractured siltstone

Soil Properties and Qualities

Steinsburg

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Sandstone residuum
Permeability: Moderately rapid
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: Low
Available water capacity: Very low (generally 2.6 inches)
Cation-exchange capacity: 8 to 12 centimoles per kilogram

Gilpin

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Low (generally 4.3 inches)
Cation-exchange capacity: 8 to 18 centimoles per kilogram

Composition

Steinsburg soil and similar components: 55 percent
Gilpin soil and similar components: 20 percent
Inclusions: 25 percent

Inclusions

Soils similar to the Steinsburg soil:
- Soils that have more clay in the subsurface layer than the Steinsburg soil

Contrasting components:
- Latham soils in the less sloping areas
- Rarden soils in the less sloping areas
- Wharton soils in concave areas on slopes and near the base of slopes
- Areas of rock outcrop near the base of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

TaB—Tarhollow silt loam, 2 to 6 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Size of areas: 2 to 10 acres
Note: Saddles and knobs; clayey subsoil

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 32 inches—yellowish brown, friable and firm silt loam and silty clay loam; mottled in the lower part
32 to 46 inches—yellowish brown, mottled, firm silty clay
Bedrock:
46 to 49 inches—weathered, thinly bedded siltstone

Soil Properties and Qualities

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Loess over residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Apparent
Depth to the water table: 2.0 to 3.5 feet

Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 7.5 inches)
Cation-exchange capacity: 7 to 21 centimoles per kilogram

Composition

Tarhollow soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have more clay in the subsoil than the Tarhollow soil
Contrasting components:
• Germano soils on shoulders
• Wharton soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

TeB—Tilsit silt loam, 3 to 8 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 3 to 8 percent
Size of areas: 2 to 10 acres
Note: Saddles and knobs; fragipan

Typical Profile

Surface layer:
0 to 10 inches—brown, friable silt loam
Subsoil:
10 to 29 inches—yellowish brown, friable and firm silt loam and silty clay loam
29 to 58 inches—a fragipan of yellowish brown, mottled, very firm and brittle silt loam and silty clay loam
Bedrock:
58 to 60 inches—thinly bedded, rippable shale

Soil Properties and Qualities

Depth class: Deep and very deep (40 to 80 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Loess over residuum derived from shale, siltstone, or sandstone
Permeability: Moderate above the fragipan; slow in the fragipan
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 2.5 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: Moderate (generally 8.0 inches)
Cation-exchange capacity: 6 to 16 centimoles per kilogram

Composition

Tilsit soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
• Soils that have a seasonal high water table at a depth of 2 to 3 feet
Contrasting components:
• Germano soils on shoulders
• Wharton soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Tg—Tioga fine sandy loam, frequently flooded

Setting

Landform: Flood plains
Position on the landform: Steps of flood plains
Slope range: 0 to 2 percent
Size of areas: 10 to 250 acres
Note: Meander scars

Typical Profile

Surface layer:
0 to 9 inches—brown, friable fine sandy loam
Subsoil:
9 to 35 inches—dark yellowish brown, friable fine sandy loam
Substratum:
35 to 80 inches—dark yellowish brown, friable stratified silt loam and fine sandy loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Well drained
Dominant parent material: Alluvium
Permeability: Moderate or moderately rapid in the subsoil; moderate to rapid in the substratum
Flooding: Frequent
Kind of water table: Apparent
Depth to the water table: 3 to 6 feet
Content of organic matter in the surface layer: Moderate or high (2 to 6 percent)
Shrink-swell potential: Low
Potential for frost action: Moderate
Available water capacity: Moderate (generally 7.9 inches)
Cation-exchange capacity: 12 to 28 centimoles per kilogram

Composition

Tioga soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more acid in the subsoil than the Tioga soil

Contrasting components:
- Chagrin soils in landscape positions similar to those of the Tioga soil
- Orrville soils in meander channels

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

W—Water

This map unit consists of areas inundated with water for most of the year. It generally includes rivers, lakes, and ponds. Individual areas of this map unit range from 1 to 20 acres in size.

No interpretations are given for this map unit.

WbC—Wellston silt loam, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 50 acres
Note: Broad ridges

Typical Profile

Surface layer:
0 to 6 inches—brown, friable silt loam
Subsoil:
6 to 27 inches—brown and yellowish brown, friable silt loam and silty clay loam
27 to 33 inches—yellowish brown, friable loam
Substratum:
33 to 42 inches—yellowish brown, friable sandy loam
Bedrock:
42 to 45 inches—sandstone

Soil Properties and Qualities

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Well drained
Dominant parent material: Loess over residuum derived from sandstone or siltstone
Permeability: Moderate
Flooding: None
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: Moderate (generally 7.4 inches)
Cation-exchange capacity: 8 to 16 centimoles per kilogram

Composition

Wellston soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have a dense layer in the subsoil
- Moderately well drained soils

Contrasting components:
- Germano soils on shoulders
- Gilpin soils on shoulders
- Tarhollow soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

WkC—Wharton-Latham complex, 6 to 15 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, shoulders
Slope range: 6 to 15 percent
Size of areas: 5 to 100 acres
Note: Narrow ridgetops

Typical Profile

Wharton

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 18 inches—strong brown, firm silty clay loam
18 to 48 inches—yellowish brown, mottled, firm silty clay loam and clay loam
Bedrock:
48 to 51 inches—weathered siltstone

Latham

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 16 inches—yellowish brown, friable silty clay loam
16 to 24 inches—yellowish brown, mottled, friable channery silty clay loam
24 to 31 inches—yellowish brown, mottled, firm channery silty clay
Substratum:
31 to 36 inches—light brownish gray, very firm very channery silty clay
Bedrock:
36 to 39 inches—thinly bedded shale and siltstone

Soil Properties and Qualities

Wharton

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 9 to 17 centimoles per kilogram

Latham

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale or siltstone
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Low (generally 5.3 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Wharton soil and similar components: 30 percent
Latham soil and similar components: 25 percent
Inclusions: 45 percent

Inclusions

Soils similar to the Wharton soil:
- Well drained soils

Soils similar to the Latham soil:
- Soils that have red colors in the subsoil

Contrasting components:
- Germano soils on shoulders
- Gilpin soils on shoulders
- Tarhollow soils in saddles
- Zanesville soils in the less sloping areas

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

WkD—Wharton-Latham complex, 15 to 25 percent slopes

Setting

Landform: Hills
Position on the landform: Summits, backslopes
Slope range: 15 to 25 percent
Size of areas: 10 to 100 acres
Note: Saddles, narrow benches

Typical Profile

Wharton

Surface layer:
0 to 7 inches—brown, friable silt loam
Subsoil:
7 to 22 inches—yellowish brown, friable silt loam
22 to 48 inches—yellowish brown, mottled, firm channery silty clay loam
Substratum:
48 to 55 inches—yellowish brown, mottled, firm channery silty clay loam
Bedrock:
55 to 58 inches—weathered siltstone and sandstone

Latham

Surface layer:
0 to 10 inches—brown, friable silt loam
Subsoil:
10 to 15 inches—yellowish brown, firm channery silty clay loam
15 to 30 inches—yellowish brown, grayish brown, and brown, mottled, firm channery silty clay
30 to 37 inches—strong brown, mottled, firm channery silty clay loam
Bedrock:
37 to 40 inches—weathered siltstone and sandstone

Soil Properties and Qualities

Wharton

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 9 to 17 centimoles per kilogram

Latham

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale or siltstone
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Low (generally 5.3 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Wharton soil and similar components: 55 percent
Latham soil and similar components: 25 percent
Inclusions: 20 percent

Inclusions

Soils similar to the Wharton soil:
- Well drained soils

Soils similar to the Latham soil:
- Soils that have red colors in the subsoil

Contrasting components:
- Cruze soils in the less sloping areas
- Germano soils on the steeper part of slopes

- Gilpin soils on the steeper part of slopes
- Tarhollow soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

WkE—Wharton-Latham complex, 25 to 40 percent slopes

Setting

Landform: Hills
Position on the landform: Backslopes
Slope range: Wharton—25 to 35 percent; Latham—25 to 40 percent
Size of areas: 25 to 500 acres
Note: Narrow benches

Typical Profile

Wharton

Surface layer:
0 to 3 inches—brown, friable silt loam
Subsurface layer:
3 to 8 inches—yellowish brown, friable silt loam
Subsoil:
8 to 34 inches—yellowish brown, mottled, firm channery silty clay loam
34 to 54 inches—yellowish brown and brown, mottled, firm silty clay
Bedrock:
54 to 57 inches—weathered shale and siltstone

Latham

Surface layer:
0 to 3 inches—brown, friable silt loam
Subsurface layer:
3 to 8 inches—brown, friable silt loam
Subsoil:
8 to 17 inches—yellowish brown, firm channery silty clay loam
17 to 35 inches—yellowish brown and grayish brown, mottled, firm silty clay
Bedrock:
35 to 38 inches—weathered siltstone and sandstone

Soil Properties and Qualities

Wharton

Depth class: Deep and very deep (40 to 72 inches)
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale, siltstone, or sandstone
Permeability: Slow or moderately slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 4 percent)
Shrink-swell potential: Moderate
Potential for frost action: High
Available water capacity: Moderate (generally 6.7 inches)
Cation-exchange capacity: 9 to 17 centimoles per kilogram

Latham

Depth class: Moderately deep (20 to 40 inches)
Root zone: Moderately deep
Drainage class: Moderately well drained
Dominant parent material: Residuum derived from shale or siltstone
Permeability: Slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Low (generally 5.3 inches)
Cation-exchange capacity: 10 to 20 centimoles per kilogram

Composition

Wharton soil and similar components: 65 percent
Latham soil and similar components: 25 percent
Inclusions: 10 percent

Inclusions

Soils similar to the Wharton soil:
- Well drained soils

Soils similar to the Latham soil:
- Soils that have red colors in the subsoil

Contrasting components:
- Germano soils on the steeper part of slopes

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

WtB—Wyatt silt loam, 2 to 6 percent slopes

Setting

Landform: Terraces
Position on the landform: Treads
Slope range: 2 to 6 percent
Size of areas: 5 to 20 acres
Note: Narrow terraces; clayey subsoil

Typical Profile

Surface layer:
0 to 10 inches—brown, friable silt loam
Subsoil:
10 to 19 inches—yellowish brown, firm silty clay
19 to 53 inches—yellowish brown and dark yellowish brown, mottled, firm and very firm clay
Substratum:
53 to 63 inches—brown, mottled, very firm clay that has thin lenses of silty clay and silty clay loam

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Permeability: Slow or very slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet
Content of organic matter in the surface layer: Moderate or moderately low (1 to 3 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Moderate (generally 7.4 inches)
Cation-exchange capacity: 12 to 20 centimoles per kilogram

Composition

Wyatt soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have more clay in the surface layer than the Wyatt soil

Contrasting components:
- Doles soils in depressions and drainageways
- Omulga soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

WyC2—Wyatt silty clay loam, 6 to 15 percent slopes, eroded

Setting

Landform: Terraces
Position on the landform: Treads, risers
Slope range: 6 to 15 percent
Size of areas: 5 to 20 acres
Note: Erosion removed part of original surface layer; present surface layer a mixture of original surface layer and subsoil material; clayey subsoil

Typical Profile

Surface layer:
0 to 6 inches—brown, friable silty clay loam
Subsoil:
6 to 15 inches—yellowish brown and brown, firm silty clay and clay
15 to 36 inches—yellowish brown and dark yellowish brown, mottled, firm clay
Substratum:
36 to 60 inches—yellowish brown, mottled, firm clay

Soil Properties and Qualities

Depth class: Very deep (more than 60 inches)
Drainage class: Moderately well drained
Dominant parent material: Lacustrine deposits
Permeability: Slow or very slow
Flooding: None
Kind of water table: Perched
Depth to the water table: 1.5 to 3.0 feet

Content of organic matter in the surface layer: Low or moderately low (0.5 to 2.0 percent)
Shrink-swell potential: High
Potential for frost action: High
Available water capacity: Low (generally 5.8 inches)
Cation-exchange capacity: 14 to 24 centimoles per kilogram

Composition

Wyatt soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that have less clay in the surface layer than the Wyatt soil
- Soils that have less clay in the subsoil than the Wyatt soil

Contrasting components:
- Doles soils in depressions and drainageways
- Omulga soils in the higher positions on the landscape

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

ZnB—Zanesville silt loam, 2 to 6 percent slopes

Setting

Landform: Hills
Position on the landform: Summits
Slope range: 2 to 6 percent
Size of areas: 5 to 50 acres
Note: Broad ridgetops; fragipan

Typical Profile

Surface layer:
0 to 8 inches—brown, friable silt loam
Subsoil:
8 to 26 inches—yellowish brown, firm silt loam and silty clay loam; mottled in the lower part
26 to 45 inches—a fragipan of yellowish brown, mottled, very firm and brittle silty clay loam
45 to 60 inches—yellowish brown, firm clay loam
Bedrock:
60 to 63 inches—hard sandstone

Soil Properties and Qualities

Depth class: Deep and very deep (40 to 80 inches)
Root zone: Moderately deep
Drainage class: Well drained or moderately well drained
Dominant parent material: Loess over residuum derived from sandstone, siltstone, or shale
Permeability: Moderate above the fragipan; slow or moderately slow in the fragipan
Kind of water table: Perched
Depth to the water table: 2 to 3 feet
Content of organic matter in the surface layer: Moderately low (1 to 2 percent)
Shrink-swell potential: Low
Potential for frost action: High
Available water capacity: Moderate (generally 8.6 inches)

Composition

Zanesville soil and similar components: 85 percent
Inclusions: 15 percent

Inclusions

Similar components:
- Soils that do not have a dense layer in the subsoil

Contrasting components:
- Aaron soils in saddles
- Gilpin soils on shoulders
- Tarhollow soils in saddles

Management

For general and detailed information about managing this map unit, see the following sections in this publication:

- "Woodland" section
- "Crops" and "Pasture and Hayland" sections
- "Recreation" section
- "Wildlife Habitat" section
- "Engineering" and "Soil Properties" sections

Use and Management of the Soils

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

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

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

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

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

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

The soils in the survey area are assigned to various interpretive groups at the end of each map unit description and in some of the tables. The groups for each map unit also are shown under the heading "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

Dorothy S. Riley, district conservationist, Natural Resources Conservation Service, helped to prepare this section.

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed, the system of land capability classification used by the Natural Resources Conservation Service is explained, and prime farmland is described.

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

In 1997, about 67,100 acres in the county was used as cropland or pasture (USDA 1997). Of this total, 23,900 acres was used for crops. The remaining 43,200 acres was used for pasture. Hay is the principal crop grown in the county. Cultivated crops include corn, wheat, and soybeans.

Water erosion is the major management concern on most of the cropland in Vinton County. Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced when 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 that have a high content of clay in the subsoil and on soils that have a layer in or below the subsoil that restricts roots. Examples of restrictive layers include the fragipan in the Doles, Omulga, and Zanesville soils and bedrock in the Germano and Rarden soils.

The second damaging effect of erosion is the deposition of sediment in streams. Controlling erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

Erosion-control measures help to provide a protective surface cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a plant cover on the soil for extended periods of time helps to hold soil losses to an amount that does not reduce the productive capacity of the soil. A system of conservation tillage that leaves crop residue on the surface of the soil increases the infiltration rate and helps to control runoff and erosion. It can be adapted to most of the soils used as cropland in the county. In areas used for corn, no-till farming, which is being used on an increasing number of acres, is very effective in controlling erosion. It also can be adapted to most of the soils used as cropland in the county.

Diversions effectively reduce the length of slope and thus help to control runoff and erosion. On many sites they also intercept the concentrated flow of water. Most of the nearly level to strongly sloping soils in the county are suited to diversions.

Contour farming and contour stripcropping are commonly used erosion-control measures in the county. These practices are suited to most of the gently sloping to moderately steep soils in Vinton County.

Soil drainage is a management concern in the county. A drainage system is needed in areas of poorly drained and somewhat poorly drained soils, such as the Doles, Melvin, and Orrville soils, and in areas of wet soils that are included in mapping with the Omulga and Philo soils or other well drained or moderately well drained soils. It is important to check with the local office of the Natural Resources Conservation Service before installing a drainage system to see if these areas are legal wetlands. Soils in areas determined to be wetlands cannot be drained if the producer accepts any benefits from any U.S. Department of Agriculture program.

Fertility is naturally low in some upland soils, especially in those that formed in sandstone or siltstone residuum, such as the Germano and Wharton soils. All of the upland soils that formed in colluvium and residuum derived from sandstone, siltstone, or shale are naturally acid. Soils on flood plains, such as the Chagrin and Orrville soils, are medium or high in natural fertility and typically are acid or neutral throughout; however, the Tioga soils in the Salt Creek valley typically are neutral or mildly alkaline throughout.

Upland soils that are naturally acid need applications of lime to raise the pH level of the soil sufficiently for such crops as alfalfa to grow well. Available phosphorus and potassium levels are naturally low in many of these soils. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Ohio State University Extension can help determine the kind and amount of fertilizer and the amount of lime needed for application.

Tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous. Most of the soils used for crops in Vinton County have a surface layer of silt loam that is light in color and moderately low in organic matter content. Generally, the structure of such soils is moderate or weak. During periods of heavy rainfall, a crust forms on the surface of the soils. Because the crust is hard when dry and nearly impervious to water, it reduces the rate of water infiltration and increases the runoff rate. Regularly adding crop residue, manure, and other organic material helps to improve soil structure and minimize crusting.

Fall plowing is not a good practice in areas of light colored soils that have a surface layer of silt loam because it can result in crusting in winter and spring. If plowed in the fall, many of these soils are nearly as dense and hard at planting time as they were before they were plowed. Erosion is a severe hazard in fall-plowed areas that have slopes of more than 2 percent.

Field crops suited to the soils and climate of the county include many that are not commonly grown. Corn is the chief row crop. Soybeans are grown on a small acreage. Grain sorghum, sunflowers, canola, potatoes, and similar crops can be grown. Wheat and oats are the most common close-growing crops. Rye, barley, buckwheat, and flax could also be grown.

Most of the acreage used for pasture and hay in the county is on hillsides. The soils in these areas formed mainly in material weathered from shale, siltstone, or sandstone. They are subject to erosion. The dominant forage species in the county are bluegrass, tall fescue, orchardgrass, and timothy. Many pastures are unimproved and need renovation and brush control.

In some pastures and meadows, overgrazing has resulted in weedy, low producing forage. In these areas the hazard of erosion has increased because of the sparse, short vegetative cover. The soils typically are acid and are low in phosphorus and potassium. Under good management, which includes using soil tests, these soils can, in time, be restored to a much higher level of productivity. A current agronomy guide that gives recommendations on the proper management of hayland and pasture is available from the Ohio State University Extension.

If forage crops are to be successfully established, good-quality seed of species and varieties suited to the soils of the county should be selected for planting. Reseeding requires proper seedbed preparation, proper seeding methods, timely seeding, and recommended applications of lime and fertilizer. Pasture renovation requires that the existing grasses and weeds be killed or suppressed before reseeding. The objective is to kill the existing sod and leave it on or near the surface of the soil as a dead mulch to help control erosion. The pasture should be tilled and seeded on the contour.

No-till seeding can be effective on most of the soils in Vinton County, except for those with drainage limitations. In areas where a no-till seeding method is used, the existing vegetation should be killed or suppressed by grazing or by using herbicides.

April or August generally is the best time for seeding forage species. Forages can be seeded with small grain. If small grain is seeded in the spring, it aids in weed control but must be mowed off prior to heading to minimize competition for light, moisture, and nutrients.

Seeding mixtures should be based on the soil and the desired pasture management system. Mixtures of legumes and grasses have a higher nutritional value than grasses alone. Alfalfa and red clover should be seeded in areas of well drained soils. Ladino clover and alsike clover are better suited to wet soils. Bromegrass, lespedeza, warm-season grasses, and vetches generally are not grown as forage species in Vinton County but are adapted to the soils and can be included in a forage management system.

Maintenance applications of lime and fertilizer based on the results of soil tests help to ensure good productivity and lengthen the life of the stand. Weed control by mowing or spraying chemicals, or both, helps to maintain a high level of production. Weeds should be mowed before they go to seed. Control of insects, such as the alfalfa weevil and potato leafhopper, may be needed. When herbicides or insecticides are used, all label restrictions and directions should be followed.

Planners of management systems for individual fields or farms can obtain specific information from the local office of the Natural Resources Conservation Service or the Ohio State University Extension.

Specialty Crops

Specialty crops grown in Vinton County include strawberries and tree fruits. Apples and peaches are the most common tree fruits grown in the county (Ohio Agricultural Statistics Service 1991). Other specialty crops, such as raspberries, blackberries, blueberries, and grapes, can also be grown.

Deep, well drained soils, such as the Chavies and Wellston soils, warm up early in the spring. They are especially well suited to many vegetables. Crops can generally be planted and harvested earlier on these soils than on the other soils in the county.

Most of the nearly level to moderately steep, well drained soils on stream terraces and uplands are suited to orchards. Soils in low areas, where frost occurs frequently and air drainage is poor, generally are poorly suited to both vegetables and orchards.

The latest information about growing specialty crops can be obtained from the local office of the Ohio State University Extension or the Natural Resources Conservation Service.

Cropland Limitations and Hazards

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in table 5. The main concerns affecting the management of cropland are controlling erosion; removing excess water; minimizing surface crusting and compaction; conserving moisture; and maintaining soil tilth, organic matter content, and fertility.

Generally, a combination of several practices is needed to control erosion. Conservation tillage, stripcropping, field windbreaks, tall grass barriers, contour farming, conservation cropping systems, crop residue management, diversions, and grassed waterways help to prevent excessive soil loss.

Surface or subsurface drainage systems, or both, are used to remove excess water, lower the seasonal high water table, and minimize ponding.

A surface crust forms in tilled areas after hard rains and may inhibit seedling emergence. Regular additions of crop residue, manure, or other organic materials improve soil structure and minimize crusting. Tilling within the proper range in moisture content minimizes surface compaction.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the rate of water infiltration. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Measures that are effective in maintaining soil tilth, organic matter content, and fertility are management needs. These measures include applying organic and inorganic fertilizer, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in areas where erosion is controlled. All soils used for crops respond well to applications of fertilizer.

Some of the limitations and hazards shown in the table cannot be easily overcome. These are *flooding, depth to rock, ponding, slope,* and *limited organic matter content.*

Flooding.—Flooding can damage winter grain and forage crops. A tillage method that partly covers crop residue and leaves a rough or ridged surface helps to prevent removal of crop residue by floodwater. Tilling and planting should be delayed in the spring until flooding is no longer a hazard.

Depth to rock.—Rooting depth and available moisture may be limited by rock within a depth of 40 inches.

Ponding.—The soils are subject to ponding. Surface drains help to remove excess surface water and minimize damage from ponding.

Slope.—Unless a conservation tillage system is applied, water erosion may be accelerated in areas where the slope is more than 15 percent. The selection of crops and the use of equipment are limited. Cultivation may be restricted.

Limited organic matter content.—Many soils that have a light colored surface layer have a low or moderately low organic matter content and weak or moderate structure. Regularly adding crop residue, manure, and other organic material to the soil helps to maintain or improve the content of organic matter and soil structure.

Other limitations and hazards shown in the table are *potential for ground-water pollution, limited available water capacity, poor or fair tilth, restricted permeability, surface crusting, part of original surface layer removed by erosion, frost heave, easily eroded, seasonal high water table,* and *surface compaction.*

Potential for ground-water pollution.—The potential for ground-water pollution is a management concern in areas of soils that are excessively permeable or have hard bedrock, a fragipan, or a water table within the profile.

Limited available water capacity, poor or fair tilth, restricted permeability, and *surface crusting.*—These limitations can be overcome by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems.

Part of original surface layer removed by erosion.—More than 25 percent of the original surface layer has been removed by erosion. In cultivated areas the existing surface layer consists of a mixture of the original surface layer and part of the subsurface layer or subsoil.

Frost heave.—Deep-rooted legumes and some small grain crops can be damaged by frost heave.

Easily eroded.—Some soils are more susceptible to erosion, as shown by their high K value. When these soils are used for crop production, they can be quickly degraded through loss of topsoil.

Seasonal high water table.—The choice of crops may be limited and the stand and vigor of crop species may be reduced by the seasonal high water table, especially if it is at a depth of less than 40 inches. The seasonal high water table can also have an adverse effect on pesticide and herbicide movement in the soil, leading to possible ground-water contamination.

Surface compaction.—If the surface of the soil is compacted, pore space is decreased, which reduces the infiltration rate, permeability, and the extent of the soil surface area available for cation exchange. As a result, seed germination and seedling vigor may be reduced.

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 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

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

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

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

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

Land Capability Classification

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

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have few limitations that restrict their use.

Class 2 soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class 5 soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation.

Class 7 soils have very severe limitations that make them unsuitable for cultivation.

Class 8 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, 2e. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w, s,* or *c* because the soils in class 5 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 7. The capability classification of map units in this survey area is given in the yields table and under the heading "Interpretive Groups," which follows the tables at the back of this survey.

Pasture and Hayland Suitability and Production

Information in table 8 and in the "Interpretive Groups" section can be used by farmers, farm managers, conservationists, and extension agents in planning the use of soil for pasture and hay crops. Soils on slopes of more than 25 percent generally are unsuited to hay and those on slopes of more than 40 percent generally are unsuited to hay and pasture. The table lists estimated yields for common pasture and hay crops and identifies the pasture and hayland suitability group for each soil.

The pasture and hayland suitability groups are based on soil characteristics and limitations. Soils assigned the same suitability group symbol require the same general management and have about the same potential productivity. Only the characteristics and limitations of soils in Vinton County are included in the following descriptions.

Group A consists of soils that have few limitations affecting the management and growth of climatically adapted plants. *Group A-1* consists of deep and very deep, well drained and moderately well drained soils. The soils have a surface layer of silt loam, silty clay loam, loam, or channery loam. They have a moderate or high available water capacity. Plants in areas of the soils respond favorably to additions of lime. Frequent applications of lime may be needed to maintain an adequate pH level. The low pH level in the subsoil shortens the life of some deep-rooted legumes in stands. Slopes range from 1 to 15 percent.

Group A-2 consists of deep and very deep, well drained and moderately well drained soils. The soils have a surface layer of silt loam, silty clay loam, loam, or channery loam. They have a moderate or high available water capacity. Plants on the soils respond favorably to additions of lime. Frequent applications of lime may be needed to help maintain an adequate pH level. The low pH level in the subsoil shortens the life of some deep-rooted legumes. Slope ranges from 15 to 25 percent. It limits mechanically applying lime and fertilizer and clipping, mowing, and spraying for weed control. Erosion is a hazard if pastures are overgrazed or are cultivated for reseeding. The soils are unsuited to no-till seeding.

Group A-3 consists of deep and very deep, well drained and moderately well drained soils. The soils have a surface layer of silt loam or silty clay loam. The available water capacity is moderate. Slope ranges from 25 to 40 percent. The soils are generally unsuited to hay and are poorly suited to pasture.

Group A-4 consists of moderately deep, well drained soils that have stones on the surface. The stones are extensive enough to preclude the use of hay making equipment. The soils have a surface layer of channery loam and are droughty. The available water capacity is very low. Slope ranges from 25 to 70 percent.

Group A-5 consists of very deep, well drained and moderately well drained soils on flood plains and low stream terraces. The soils are subject to flooding. The flooding limits the use of the soils for pasture during periods of stream overflow, and the deposition of sediment by floodwater lowers the quality of the forage. The soils have a surface layer of loam or silt loam. The available water capacity is moderate or high. Slope ranges from 0 to 6 percent.

Group A-6 consists of deep and very deep, well drained and moderately well drained soils. The soils are subject to frost action, which can damage legumes. Including grasses in seeding mixtures with legumes minimizes the damage caused by frost heaving. The soils have a surface layer of silt loam or silty clay loam. The available water capacity is moderate or high. Slope ranges from 0 to 15 percent.

Group B consists of soils that are droughty. The droughtiness limits the growth and production of hay and pasture.

Group B-2 consists of deep and very deep, well drained, droughty soils. The soils have a surface layer of channery loam. The available water capacity is very low. Slope ranges from 25 to 40 percent. The soils have a high content of rock fragments in the subsoil. They are generally unsuited to hay and are poorly suited to pasture.

Group B-3 consists of very deep, moderately well drained soils on flood plains. The soils are subject to flooding. The flooding limits the use of the soils for pasture during periods of stream overflow, and the deposition of sediment by floodwater lowers the quality of the forage. The soils have a surface layer of silt loam. The available water capacity is moderate. Slope ranges from 0 to 3 percent.

Group B-4 consists of soils that have been reclaimed following surface mining operations. The soils are very deep, well drained, and droughty. They have a surface layer of silty clay loam or clay loam and a high percentage of rock fragments in the substratum. The available water capacity is low or very low. Most plants on the soils respond favorably to additions of lime. Frequent applications of lime may be needed to help maintain an adequate pH level. The root zone generally is 20 to 30 inches deep. Slope ranges from 0 to 25 percent.

Group C consists of soils that generally are wet because they have a seasonal high water table. Some of the soils are saturated during the growing season.

Group C-1 consists of very deep, somewhat poorly drained soils. The soils are subject to frost action, which can damage legumes. Including grasses in seeding mixtures with legumes minimizes the damage caused by frost heaving. The soils have a surface layer of silt loam. The available water capacity is high. The seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species grow best on the soils. Subsurface drains are used to lower the seasonal high water table. Plants on the soils respond favorably to additions of lime. Frequent applications of lime may be needed to help maintain an adequate pH level. The low pH level in the subsoil shortens the life of some deep-rooted legumes. Slope ranges from 0 to 3 percent.

Group C-2 consists of deep and very deep, somewhat poorly drained soils. Some of the soils are subject to flooding. The flooding limits the use of soils for pasture during periods of stream overflow, and the deposition of sediment by floodwater lowers the quality of the forage. The soils in group C-2 have a surface layer of silt loam or silty clay loam. The available water capacity is moderate or high. The seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species grow best on the soils. Because of the moderately deep root zone, the soils are best suited to forage plants that do not have a taproot. Subsurface drains are used to lower the seasonal high water table. The effectiveness of the drains generally is limited by the restricted permeability in the subsoil or the landscape position of the soils. Slope ranges from 0 to 15 percent.

Group C-3 consists of very deep, somewhat poorly drained to very poorly drained soils on flood plains. The soils are subject to frequent, occasional, or rare periods of flooding. The flooding limits the use of the soils for pasture during periods of stream overflow, and the deposition of sediment by the floodwater lowers the quality of the forage. The soils have a surface layer of silt loam or silty clay loam. The available water capacity is moderate or high. Frost action may damage legumes. Including grasses in seeding mixtures with legumes minimizes the damage caused by frost heaving. A seasonal high water table limits the rooting depth of deep-rooted forage plants. Shallow-rooted species grow best on the soils. Subsurface drains are used to lower the seasonal high water table. The effectiveness of the drains is limited by the landscape position of the soils. Slope ranges from 0 to 3 percent.

Group E consists of very deep soils that have an effective rooting depth of less than 20 inches. The soils formed in mine spoil. They have a shallow surface layer and a toxic, acid subsoil. Because of the shallow root zone, the soils are best suited to forage plants that have a fibrous root system than to plants that have deep roots.

Group E-2 consists of very deep, well drained, droughty soils. The soils have a surface layer of silty clay loam or clay loam. The available water capacity is low or very low. Slope ranges from 25 to 40 percent. Soils in this group are generally unsuited to hayland and are poorly suited to pasture.

Group E-3 consists of very deep, well drained, droughty soils. The soils have a surface layer of channery loam. The available water capacity is low. Slope ranges from 0 to 25 percent.

Group F consists of soils that have a restricted root zone. The root growth of climatically adapted plants is limited to a depth of 20 to 40 inches. Because of the moderately deep root zone, the soils are best suited to forage plants that do not have a taproot.

Group F-1 consists of moderately deep, well drained soils. The soils have a surface layer of silt loam or channery silt loam. The available water capacity is low or very low. Some of the soils are droughty. Plants on the soils respond favorably to additions of lime. Frequent applications of lime may be needed to help maintain an adequate pH level. The low pH level in the subsoil shortens the life of some deep-rooted legumes. Slope ranges from 2 to 25 percent.

Group F-2 consists of moderately deep, well drained, droughty soils. The soils have a surface layer of channery silt loam or channery loam and a high content of rock fragments in the subsoil. Slope ranges from 25 to 40 percent. The soils are generally unsuited to hayland and are poorly suited to pasture.

Group F-3 consists of deep and very deep, moderately well drained, droughty soils that are moderately deep to a fragipan. The soils have a surface layer of silt loam or channery silt loam. The available water capacity is low in the root zone. Plants on the soils respond favorably to additions of lime. Frequent applications of lime may be needed to help maintain an adequate pH level. The low pH level in the subsoil shortens the life of some deep-rooted legumes. Slope ranges from 1 to 25 percent.

Group F-5 consists of deep and very deep, well drained soils with a high clay content in the subsoil that restricts rooting depth. The soils have a surface layer of silty clay loam or silt loam. The available water capacity is moderate in the root zone. Slope ranges from 2 to 25 percent.

Group F-6 consists of deep and very deep, well drained soils with a high clay content in the subsoil that restricts rooting depth. The soils have a surface layer of silty clay loam. The available water capacity is moderate in the root zone. Slope ranges from 25 to 40 percent.

Group G consists of soils that have a very restricted root zone. The soils formed in mine spoil. They have a shallow surface layer and a toxic, extremely acid subsoil. Because of the shallow root zone, the soils are best suited to forage plants that have a fibrous root system than to plants that have deep roots.

Group G-1 consists of very deep, well drained, droughty soils. The soils have a surface layer of loam. The available water capacity is low. Slope ranges from 0 to 25 percent. The soils are poorly suited to hayland, and because of a severe hazard of erosion, they are generally unsuited to pasture.

Group H consists of soils that are not suited to forage species. *Group H-1* consists of soils that have slopes of more than 40 percent and those in surface mined areas with soil characteristics that prohibit them from being used as pasture. The soils in this group are generally unsuited to hay and pasture.

Miscellaneous land types and soils that are subject to ponding are not assigned a rating. The ponded soils generally are not used for forage production.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses (fig. 8). It could be cultivated land, pastureland, forest land, or other land, but it is not urban or built-up land or water areas (Federal Register 1978). The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 9,400 acres in Vinton County, or nearly 4 percent of the total acreage, meets the soil requirements for prime farmland. An additional 24,900 acres, or about 9 percent of the acreage in the county, meets the requirements for prime farmland if the soils are drained or protected from frequent flooding, or both. Fairly large areas of prime farmland in Vinton County are on bottom land and terraces. Other areas of prime farmland are on gently sloping upland ridgetops. About 40 percent of the prime farmland in the county is used as cropland or pasture (Federal Register 1978).

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

Figure 8.—An area of prime farmland used for hay. The soil is Omulga silt loam, 0 to 2 percent slopes.

The map units in the survey area that are considered prime farmland are listed in table 9. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Lands Surface Mined for Coal

Surface mining has affected thousands of acres in Vinton County. Consequently, more and more farmers are utilizing reclaimed land in their farming operations. Land that is reclaimed under current regulations has greater potential for agricultural production than that mined prior to the enactment of the Ohio strip mine reclamation law in 1972. Some limitations affect the management of this disturbed land.

Under current law, coal companies are required to replace a minimum of 6 inches of soil material from natural soils in most of the disturbed areas that are reclaimed. In areas identified as prime farmland, the companies are required to replace the A, B, and C horizons to a depth of as much as 48 inches; however, most soils that are strip-mined in the county do not meet the requirements for prime farmland. As a result, the majority of mined land is being reclaimed with a minimum of 6 inches of soil material over the spoil.

In evaluating the potential of reclaimed mine spoil for agricultural use, it is important to know the physical and chemical properties of the spoil and its suitability for crops. By evaluating these properties against crop needs for air, water, and nutrients, land users will be able to select suitable crops and the best management practices.

Rock fragments derived from fragmented bedrock make up from 35 to 60 percent of the volume of most mine spoil. The content of rock fragments in the mine spoil is significantly higher than it was in the upper 18 inches of the natural soil that was removed. In most natural soils, the content of rock fragments ranges from 0 to 15 percent in the surface layer and subsoil.

The high content of rock fragments restricts the effective root zone and limits the available water capacity in the soil. Roots tend to concentrate along the soil-rock fragment interfaces, and a few roots penetrate the compact, massive spoil material.

The organic matter content is considerably lower in mine spoil than it is in natural soils. The low organic matter content of the mine spoil results in a lower level of natural fertility and in poorer tilth.

High bulk density is common in areas of mine spoil. It occurs in both the replaced soil material and the underlying graded spoil. The high bulk density is attributed to compacting by heavy wheel-type machinery used during reclamation; increased handling of topsoil material during stockpiling and spreading; performing mining and reclamation operations when the soils are too wet; and allowing insufficient time for soil-forming processes, such as freezing and thawing, wetting and drying, biological activity, and root action, to decrease the bulk density.

As a result of the high bulk density in both the graded spoil and the replaced soil material, mine soils have less pore space, are less permeable to water and air movement through the soil, and cannot be easily penetrated by roots. These factors retard plant growth and result in reduced yields.

Specific information about using mine soils for agricultural production can be obtained from the local office of the Natural Resources Conservation Service or the Ohio State University Extension.

Woodland

The woodland cover in Vinton County is extensive. Forest land makes up about 178,000 acres, or about 67 percent of the total area of Vinton County (USDA 1997). Both state and federally owned forests are in the county, but most of the forested land is privately owned.

The only areas that have been extensively cleared of trees are the valleys of Salt Creek and Raccoon Creek. Salt Creek valley is the main agricultural area in the county. In many areas old pastures or abandoned strip mines are reverting back to woodland. As a result, the total acreage of woodland is increasing in the county.

The woodland is mainly a mixed mesophytic forest dominated by oak. Other major types of trees include hickory, maple, yellow-poplar, walnut, and beech. Red maple and yellow-poplar tend to be the early successional species. Oak, hickory, beech, and maple are the climax species, and as such, they are characteristic of mature forests.

In places the woodland shows the result of abuse and neglect. Heavy cutting without planning for future timber production has resulted in understocked stands of desirable tree species, and high grading, a practice where the most valuable trees are selected for harvest, has resulted in the continual removal of the best trees. Culls and low-value trees have not been removed from many good-quality stands. In a few areas, grazing by livestock has destroyed the leaf litter, damaged roots, killed young trees, compacted the soil, and increased the hazard of erosion. Good management can, in time, restore these areas to a higher level of production.

Soils differ in their productivity for tree growth. The available water capacity of a soil is an important factor affecting tree growth. It is influenced by soil depth, texture, permeability, and internal drainage. The aspect, which is the direction of exposure, and the position of the soil on the landscape also are important factors affecting tree growth. Other factors include the slope, the degree of past erosion, and the levels of acidity and natural fertility of the soil.

Aspect is the compass direction toward which a slope faces. North aspects are slopes that have an azimuth of 355 degrees to 95 degrees; south aspects are slopes that have an azimuth of 96 degrees to 354 degrees. Trees grow better on north aspects and in coves because they are less exposed to the prevailing winds and the sun. The slower tree growth on south aspects is due to a higher soil temperature and a higher evaporation rate.

The position of the soil on the landscape also affects the amount of moisture available for tree growth. The moisture supply tends to be higher in the downslope areas because of the downhill movement of water. On the lower parts of the slopes, the soils are generally deeper, less soil moisture is lost through evaporation, and the soil temperature is generally lower.

The slope is another important management factor. A very steep slope seriously limits the use of equipment. As the percentage of slope increases, the rate of water infiltration decreases and the rate of runoff and the hazard of erosion increase.

Erosion reduces the volume of soil available for water storage. Severe erosion removes the original surface layer and exposes the subsoil. Because the subsoil is commonly less porous, the runoff rate increases and the rate of water infiltration decreases. Both tree growth and natural reseeding are adversely affected.

Woodland Management and Productivity

Table 10 can help woodland owners or forest managers plan the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce in a pure stand under natural conditions. The number 1 indicates low potential productivity; 2 or 3, moderate; 4 or 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and N.

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

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

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

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the most common species on the soil and is the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Woodland Harvesting and Regeneration Activities

Table 11 gives the degree and kind of limitations that affect the operation of the equipment used in tree harvesting and in the regeneration of forests. Ratings are given for haul roads, log landings, skid trails and logging areas, and site preparation and planting. The limitations are considered *slight* if the physical site characteristics impose little or no limitations on the kind of equipment or the time of operation; *moderate* if the site characteristics impose some limitations on the kind of equipment or the time of operation, or both; and *severe* if the site conditions are such that special equipment or techniques are needed or the time of efficient operation is very limited, or both.

Haul roads are access roads leading from log landings to primary or surfaced roads. Generally, they have not been paved or graveled. The ratings are based on soil properties, site features, and the observed performance of the soils. Wetness, rockiness, depth to hard bedrock, stoniness, soil strength, slope, soil texture, and flooding should be considered when selecting routes for haul roads. The wetness and flooding affect the duration of use. Rock outcrops, stones, and boulders, which are difficult to move, hinder construction when cutting or filling is needed. Soil strength, as inferred from the AASHTO group index and AASHTO group, is a measure of the traffic-supporting capacity of the soil. Slope affects the use of equipment and the cutting and filling requirements of the site.

Log landings are areas where logs are assembled for transportation. The best sites for landings require little or no surface preparation, which consists of cutting and filling. Considerable soil compaction can be expected in these areas. The ratings are based on the soil properties, site features, and observed performance of soils. Wetness, flooding, rockiness, stoniness, slope, depth to hard bedrock, soil strength, soil texture, and content of coarse fragments should be considered when selecting sites for log landings. The wetness and flooding affect the duration of use. Rock outcrop, stones, and boulders, which are difficult to move, limit the use of equipment and affect the configuration and location of landings. Depth to hard bedrock is a problem where cutting and filling are required. Slope affects the use of equipment and the cutting and filling requirements of the site. Soil texture affects trafficability. Soil strength, as inferred from the AASHTO group index and the AASHTO group, is a measure of the traffic-supporting capacity of the soil.

Skid trails and logging areas refer to the areas that are partially or completely logged. In these areas logs are moved from the stump to the log landing with rubber-tired equipment. Using other types of log-moving equipment can sometimes minimize or help to overcome limitations. The ratings are based on the soil properties, site features, and observed performance of the soils. The seasonal high water table, flooding, rockiness, stoniness, texture, and slope affect the use of logging equipment. Deferring logging activities during periods when the soil is saturated near the surface minimizes the environmental damage. In addition, special equipment is generally required during these periods. Equipment should not be used on soils that are subject to long periods of flooding. Operating equipment on these soils can result in equipment damage or environmental damage, or both. Surface stones, boulders, and rock outcrop limit the safe and efficient use of equipment. As slope gradients increase, traction problems worsen. Traction is a problem on clayey soils during wet periods.

Site preparation and planting are mechanized activities. The ratings are based both on the limitations affecting the efficient use of equipment and on the hazards that can result in damage to the site when the equipment is used. It is assumed that the operating techniques used do not displace or remove topsoil from the site or create channels in which storm water can concentrate. The seasonal high water table, flooding, rockiness, stoniness, content of coarse fragments, depth to hard bedrock, texture, and slope affect the use of site preparation and planting equipment. Deferring site preparation and planting during periods when the soil is saturated near the surface helps to minimize environmental damage. Special equipment is generally required during these periods. Equipment should not be used on soils that are subject to long periods of flooding. Operating equipment on the soils can result in damage to the equipment or the environment, or both. Surface stones, boulders, and rock outcrop limit the safe and efficient use of equipment. The coarse fragments and the very shallow depth to hard bedrock can interfere with the equipment used in site preparation and planting. As slope gradients increase, traction problems worsen. Traction is a problem on clayey soils during wet periods and on sandy soils during dry periods.

Christmas Tree Production

Christmas tree production is increasing in Vinton County, and the potential is good for additional expansion. The county is not far from highly populated areas of the State so growers have access to large markets for Christmas trees.

In the past, Christmas trees were grown generally on marginal soils that were too steep, infertile, dry, or eroded for other agricultural purposes. Emphasis has now shifted toward the production of high-quality trees requiring much more intensive cultural practices and higher soil productivity. As a result, the marginal agricultural areas used in the past are no longer suitable for Christmas tree production.

The soils best suited to Christmas tree production are in nearly level to sloping areas. All operations, from site preparation to harvesting, are accomplished faster, more easily, and with less manpower and less wear on equipment in the less sloping areas than they are in the more sloping areas. The soils in the steeper areas also are more susceptible to erosion and are generally drier and less fertile than the soils in the less sloping areas.

Areas that are relatively free of such obstructions as large rocks, tall trees, fence rows, and brush are preferred as sites for Christmas tree production. Unless these obstructions are removed in areas used for Christmas trees, production will be hampered; however, removing the obstructions can be costly, especially if heavy equipment is used during the process.

In some years harvesting and other operations have been done during inclement weather. Good roads to the plantation area are necessary, especially if trucks are used to remove the trees. Good access is also important for retail operations where consumers choose or cut their own trees.

The choice of tree species to plant is an important decision. Making a suitable choice saves both time and money. The following considerations may influence this choice—consumer preference, plant characteristics, soil characteristics, and presence of diseases or harmful insects. The combination of soil conditions, topographic factors, and biological agents prevailing in an area constitute the site factors of that area. The combination of these factors, along with the ecological requirements of the species, should be carefully considered in order to ensure the successful establishment, survival, and growth of trees.

The paragraphs that follow describe the most common species selected for planting as Christmas trees in the county.

Scotch pine is the most widely planted Christmas tree species in Vinton County. It grows best in areas of moist, well drained soils. It requires considerable shaping but responds well to shearing. Trees 6 to 7 feet tall generally can be produced in 6 to 9 years.

Eastern white pine is native to some parts of Ohio.

It grows best in areas of moist, well drained soils but is more water tolerant than Scotch pine. It generally requires heavy shearing to produce high-quality trees. Trees 6 to 7 feet tall can generally be produced in 6 to 9 years.

Blue spruce is extensively planted in Vinton County. It grows best in areas of moist, well drained soils but will survive and grow in areas of somewhat poorly drained soils. It requires some light shearing to produce high-quality trees. It is subject to damage from spring frost and should not be planted in the lower landscape positions or in frost pockets. Trees 6 to 7 feet tall can generally be produced in 8 to 12 years.

Norway spruce formerly was one of the most widely planted species. Needle retention, however, is very poor when the tree is cut, and sales have declined in recent years. As a result, this species is no longer extensively planted. It is the easiest spruce to establish. Trees 6 to 7 feet tall can generally be produced on good sites in 7 to 11 years. Delaying harvesting as long as possible improves needle retention after the tree is cut.

White spruce retains its needles better than Norway spruce but not as well as the pines. Harvesting white spruce should be delayed as long as possible. On relatively good sites, this species grows to a height of 6 to 7 feet in 8 to 11 years.

Fraser fir, like other firs, can be planted in areas of moist, well drained soils throughout the county, but it grows best on the cooler, north- or east-facing slopes. It does not grow well on wet soils or during periods of prolonged drought. It generally grows to a height of 6 to 7 feet in 7 to 11 years.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 12 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in the table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from the local office of the Natural Resources Conservation Service or of the Coöperative Extension Service or from a commercial nursery.

Recreation

The recreation industry in Vinton County has expanded during the past few decades because several State parks, State forests, and public hunting areas are located in the area. Federal and State governments and large corporations own several thousand acres of land in the county. Most of this acreage is available for recreational uses.

The public is provided opportunities for hunting, fishing, camping, hiking, picnicking, and other outdoor activities. Hunting is not permitted in the State parks for safety reasons. Privately owned recreational areas are also being developed and are currently being used in several locations in the county.

Lake Hope State Park and the adjacent Zaleski State Forest are in the northeastern corner of the county. Lake Alma State Park, Lake Rupert, and Richland Furnace State Forest are in the south-central part of the county. A portion of Tar Hallow State Forest is in the northwest corner of the county, and a portion of Wayne National Forest is in the north-central part of the county.

The soils of the survey area are rated in table 13 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 sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

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

The information in table 13 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 16 and interpretations for dwellings without basements and for local roads and streets in table 15.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

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

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

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

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

Wildlife Habitat

A wide variety of wildlife inhabits Vinton County, and a wide variety of habitats support the diverse wildlife. The various habitats include cropland, openland, various successional stages of woodland, riparian areas (borders of rivers and streams), and wetlands. Wildlife habitat is directly related to soil type and land use.

Upland wildlife habitat consists of areas of cropland, openland, and woodland. The major soils in areas of this habitat are those in the Shelocta, Brownsville, Wharton, Rarden, Gilpin, Latham, and Omulga series. Wildlife in the cropland and openland areas include deer, rabbit, woodchuck, red-tailed hawk, quail, dove, and bobolink. The habitat for upland wildlife can be improved by including grasses and legumes in crop rotations, applying a system of conservation tillage, constructing ponds, and planting trees and shrubs.

Wildlife in the woodland areas include deer, grouse, turkey, raccoon, squirrel, and pileated woodpecker. The habitat for woodland wildlife can be improved by excluding livestock from woodlands, building brush piles, and clearcutting small plots in stands of mature trees.

The major riparian areas in the county are along Raccoon Creek and its tributaries and along Salt Creek. Deer, beaver, muskrat, wood duck, heron, and turtles inhabit these areas. Pope, Tioga, Philo, Orrville, and Chavies soils are common in these riparian areas. The habitat for riparian wildlife can be improved by stabilizing streambanks, erecting wood duck nest boxes, and maintaining or reestablishing forest buffers along the riparian areas.

Wetlands commonly are in the riparian areas in the county. Oxbows and undrained depressions along streams can be further developed to improve wetland wildlife habitat. Special plantings can attract waterfowl, and water level management can enhance the value of the wetlands to wildlife.

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture also are 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 flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are foxtail, goldenrod, smartweed, ragweed, and fall panicum.

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

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

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, saltgrass, cordgrass, rushes, sedges, and reeds.

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

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

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

Habitat for woodland wildlife consists of areas of deciduous and/or coniferous plants and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, 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, shore birds, muskrat, mink, and beaver.

Engineering

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

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

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

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

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

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

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

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

Building Site Development

Table 15 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, or 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 depth to the water table.

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

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock 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 16 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

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

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock 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 filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

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

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

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

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

The ratings in the table 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 landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 17 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

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

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

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

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

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

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

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

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

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

Water Management

Table 18 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a fragipan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock 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, and 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 control 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 erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

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

Soil Properties

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

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

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

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

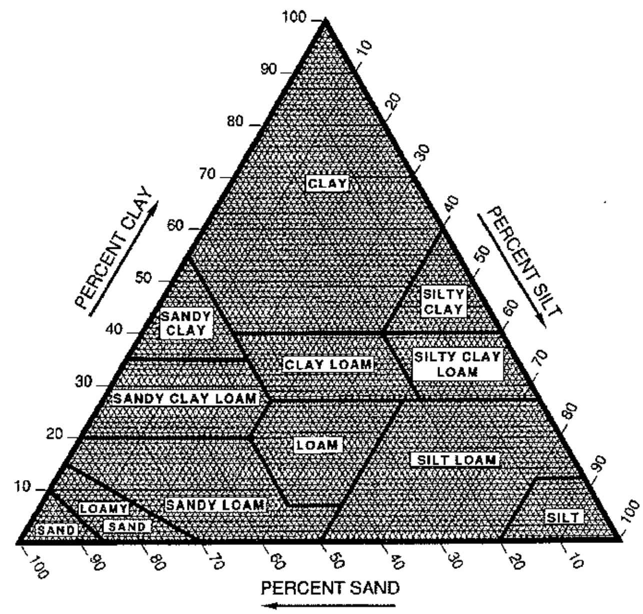

Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 19 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO 1986).

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

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

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

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

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

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

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

Physical and Chemical Properties

Tables 20 and 21 show 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.

Depth to the upper and lower boundaries of each layer is indicated.

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

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3-bar moisture tension. Weight is determined after the soil is dried at 105 degrees C. In table 20, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

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

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect retention of water and 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.

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 the basis of measurements of similar soils.

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

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

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In this table, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.02 to 0.64. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

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

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

1. Coarse sands, sands, fine sands, and very fine sands.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of coarse fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

In table 21, *cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. Soils having a high cation-exchange capacity can retain cations. The ability to retain cations helps to prevent the pollution of ground water.

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.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Soil and Water Features

Tables 22 and 23 give estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

In table 22, *hydrologic soil groups* are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

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

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

The table gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs, on the average, once or less in 2 years (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs, on the average, more than once in 2 years (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered 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 estimates are based mainly on observations of the water table at selected sites and on the evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. Indicated in the table are depth to the seasonal high water table, the kind of water table, 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 the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot.

The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. *Ponding duration* classes are the same as those for flooding. *Maximum ponding depth* refers to the depth of the water above the surface of the soil.

In table 23, *depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

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

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

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

Hydric Soils

In this section, hydric soils are defined and described and the hydric soils in the survey area are listed.

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (Cowardin and others 1979; U.S. Army Corps of Engineers 1987; National Research Council 1995; Tiner 1985). Criteria for each of the characteristics must be met for areas to be identified as wetlands. Undrained hydric soils that have natural vegetation should support a dominant population of ecological wetland plant species. Hydric soils that have been converted to other uses should be capable of being restored to wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register 1994). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register 1995). These criteria are used to identify a phase of a soil series that normally is associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff 1998) and in the "Soil Survey Manual" (Soil Survey Division Staff 1993).

If soils are wet enough for a long enough period to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field

Indicators of Hydric Soils in the United States" (Hurt, Whited, and Pringle 1996).

Hydric soils are identified by examining and describing the soil to a depth of about 20 inches. This depth may be greater if determination of an appropriate indicator so requires. It is always recommended that soils be excavated and described to the depth necessary for an understanding of the redoximorphic processes. Then, using the completed soil descriptions, soil scientists can compare the soil features required by each indicator and specify which indicators have been matched with the conditions observed in the soil. The soil can be identified as a hydric soil if at least one of the approved indicators is present.

The following map units meet the definition of hydric soils and, in addition, have at least one of the hydric soil indicators. This list can help in planning land uses; however, onsite investigation is recommended to determine the hydric soils on a specific site (National Research Council 1995; Hurt, Whited, and Pringle 1996).

Bo Bonnie silt loam, frequently flooded
Bp Bonnie silt loam, ponded
Pm Piopolis silt loam, frequently flooded

Map units that are made up of hydric soils may have small areas, or inclusions, of nonhydric soils in the higher positions on the landform, and map units made up of nonhydric soils may have inclusions of hydric soils in the lower positions on the landform.

The following map units, in general, do not meet the definition of hydric soils because they do not have one of the hydric soil indicators. A portion of these map units, however, may include hydric soils. Onsite investigation is recommended to determine whether hydric soils occur and the location of the included hydric soils.

Cg Chagrin silt loam, frequently flooded
DoA Doles silt loam, 0 to 2 percent slopes
FcA Fitchville silt loam, 0 to 2 percent slopes
McA McGary silty clay loam, 0 to 2 percent slopes
Nw Newark silt loam, frequently flooded
OmA Omulga silt loam, 0 to 2 percent slopes
Or Orrville silt loam, frequently flooded
Ph Philo silt loam, frequently flooded
Po Pope loam, frequently flooded

Physical and Chemical Analyses of Selected Soils

Samples of some of the soils in Vinton County were analyzed by the Soil Characterization Laboratory, Department of Agronomy, The Ohio State University, Columbus, Ohio. The physical and chemical data obtained from the samples include those on particle-size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations. These data were used in classifying and correlating the soils and in the evaluation of their behavior under various land uses.

In addition to the data from Vinton County, laboratory data are also available for nearby counties that have many of the same soils. All of these data and the data from Vinton County are on file at the School of Natural Resources, The Ohio State University, Columbus, Ohio; the Department of Natural Resources, Division of Soil and Water Conservation, Columbus, Ohio; and the Natural Resources Conservation Service, State Office, Columbus, Ohio.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (Soil Survey Staff 1975, 1990). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 24 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

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

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

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (Soil Survey Division Staff 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (Soil Survey Staff 1975) and in "Keys to Soil Taxonomy" (Soil Survey Staff 1990). Unless otherwise indicated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Aaron Series

Depth class: Deep
Drainage class: Moderately well drained
Permeability: Slow
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, shoulders
Slope: 6 to 15 percent

Commonly adjacent soils: Germano, Gilpin, Rarden

Taxonomic class: Fine, mixed, mesic Aquic Hapludalfs

Typical Pedon

Aaron silt loam, in an area of Gilpin-Aaron complex, 6 to 15 percent slopes; about 2 miles north of Bolins Mills, in Knox Township; 1,150 feet west and 2,250 feet north of the southeast corner of sec. 34, T. 10 N., R. 15 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; firm; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few faint brown (10YR 5/3) silt coatings on faces of peds; moderately acid; clear smooth boundary.

Bt2—11 to 19 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct grayish brown (10YR 5/2) and yellowish red (5YR 5/6) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—19 to 28 inches; light yellowish brown (10YR 6/4) silty clay loam; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

BC—28 to 37 inches; light yellowish brown (2.5Y 6/4) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) and few medium distinct olive yellow (2.5Y 6/8) mottles; weak coarse subangular blocky structure; firm; common distinct gray (N 6/) clay films on faces of peds; strongly acid; gradual wavy boundary.

C—37 to 46 inches; light yellowish brown (2.5Y 6/4) silty clay loam; common medium distinct gray (N 6/) mottles; massive; firm; many soft siltstone fragments; strongly acid; gradual wavy boundary.

Cr—46 to 49 inches; light olive brown (2.5Y 5/4), weathered siltstone bedrock.

Range in Characteristics

Thickness of the solum: 30 to 50 inches
Depth to bedrock: 40 to 60 inches
Content of rock fragments: Ap and Bt horizons—0 to 14 percent; BC and C horizons—0 to 35 percent
Ap horizon:
Color—hue of 10YR, value of 4, chroma of 2 or 3
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 4 to 6
Texture—silty clay loam, silty clay, clay
C horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 4 to 6
Texture—silty clay loam, silty clay, or clay in the fine-earth fraction

Berks Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, shoulders
Slope: 6 to 15 percent
Commonly adjacent soils: Brownsville, Shelocta, Tarhollow

Taxonomic class: Loamy-skeletal, mixed, mesic Typic Dystrochrepts

Typical Pedon

Berks channery loam, in an area of Berks-Tarhollow complex, 6 to 15 percent slopes; about 3 miles east of Eagle Mills, in Eagle Township; 1,300 feet east and 1,950 feet south of the northwest corner of sec. 19, T. 10 N., R. 19 W.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) channery loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; about 20 percent sandstone channers; very strongly acid; abrupt wavy boundary.

E—1 to 3 inches; brown (10YR 5/3) channery loam; weak thin platy structure; friable; many fine and few medium roots; about 20 percent sandstone channers; very strongly acid; abrupt wavy boundary.

Bw1—3 to 8 inches; yellowish brown (10YR 5/4) channery loam; weak medium subangular blocky structure; friable; common fine and few medium roots; about 25 percent sandstone channers; very strongly acid; clear smooth boundary.

Bw2—8 to 15 inches; yellowish brown (10YR 5/4) extremely channery loam; weak fine subangular blocky structure; friable; few medium roots; about 65 percent sandstone channers; very strongly acid; clear wavy boundary.

C—15 to 24 inches; yellowish brown (10YR 5/4) extremely channery loam; massive; friable; few medium roots; about 80 percent sandstone channers; very strongly acid; clear wavy boundary.

R—24 to 27 inches; fractured, thinly bedded, fine grained sandstone bedrock.

Range in Characteristics

Thickness of the solum: 12 to 40 inches
Depth to bedrock: 20 to 40 inches
Content of rock fragments: A and E horizons—10 to 30 percent; Bw horizon—20 to 75 percent; C horizon—35 to 90 percent
A horizon:
Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4
Texture—loam or silt loam in the fine-earth fraction
E horizon:
Color—hue of 10YR, value of 4 to 6, chroma of 3 to 6
Texture—loam or silt loam in the fine-earth fraction
Bw horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 3 to 6
Texture—loam or silt loam in the fine-earth fraction
C horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—loam or silt loam in the fine-earth fraction

Bethesda Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Parent material: Noncalcareous regolith from surface mining
Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope: 0 to 70 percent
Commonly adjacent soils: Germano, Gilpin, Latham, Rarden

Taxonomic class: Loamy-skeletal, mixed, acid, mesic Typic Udorthents

Typical Pedon

Bethesda silty clay loam, 20 to 40 percent slopes; about 0.5 mile east of Mt. Pleasant, in Swan Township; 1,000 feet south and 2,100 feet east of the northwest corner of sec. 3, T. 12 N., R. 17 W.

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silty clay loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; many fine roots; about 10 percent shale and coal fragments; very strongly acid; abrupt smooth boundary.

C1—6 to 19 inches; yellowish brown (10YR 5/4) and very dark grayish brown (10YR 3/2) channery clay loam; massive; firm; many soft shale fragments; about 25 percent rock channers; extremely acid; abrupt smooth boundary.

C2—19 to 36 inches; very dark grayish brown (10YR 3/2) and yellowish brown (10YR 5/4) very channery clay loam; massive; firm; about 50 percent rock and coal channers; extremely acid; abrupt smooth boundary.

C3—36 to 42 inches; yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) channery clay loam; massive; firm; about 30 percent rock channers; extremely acid; abrupt smooth boundary.

C4—42 to 80 inches; black (10YR 2/1) extremely channery clay loam; massive; firm; about 75 percent rock fragments of shale and coal; extremely acid.

Range in Characteristics

Depth to bedrock: More than 60 inches
Content of rock fragments: Ap horizon—0 to 20 percent; C horizon—10 to 80 percent above a depth of 20 inches, 25 to 80 percent below a depth of 20 inches, averaging more than 35 percent
Ap horizon:
Color—hue of 7.5YR to 5Y or is neutral; value of 3 to 6; chroma of 0 to 8
Texture—silty clay loam, clay loam, silt loam, or loam in the fine-earth fraction
C horizon:
Color—hue of 7.5YR to 5Y or is neutral; value of 2 to 6; chroma of 0 to 8
Texture—silty clay loam, clay loam, silt loam, or loam in the fine-earth fraction

Bonnie Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Moderately slow
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains, depressions
Slope: 0 to 2 percent

Commonly adjacent soils: Newark, Orrville, Philo, Pope

Taxonomic class: Fine-silty, mixed, acid, mesic Typic Fluvaquents

Typical Pedon

Bonnie silt loam, frequently flooded; about 3 miles north of Bolins Mills, in Knox Township; 2,450 feet north and 2,650 feet east of the southwest corner of sec. 35, T. 10 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (2.5Y 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; common distinct dark brown (7.5YR 4/4) stains; strongly acid; clear smooth boundary.

Cg1—7 to 11 inches; gray (5Y 5/1) silt loam; massive; friable; few fine roots; common distinct dark brown (7.5YR 4/4) stains; strongly acid; clear smooth boundary.

Cg2—11 to 38 inches; olive gray (5Y 5/2) silt loam; few distinct gray (N 6/) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; common distinct dark brown (7.5YR 4/4) stains; strongly acid; gradual smooth boundary.

Cg3—38 to 80 inches; grayish brown (2.5Y 5/2) silt loam; common distinct yellowish brown (10YR 5/4) mottles; massive; friable; few distinct black (N 2/) stains of iron and manganese oxide; strongly acid.

Range in Characteristics

Depth to bedrock: More than 60 inches

Ap horizon:

Color—hue of 2.5Y or 10YR, value of 4 or 5, chroma of 1 to 3

Texture—silt loam

Cg horizon:

Color—hue of 10YR to 5Y or is neutral; value of 5 to 7; chroma of 0 to 2

Texture—silt loam above a depth of 40 inches, silt loam or silty clay loam below a depth of 40 inches

Brownsville Series

Depth class: Deep and very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid
Parent material: Colluvium and residuum
Landform: Hills
Position on the landform: Backslopes
Slope: 25 to 70 percent
Commonly adjacent soils: Berks, Gilpin, Shelocta

Taxonomic class: Loamy-skeletal, mixed, mesic Typic Dystrochrepts

Typical Pedon

Brownsville channery silt loam, in an area of Shelocta-Brownsville association, very steep; about 2.5 miles southwest of Ratcliffburg, in Harrison Township; 1,900 feet east and 2,000 feet south of the northwest corner of sec. 27, T. 9 N., R. 19 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) channery silt loam, pale brown (10YR 6/3) dry; moderate medium and fine granular structure; friable; many fine and common medium roots; about 25 percent sandstone channers; slightly acid; clear smooth boundary.

BA—2 to 5 inches; dark brown (10YR 3/3) channery silt loam; weak fine subangular blocky structure parting to weak medium granular; friable; common fine and medium roots; about 20 percent sandstone channers; slightly acid; gradual smooth boundary.

Bw1—5 to 10 inches; yellowish brown (10YR 5/4) channery loam; moderate fine subangular blocky structure; friable; common fine and few medium roots; about 20 percent sandstone channers; strongly acid; clear wavy boundary.

Bw2—10 to 15 inches; yellowish brown (10YR 5/4) very channery loam; moderate fine subangular blocky structure; friable; few fine and very few medium roots; about 40 percent sandstone channers; strongly acid; clear wavy boundary.

Bw3—15 to 24 inches; yellowish brown (10YR 5/4) very channery loam; weak medium and fine subangular blocky structure; friable; few fine roots; about 50 percent sandstone channers; strongly acid; gradual wavy boundary.

BC—24 to 42 inches; yellowish brown (10YR 5/4) extremely channery loam; weak fine subangular blocky structure; friable; very few fine roots; about 65 percent sandstone channers and flagstones; strongly acid; abrupt wavy boundary.

C—42 to 49 inches; yellowish brown (10YR 5/4) very flaggy loam; massive; friable; very few fine roots; about 50 percent flagstones and channers; strongly acid; abrupt wavy boundary.

R—49 to 52 inches; yellowish brown (10YR 5/4), hard, fine grained sandstone and siltstone bedrock.

Range in Characteristics

Thickness of the solum: 24 to 55 inches
Depth to bedrock: 40 to 72 inches

Content of rock fragments: A horizon—5 to 35 percent; Bw horizon—15 to 75 percent; C horizon—30 to 90 percent

A horizon:

Color—hue of 10YR, value of 2 to 5, chroma of 2 to 4

Texture—silt loam in the fine-earth fraction

Bw horizon:

Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 3 to 6

Texture—loam or silt loam in the fine-earth fraction

C horizon:

Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 4 to 6

Texture—loam or silt loam in the fine-earth fraction

Chagrin Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Newark, Omulga, Orrville

Taxonomic class: Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts

Typical Pedon

Chagrin silt loam, in an area of Chagrin silt loam, frequently flooded; about 1 mile southwest of Arbaugh, in Vinton Township; 620 feet west and 528 feet north of the southeast corner of sec. 16, T. 9 N., R. 16 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure parting to moderate medium granular; friable; moderate fine roots; slightly acid; clear smooth boundary.

AB—8 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure parting to moderate fine granular; friable; few faint brown (10YR 5/3) coatings on faces of peds; few fine roots; slightly acid; abrupt smooth boundary.

Bw1—13 to 26 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; few fine roots; strongly acid; gradual smooth boundary.

Bw2—26 to 37 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; strongly acid; gradual smooth boundary.

Bw3—37 to 45 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; strongly acid; clear smooth boundary.

C1—45 to 70 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; loose; strongly acid; gradual smooth boundary.

C2—70 to 80 inches; yellowish brown (10YR 5/4) loamy sand; single grain; loose; strongly acid.

Range in Characteristics

Thickness of the solum: 24 to 48 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: 0 to 15 percent

Ap horizon:

Color—hue of 10YR, value of 4, chroma of 2 to 4

Texture—silt loam, loam

Bw horizon:

Color—hue of 10YR, value of 4 to 6, chroma of 3 to 6

Texture—silt loam, loam, thin subhorizons of sandy loam or fine sandy loam in some pedons

C horizon:

Color—hue of 10YR, value of 4 to 6, chroma of 2 to 6

Texture—silt loam or loam above a depth of 40 inches, silt loam to loamy sandy below a depth of 40 inches

Chavies Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Parent material: Alluvium
Landform: Stream terraces
Position on the landform: Treads
Slope: 0 to 15 percent
Commonly adjacent soils: Tioga, Glenford

Taxonomic class: Coarse-loamy, mixed, mesic Ultic Hapludalfs

Typical Pedon

Chavies silt loam, 0 to 2 percent slopes, rarely flooded; about 3.25 miles southwest of Eagle Mills, in Eagle Township; about 1,214 feet north and 1,188 feet west of the southeast corner of sec. 31, T. 10 N., R. 19 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; common fine and few medium roots; moderately acid; clear smooth boundary.

BA—10 to 15 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; common fine roots; many distinct dark brown (10YR 3/3) organic coats on faces of peds; neutral; clear wavy boundary.

Bt1—15 to 24 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/6) clay films and silt films on faces of peds; few medium dark brown (10YR 3/3) krotovinas with organic fillings; strongly acid; gradual wavy boundary.

Bt2—24 to 34 inches; yellowish brown (10YR 5/6) fine sandy loam; weak fine subangular blocky structure; very friable; very few fine roots; few faint dark yellowish brown (10YR 4/6) clay films on faces of peds; few medium dark brown (10YR 3/3) krotovinas with organic fillings; moderately acid; clear smooth boundary.

Bt3—34 to 57 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; very few fine roots; many distinct dark yellowish brown (10YR 4/6) clay films and silt films on faces of peds; moderately acid; gradual wavy boundary.

BC—57 to 70 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; very friable; few distinct dark yellowish brown (10YR 4/6) clay films and silt films on faces of peds; moderately acid; clear wavy boundary.

C—70 to 80 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; strongly acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Content of rock fragments: Ap and Bt horizons—0 to 5 percent; C horizon—0 to 15 percent
Ap horizon:
Color—hue of 10YR or 7.5YR, value of 3 to 5, chroma of 2 to 4
Texture—silt loam, fine sandy loam, sandy loam
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—fine sandy loam, sandy loam, loam
C horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—fine sandy loam, loamy sand, or sandy loam in the fine-earth fraction

Clifty Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately rapid
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Brownsville, Pope, Shelocta

Taxonomic class: Fine-loamy, mixed, mesic Fluventic Dystrochrepts

Typical Pedon

Clifty silt loam, occasionally flooded; about 2 miles northwest of Eagle Mills, in Eagle Township; 150 feet west and 1,520 feet south of the northeast corner of sec. 18, T. 10 N., R. 19 W.

Oi—1 inch to 0; white pine needle duff.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

Bw1—8 to 26 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; about 5 percent sandstone gravel; strongly acid; clear smooth boundary.

Bw2—26 to 32 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; friable; about 10 percent sandstone gravel; strongly acid; clear smooth boundary.

C1—32 to 48 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; friable; about 50 percent sandstone gravel; strongly acid; gradual smooth boundary.

C2—48 to 80 inches; yellowish brown (10YR 5/4) extremely gravelly sandy loam; friable; about 70 percent sandstone gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: Ap horizon—0 to 25 percent; Bw horizon—0 to 50 percent; C horizon—15 to 90 percent
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam or loam in the fine-earth fraction
Bw horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 3 to 6

Texture—silt loam, loam, or fine sandy loam in the fine-earth fraction

C horizon:

Color—hue of 10YR, value of 4 or 5, chroma of 1 to 6

Texture—silt loam to sandy loam in the fine-earth fraction

Cruze Series

Depth class: Deep and very deep
Drainage class: Moderately well drained
Permeability: Moderately slow or slow
Parent material: Colluvium over residuum
Landform: Hills
Position on the landform: Backslopes
Slope: 12 to 35 percent
Commonly adjacent soils: Brownsville, Shelocta

Taxonomic class: Clayey, mixed, mesic Aquic Hapludults

Typical Pedon

Cruze silt loam, 20 to 35 percent slopes; in Ross County, 3.5 miles south of Massieville, in Franklin Township; about 2,970 feet north of the intersection of U.S. Highway 23 and Ohio Highway 372, along U.S. Highway 23, then 7,920 feet east:

Oa—1 inch to 0; very dark grayish brown (10YR 3/2) decomposed leaf litter.

A—0 to 2 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine and common medium roots; 10 percent rock fragments; very strongly acid; clear smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; many fine and common medium roots; 10 percent rock fragments; very strongly acid; clear wavy boundary.

BE—6 to 9 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; common fine and few medium roots; few faint light olive brown (2.5Y 5/4) coats on faces of peds; 5 percent rock fragments; very strongly acid; clear wavy boundary.

Bt1—9 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; common fine and few medium roots; common faint yellowish brown (10YR 5/6) clay films on faces of peds; 5 percent rock fragments; very strongly acid; clear wavy boundary.

2Bt2—20 to 25 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct light brownish gray (2.5Y 6/2) and many medium distinct strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common fine and medium roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; 5 percent rock fragments; very strongly acid; clear wavy boundary.

2Bt3—25 to 37 inches; yellowish brown (10YR 5/6) silty clay; many medium distinct grayish brown (2.5YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; 5 percent rock fragments; very strongly acid; clear wavy boundary.

2BC—37 to 48 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few distinct yellowish brown (10YR 5/4) clay films on vertical faces of peds; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

2Cr—48 to 53 inches; light olive brown (2.5Y 5/4), rippable siltstone bedrock.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Depth to bedrock: 48 to 80 inches
Content of rock fragments: A horizon—0 to 15 percent; Bt and 2Bt horizons—0 to 35 percent; 2BC horizon and 2C horizon, if it occurs—0 to 35 percent

A or Ap horizon:

Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4

Texture—silt loam, silty clay loam

Bt and 2Bt horizons:

Color—hue of 7.5YR or 10YR in the upper part and 10YR and 2.5Y in the lower part; value of 5 or 6; chroma of 4 to 6

Texture—silty clay loam, silty clay, or, in the lower part, clay in the fine-earth fraction

2BC horizon and 2C horizon, if it occurs:

Color—hue of 10YR or 2.5Y, value of 5 or 6, chroma of 4 to 6

Texture—silty clay, clay, or silty clay loam in the fine-earth fraction

Cuba Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate

Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Orrville, Piopolis

Taxonomic class: Fine-silty, mixed, mesic Fluventic Dystrochrepts

Typical Pedon

Cuba silt loam, frequently flooded; in Jackson County, about 2.8 miles southeast of Pattonsville, in Bloomfield Township; 700 feet north and 600 feet east of the southwest corner of sec. 12, T. 8 N., R. 17 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/4) dry; weak medium granular structure; friable; common medium and fine roots; strongly acid; clear smooth boundary.
Bw1—8 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; few fine roots; strongly acid; clear smooth boundary.
Bw2—16 to 25 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few fine roots; very strongly acid; gradual wavy boundary.
Bw3—25 to 34 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; few faint pale brown (10YR 6/3) silt coatings on vertical faces of peds; strongly acid; gradual wavy boundary.
C—34 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive with vertical partings; friable; thin strata of loam; common faint pale brown (10YR 6/3) coatings in vertical partings; strongly acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: C horizon—0 to 15 percent
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam
Bw horizon:
Color—hue of 10YR, value of 4 to 6, chroma of 3 to 6
Texture—silt loam
C horizon:
Color—hue of 10YR, value of 4 to 6, chroma of 3 to 6
Texture—silt loam, loam

Doles Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess over colluvium and alluvium
Landform: Terraces
Position on the landform: Treads
Slope: 0 to 2 percent
Commonly adjacent soils: Fitchville, Glenford, Licking, Omulga

Taxonomic class: Fine-silty, mixed, mesic Aeric Fragiaqualfs

Typical Pedon

Doles silt loam, 0 to 2 percent slopes; about 0.5 mile southwest of Dundas, in Clinton Township; 2,100 feet west and 1,050 feet north of the southeast corner of sec. 4, T. 10 N., R. 17 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; few fine faint yellowish brown (10YR 5/4) mottles; moderate medium granular structure; friable; common fine and medium roots; common distinct very dark brown (10YR 2/2) concretions of iron and manganese oxide; slightly acid; abrupt smooth boundary.
BE—7 to 18 inches; light yellowish brown (2.5Y 6/4) and light brownish gray (2.5Y 6/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; friable; few fine roots; few fine very dark brown (10YR 2/2) concretions of iron and manganese oxide; common distinct light brownish gray (2.5Y 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.
Btg—18 to 24 inches; light brownish gray (2.5Y 6/2) and light yellowish brown (2.5Y 6/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; few faint light yellowish brown (2.5Y 6/4) clay films on faces of peds; common fine very dark brown (10YR 2/2) concretions of iron and manganese oxide; many distinct light brownish gray (2.5Y 6/2) silt coatings on faces of many peds; strongly acid; irregular wavy boundary.
Btx1—24 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; many medium prominent dark brown (7.5YR 4/4) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure; very firm and brittle; common faint yellowish brown (10YR 5/4) clay films on faces of peds; many distinct light brownish

gray (10YR 6/2) silt coatings on faces of prisms; common distinct very dark brown (10YR 2/2) concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

Btx2—40 to 54 inches; yellowish brown (10YR 5/6) silty clay loam; moderate coarse prismatic structure; very firm and brittle; common faint yellowish brown (10YR 5/4) clay films on faces of peds; many distinct light brownish gray (10YR 6/2) silt coatings on faces of prisms; common distinct very dark brown (10YR 2/2) concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

B′t—54 to 62 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; common faint yellowish brown (10YR 5/4) clay films on faces of peds; few distinct very dark brown (10YR 2/2) concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

BC—62 to 72 inches; light yellowish brown (10YR 6/4) silty clay loam; common medium prominent dark brown (7.5YR 4/4) mottles; weak coarse prismatic structure; firm; many distinct light brownish gray (10YR 6/2) silt coatings on faces of prisms; few distinct very dark brown (10YR 2/2) concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

C—72 to 80 inches; brownish yellow (10YR 6/6) silty clay loam; many medium prominent light brownish gray (10YR 6/2) mottles; massive; firm; moderately acid.

Range in Characteristics

Thickness of the solum: 52 to more than 80 inches
Depth to bedrock: More than 60 inches
Depth to top of fragipan: 20 to 30 inches
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 4
Texture—silt loam, silty clay loam
Btx and B′t horizons:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 2 to 6
Texture—silt loam, silty clay loam
C horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 7, chroma of 2 to 6
Texture—silt loam, silty clay loam

Ernest Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate above the fragipan; moderately slow or slow in the fragipan
Parent material: Colluvium
Landform: Hills
Position on the landform: Footslopes
Slope: 6 to 25 percent
Commonly adjacent soils: Brownsville, Omulga, Shelocta

Taxonomic class: Fine-loamy, mixed, mesic Aquic Fragiudults

Typical Pedon

Ernest silt loam, 6 to 15 percent slopes; in Jackson County, about 1.9 miles southwest of Mabee Corner, in Hamilton Township; 650 feet south and 2,175 feet west of the northeast corner of sec. 28, T. 5 N., R. 19 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; 3 percent rock fragments; moderately acid; abrupt smooth boundary.

BE—8 to 13 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; firm; few fine roots; 10 percent rock fragments; moderately acid; clear wavy boundary.

Bt1—13 to 20 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; few faint brown (7.5YR 5/4) clay films on faces of peds; few faint very pale brown (10YR 7/4) silt coatings on vertical faces of peds; 10 percent rock fragments; strongly acid; clear wavy boundary.

Bt2—20 to 25 inches; yellowish brown (10YR 5/6) channery silt loam; common fine distinct light gray (10YR 7/2) and few medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few faint brown (7.5YR 5/4) clay films on faces of peds; few faint very pale brown (10YR 7/4) silt coatings on vertical faces of peds; 15 percent rock fragments; very strongly acid; clear wavy boundary.

Bt3—25 to 31 inches; yellowish brown (10YR 5/6) channery silt loam; few fine distinct gray (10YR 7/1) and common coarse distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; few faint strong brown (7.5YR 5/6) clay films on faces of peds; few faint white (10YR 8/2) silt coatings on vertical faces of peds; 20 percent rock fragments; very strongly acid; clear wavy boundary.

Btx1—31 to 42 inches; yellowish brown (10YR 5/6) channery loam; common fine distinct light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure; very firm and brittle; few faint brown (7.5YR 5/4) clay films on vertical faces of peds; few faint light gray (10YR 7/2) silt coatings on vertical faces of peds; few fine distinct black (10YR 2/1) concretions of iron and manganese oxide; 15 percent rock fragments; very strongly acid; gradual wavy boundary.

Btx2—42 to 48 inches; yellowish brown (10YR 5/6) channery loam; common fine distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure; very firm and brittle; few faint brown (7.5YR 5/4) clay films on vertical faces of peds; few faint light yellowish brown (10YR 6/4) silt coatings on vertical faces of peds; few fine and medium very dark grayish brown (10YR 3/2) concretions and stains of iron and manganese oxide; 20 percent rock fragments; very strongly acid; gradual wavy boundary.

Btx3—48 to 62 inches; yellowish brown (10YR 5/6) channery silt loam; common medium distinct light gray (10YR 7/2) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure; very firm and brittle; few faint brown (7.5YR 5/4) clay films on vertical faces of peds; 15 percent rock fragments; very strongly acid; clear wavy boundary.

C—62 to 70 inches; yellowish brown (10YR 5/6) loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; massive; firm; few faint light gray (10YR 7/2) silt coatings in partings; 12 percent rock fragments; very strongly acid.

Range in Characteristics

Thickness of the solum: 45 to 72 inches
Depth to bedrock: More than 60 inches
Depth to top of fragipan: 24 to 36 inches
Content of rock fragments: Ap horizon—0 to 10 percent; Bt horizon—5 to 25 percent; Btx and C horizons—5 to 20 percent

Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 3 or 4
Texture—silt loam

Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 4 to 6
Texture—silt loam or silty clay loam in the fine-earth fraction

Btx horizon:
Color—hue of 10YR, value of 5, chroma of 4 to 6
Texture—loam, silt loam, or clay loam in the fine-earth fraction

C horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 4 to 6
Texture—silty clay loam, loam, silt loam, or clay loam in the fine-earth fraction

Fairpoint Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderately slow
Parent material: Regolith from surface mining
Landform: Hills
Position on the landform: Summits
Slope: 0 to 20 percent
Commonly adjacent soils: Bethesda, Gilpin, Rarden, Wharton

Taxonomic class: Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents

Typical Pedon

Fairpoint clay loam, 0 to 8 percent slopes; about 3.1 miles east of Hamden, in Clinton Township; 2,600 feet east and 1,386 feet north of the southwest corner of sec. 27, T. 10 N., R. 17 W.

Ap—0 to 8 inches; yellowish brown (10YR 5/6) clay loam, light yellowish brown (10YR 6/4) dry; common medium distinct brown (10YR 5/3) and few fine prominent grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; common fine roots; about 10 percent shale and siltstone channers; neutral; abrupt smooth boundary.

C1—8 to 24 inches; brown (10YR 5/3) channery clay loam; many coarse distinct gray (10YR 6/1) and common medium distinct grayish brown (10YR 5/2) mottles; massive; very firm; few fine roots;

about 50 percent shale and siltstone channers; neutral; gradual smooth boundary.

C2—24 to 80 inches; gray (10YR 6/1) extremely channery clay loam; few fine faint yellowish brown (10YR 5/6) mottles; massive; very firm; about 70 percent shale and siltstone channers; neutral.

Range in Characteristics

Depth to bedrock: More than 60 inches
Content of rock fragments: Ap horizon—0 to 15 percent; C horizon—35 to 70 percent
Ap horizon:
Color—hue of 7.5YR to 2.5Y or is neutral; value of 3 to 6; chroma of 0 to 6
Texture—clay loam, silty clay loam, silt loam, loam
C horizon:
Color—hue of 7.5YR to 2.5Y or is neutral; value of 3 to 6; chroma of 0 to 8
Texture—clay loam, silty clay loam, silt loam, or loam in the fine-earth fraction

Fitchville Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Glaciolacustrine deposits
Landform: Stream terraces
Position on the landform: Treads
Slope: 0 to 2 percent
Commonly adjacent soils: Doles, Omulga, Pope

Taxonomic class: Fine-silty, mixed, mesic Aeric Ochraqualfs

Typical Pedon

Fitchville silt loam, 0 to 2 percent slopes; about 1.75 miles southwest of Ratcliffburg, in Harrison Township; 1,210 feet west and 250 feet south of the northeast corner of sec. 21, T. 9 N., R. 19 W.

Ap—0 to 8 inches; grayish brown (2.5Y 5/2) silt loam, light gray (10YR 7/2) dry; common medium faint grayish brown (10YR 5/2) mottles; moderate medium and fine granular structure; friable; few fine roots; few fine prominent very dark brown (10YR 2/2) stains of iron and manganese oxide; mildly alkaline; abrupt smooth boundary.

BE—8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium prominent yellowish brown (10YR 5/6) and grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; very few fine roots; few prominent grayish brown (2.5Y 5/2) silt coatings on faces of peds; few fine prominent black (10YR 2/1) stains of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt1—14 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; common medium prominent light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine brown (10YR 5/3) clay films on faces of peds; many prominent light brownish gray (10YR 6/2) coatings on faces of peds; few fine prominent black (10YR 2/1) stains of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Bt2—20 to 34 inches; strong brown (7.5YR 4/6) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; many prominent light brownish gray (10YR 6/2) coatings on faces of peds; very strongly acid; gradual wavy boundary.

Bt3—34 to 47 inches; strong brown (7.5YR 4/6) silt loam; many medium prominent yellowish brown (10YR 5/8) and light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very firm; common distinct brown (10YR 5/3) clay films on faces of peds; many prominent light brownish gray (10YR 6/2) coatings on faces of peds; many fine and medium prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; strongly acid; abrupt wavy boundary.

Bt4—47 to 62 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct dark yellowish brown (10YR 4/4) and many coarse prominent light grayish brown (10YR 6/2) mottles; weak very coarse prismatic structure parting to moderate coarse angular blocky; firm; few fine brown (10YR 5/3) clay films on faces of peds; common distinct grayish brown (10YR 5/2) coatings on faces of peds; few fine prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; strongly acid; clear wavy boundary.

C—62 to 72 inches; yellowish brown (10YR 5/6) silt loam; common coarse prominent light brownish gray (10YR 6/2) mottles; massive with widely spaced vertical seams; firm; neutral; gradual wavy boundary.

Cg—72 to 80 inches; light brownish gray (2.5Y 6/2) loam; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; firm; neutral.

Range in Characteristics

Thickness of the solum: 40 to 70 inches
Depth to bedrock: More than 60 inches
Content of coarse fragments: C horizon—0 to 5 percent
Ap horizon:
Color—hue of 10YR or 2.5Y, value of 4 or 5, chroma of 2 or 3
Texture—silt loam
Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 1 to 6
Texture—silt loam, silty clay loam
C horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silt loam, loam

Germano Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, backslopes
Slope: 6 to 40 percent
Commonly adjacent soils: Gilpin, Rarden, Steinsburg

Taxonomic class: Coarse-loamy, mixed, mesic Typic Hapludults

Typical Pedon

Germano sandy loam, in an area of Germano-Gilpin complex, 25 to 40 percent slopes; about 5 1/3 miles east of New Plymouth, in Brown Township; 2,145 feet south and 1,040 feet west of the northeast corner of sec. 6, T. 11 N., R. 16 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) sandy loam, pale brown (10YR 6/3) dry; moderate medium granular structure; very friable; many fine roots; few sandstone pebbles; very strongly acid; abrupt smooth boundary.

A2—2 to 4 inches; brown (10YR 4/3) sandy loam; moderate medium granular structure; very friable; many fine and medium roots; about 5 percent sandstone gravel; very strongly acid; abrupt smooth boundary.

BA—4 to 11 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure parting to weak fine granular; friable; common medium and coarse roots; about 5 percent sandstone gravel; very strongly acid; abrupt smooth boundary.

Bt1—11 to 17 inches; yellowish brown (10YR 5/6) sandy loam; weak coarse and medium angular blocky structure; friable; few medium and fine roots; few faint yellowish brown (10YR 5/6) clay films on faces of peds; very few prominent reddish brown (2.5YR 4/4) concretions of iron and manganese oxide; about 5 percent sandstone gravel; very strongly acid; clear smooth boundary.

Bt2—17 to 28 inches; strong brown (7.5YR 5/6) coarse sandy loam; weak coarse subangular and angular blocky structure; friable; few fine and medium roots; few faint yellowish brown (10YR 5/6) clay films on faces of peds; very few prominent reddish brown (2.5YR 4/4) concretions of iron and manganese oxide; about 5 percent sandstone gravel; very strongly acid; clear smooth boundary.

Bt3—28 to 37 inches; strong brown (7.5YR 5/8) coarse sandy loam; weak coarse and medium angular blocky structure; firm; very few medium roots; few faint yellowish brown (10YR 5/6) clay films on faces of peds; very few prominent reddish brown (2.5YR 4/4) concretions of iron and manganese oxide; about 5 percent sandstone channers; very strongly acid; clear smooth boundary.

Cr—37 to 40 inches; yellowish brown (10YR 5/6), weathered sandstone bedrock.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Content of coarse fragments: A horizon—2 to 20 percent, Bt horizon—3 to 20 percent
A horizon:
Color—hue of 10YR, value of 3 or 4, chroma of 2 to 4
Texture—sandy loam, loam, or fine sandy loam in the fine-earth fraction
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 4 to 8
Texture—sandy loam or coarse sandy loam in the fine-earth fraction

Gilpin Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Residuum

Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope: 6 to 70 percent
Commonly adjacent soils: Aaron, Berks, Germano, Guernsey, Rarden, Steinsburg, Tarhollow

Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludults

Typical Pedon

Gilpin silt loam, in an area of Steinsburg-Gilpin association, very steep; about 3 miles southeast of New Plymouth, in Brown Township; 300 feet east and 1,680 feet north of the southwest corner of sec. 22, T. 11 N., R. 16 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.
A—0 to 3 inches; dark brown (10YR 3/3) silt loam; moderate medium granular structure; friable; few fine and common medium roots; about 10 percent siltstone and sandstone gravel; strongly acid; abrupt smooth boundary.
BE—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; about 10 percent sandstone gravel; very strongly acid; abrupt smooth boundary.
Bt1—7 to 12 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium and fine subangular blocky structure; firm; common fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; about 30 percent sandstone channers; strongly acid; clear wavy boundary.
Bt2—12 to 16 inches; yellowish brown (10YR 5/4) channery silt loam; moderate medium subangular blocky structure; firm; few fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; many faint light olive brown (2.5Y 5/4) soft siltstone fragments; about 25 percent sandstone and siltstone channers; very strongly acid; clear wavy boundary.
Bt3—16 to 21 inches; yellowish brown (10YR 5/4) channery silt loam; few medium distinct brown (7.5YR 5/4) and common medium distinct light olive brown (2.5Y 5/4) mottles; moderate medium and fine subangular blocky structure; firm; few fine roots; common faint yellowish brown (10YR 5/4) clay films on faces of peds; about 20 percent siltstone channers; very strongly acid; clear wavy boundary.
Bt4—21 to 26 inches; light olive brown (2.5Y 5/4) channery silt loam; moderate fine subangular blocky structure; firm; very few medium roots; few faint light olive brown (2.5Y 5/4) clay films on faces of peds; few light brownish gray (2.5Y 6/2) soft siltstone fragments; about 30 percent sandstone and siltstone channers; very strongly acid; abrupt wavy boundary.
C—26 to 32 inches; light olive brown (2.5Y 5/4) extremely channery silt loam; massive; firm; very few medium roots; about 70 percent siltstone channers; extremely acid; abrupt wavy boundary.
R—32 to 35 inches; fractured siltstone bedrock.

Range in Characteristics

Thickness of the solum: 18 to 36 inches
Depth to bedrock: 20 to 40 inches
Content of rock fragments: A and Bt horizons—5 to 40 percent; C horizon—30 to 90 percent
A horizon:
Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4
Texture—silt loam or loam in the fine-earth fraction
Bt horizon:
Color—hue of 7.5YR to 2.5Y, value and chroma of 4 to 6
Texture—silt loam, silty clay loam, clay loam, or loam in the fine-earth fraction
C horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 or 5, chroma of 2 to 6
Texture—silt loam, loam, or silty clay loam in the fine-earth fraction

Glenford Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderately slow
Parent material: Glaciolacustrine deposits
Landform: Lake plains
Position on the landform: Treads
Slope: 0 to 6 percent
Commonly adjacent soils: Chavies, Fitchville, Licking

Taxonomic class: Fine-silty, mixed, mesic Aquic Hapludalfs

Typical Pedon

Glenford silt loam, 2 to 6 percent slopes; about 1.6 miles southwest of Ratcliffburg, in Harrison Township; 398 feet west and 460 feet south of the northeast corner of sec. 21, T. 9 N., R. 19 W.

Ap—0 to 11 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium and fine subangular blocky structure; friable; many fine roots; many fine distinct very dark grayish brown (10YR 3/2) organic stains; neutral; abrupt smooth boundary.

Bt1—11 to 17 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct brown (10YR 5/3) mottles; moderate medium and coarse subangular blocky structure; friable; few fine roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—17 to 24 inches; yellowish brown (10YR 5/6) silt loam; few fine distinct light brownish gray (2.5Y 6/2) and brown (10YR 5/3) mottles; moderate coarse subangular blocky structure; firm; few fine roots; many prominent yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—24 to 31 inches; yellowish brown (10YR 5/6) silt loam; many medium prominent light brownish gray (2.5Y 6/2) and few medium distinct brown (10YR 5/3) mottles; moderate coarse subangular blocky structure; firm; very few fine roots; many prominent yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

Bt4—31 to 39 inches; yellowish brown (10YR 5/4) silt loam; many medium prominent light brownish gray (2.5Y 6/2) and strong brown (7.5YR 4/6) mottles; strong coarse subangular blocky structure; firm; many prominent brown (10YR 5/3) clay films on faces of peds; few fine prominent black (10YR 2/1) stains of iron and manganese oxide; slightly acid; abrupt wavy boundary.

BC—39 to 47 inches; yellowish brown (10YR 5/4) silt loam; many medium prominent light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 4/6) mottles; weak very coarse subangular blocky structure; firm; few distinct brown (10YR 5/3) and grayish brown (10YR 5/2) clay films on faces of peds; many medium prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; slightly acid; clear wavy boundary.

C—47 to 80 inches; yellowish brown (10YR 5/6) silt loam; many coarse prominent light brownish gray (2.5Y 6/2) and strong brown (7.5YR 4/6) mottles; massive; firm; common medium prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; neutral.

Range in Characteristics

Thickness of the solum: 30 to 60 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: BC horizon—0 to 3 percent; C horizon—0 to 5 percent
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 6
Texture—silt loam, silty clay loam
C horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 3 to 6
Texture—silt loam, silty clay loam

Guernsey Series

Depth class: Deep and very deep
Drainage class: Moderately well drained
Permeability: Slow or moderately slow
Parent material: Colluvium and residuum
Landform: Hills
Position on the landform: Backslopes, shoulders
Slope: 15 to 70 percent
Commonly adjacent soils: Germano, Gilpin, Rarden, Wharton

Taxonomic class: Fine, mixed, mesic Aquic Hapludalfs

Typical Pedon

Guernsey silt loam, in an area of Gilpin-Guernsey complex, 15 to 25 percent slopes; about 3 miles east of New Plymouth, in Brown Township; 1,980 feet south and 130 feet east of the northwest corner of sec. 24, T. 11 N., R. 16 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.

A—0 to 4 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine, common medium, and few coarse roots; few siltstone channers; strongly acid; abrupt smooth boundary.

BE—4 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; about 5 percent siltstone channers; strongly acid; clear smooth boundary.

Bt1—11 to 21 inches; yellowish brown (10YR 5/6) silty clay; common medium faint brown (10YR 5/3), few fine distinct light brownish gray (10YR 6/2), and common medium prominent yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine and medium roots; common distinct brown (10YR 5/3) clay films on faces of peds; about 5 percent siltstone channers; strongly acid; clear smooth boundary.

2Bt2—21 to 35 inches; light olive brown (2.5Y 5/3) clay; common medium prominent light brownish gray (2.5Y 6/2) and many medium prominent yellowish red (5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; very few medium and fine roots; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; about 5 percent siltstone channers; strongly acid; gradual wavy boundary.

2BC—35 to 45 inches; light olive brown (2.5Y 5/4) clay; common medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; firm; very few fine roots; common fine prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; about 5 percent siltstone channers; many prominent slickensides in the lower part of this horizon; neutral; gradual wavy boundary.

2C—45 to 56 inches; light olive brown (2.5Y 5/4) silty clay; many coarse prominent brownish yellow (10YR 6/8) and common medium distinct grayish brown (2.5Y 5/2) mottles; massive; firm; common fine gypsum crystals; about 5 percent siltstone channers; many prominent slickensides in the upper part of this horizon; neutral; clear smooth boundary.

2Cr—56 to 59 inches; weathered, interbedded shale and siltstone bedrock.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Depth to bedrock: More than 50 inches
Content of rock fragments: A horizon—2 to 15 percent; Bt and 2Bt horizons—2 to 25 percent; 2C horizon—2 to 20 percent
A horizon:
Color—hue of 10YR, value of 3 or 4, chroma of 2 or 3
Texture—silt loam
Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 3 to 8
Texture—silt loam, silty clay loam, silty clay, or clay in the fine-earth fraction
2Bt horizon:
Color—hue of 10YR to 2.5Y, value of 4 to 6, chroma of 3 to 8
Texture—silty clay loam, silty clay, or clay in the fine-earth fraction
2C horizon:
Color—hue of 10YR to 5Y or is neutral; value of 4 to 6; chroma of 0 to 6
Texture—clay, silty clay, or silty clay loam in the fine-earth fraction

Latham Series

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Slow
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope: 6 to 40 percent
Commonly adjacent soils: Gilpin, Tarhollow, Wharton

Taxonomic class: Clayey, mixed, mesic Aquic Hapludults

Typical Pedon

Latham silt loam, in an area of Wharton-Latham complex, 15 to 25 percent slopes; about 2.5 miles northwest of Stella, in Jackson Township; 1,450 feet west and 2,050 feet south of the northeast corner of sec. 4, T. 10 N., R. 18 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure parting to moderate medium granular; friable; many fine roots; few sandstone channers; moderately acid; abrupt wavy boundary.

Bt1—10 to 15 inches; yellowish brown (10YR 5/6) channery silty clay loam; few medium distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; many faint yellowish brown (10YR 5/4) clay films on faces of peds; about 20 percent sandstone channers; very strongly acid; clear wavy boundary.

Bt2—15 to 19 inches; yellowish brown (10YR 5/4) silty clay; common coarse prominent dark grayish brown (10YR 4/2) and common medium prominent yellowish red (5YR 4/6) mottles; strong medium subangular blocky structure; firm; few fine roots; many faint yellowish brown (10YR 5/4) and many prominent light brownish gray (10YR 6/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—19 to 24 inches; grayish brown (10YR 5/2) silty clay; many medium prominent yellowish red (5YR 5/6) and common fine prominent yellowish red

(5YR 4/6) mottles; weak medium prismatic structure parting to strong medium subangular blocky; firm; very few fine roots; many faint grayish brown (10YR 5/2) clay films on faces of peds; few fine prominent black (10YR 2/1) stains of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt4—24 to 30 inches; brown (10YR 5/3) silty clay; many coarse prominent yellowish red (5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; firm; very few fine roots; common faint brown (10YR 5/3) clay films on faces of peds; many coarse prominent black (10YR 2/1) iron and manganese oxide stains in the upper 3 inches of this horizon; few sandstone channers; very strongly acid; clear wavy boundary.

Bt5—30 to 37 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; very few fine roots; common prominent gray (10YR 5/1) and light gray (5Y 7/2) clay films on faces of peds; about 10 percent siltstone and sandstone channers; very strongly acid; abrupt wavy boundary.

Cr—37 to 40 inches; weathered, interbedded siltstone and sandstone bedrock.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Content of rock fragments: Ap horizon—0 to 15 percent; Bt horizon—0 to 20 percent; C horizon—less than 30 percent

Ap horizon:
Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4
Texture—silt loam, silty clay loam

A horizon:
Color—hue of 10YR, value of 3 or 4, chroma of 2 or 3
Texture—silt loam, silty clay loam

Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 2 to 8
Texture—silty clay loam or silty clay in the fine-earth fraction

C horizon, if it occurs:
Color—hue of 10YR or 2.5Y, value of 5 or 6, chroma of 2 to 6
Texture—silty clay loam or silty clay in the fine-earth fraction

Licking Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow
Parent material: Lacustrine deposits
Landform: Lake plains, terraces
Position on the landform: Treads, risers
Slope: 2 to 25 percent
Commonly adjacent soils: Doles, Glenford, Omulga

Taxonomic class: Fine, mixed, mesic Aquic Hapludalfs

Typical Pedon

Licking silt loam, 2 to 6 percent slopes; about 2 miles southeast of McArthur, in Elk Township; 850 feet east and 2,650 feet south of the northwest corner of sec. 34, T. 11 N., R. 17 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular structure; friable; many fine roots; few distinct strong brown (7.5YR 5/8) stains; very strongly acid; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure parting to moderate fine subangular blocky; friable; few fine roots; few faint brown (10YR 5/3) silt coatings on faces of peds; few distinct strong brown (7.5YR 5/8) stains and few distinct black (N 2/) concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt1—13 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; very few fine roots; common distinct light brownish gray (2.5Y 6/2) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct black (N 2/) concretions of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct gray (10YR 6/1) mottles; moderate medium and fine subangular blocky structure; firm; very few fine roots; common distinct light brownish gray (2.5Y 6/2) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct black (N 2/) concretions of iron and manganese oxide; strongly acid; clear wavy boundary.

2Bt3—25 to 33 inches; yellowish brown (10YR 5/6) silty clay; few medium distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; common faint yellowish brown (10YR 5/4) and common distinct gray (N 6/) clay films on faces of peds; common distinct black (N 2/) stains of iron and manganese oxide; strongly acid; clear wavy boundary.

2Bt4—33 to 46 inches; yellowish brown (10YR 5/6) silty clay; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; common faint yellowish brown (10YR 5/4) and common distinct gray (10YR 6/1) clay films on faces of peds; common distinct black (N 2/) stains of iron and manganese oxide; strongly acid; clear wavy boundary.

2Bt5—46 to 53 inches; yellowish brown (10YR 5/6) silty clay; moderate medium angular blocky structure; firm; common distinct dark yellowish brown (10YR 4/4) and few distinct gray (10YR 6/1) clay films on faces of peds; common distinct black (N 2/) stains and concretions of iron and manganese oxide; moderately acid; clear wavy boundary.

2BC—53 to 70 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct gray (N 6/) mottles; strong thick platy structure parting to moderate fine subangular blocky; firm; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds and common distinct gray (N 6/) clay films on horizontal faces of peds; common distinct black (N 2/) stains and concretions of iron and manganese oxide; neutral; clear smooth boundary.

2C—70 to 80 inches; brown (7.5YR 5/4) silty clay; common fine strong brown (7.5YR 5/6) and olive (5Y 5/2) mottles; weak coarse platy structure in the upper part of the horizon, massive in the lower part; firm; common distinct black (N 2/) stains and concretions of iron and manganese oxide; thin strata of loam; neutral.

Range in Characteristics

Thickness of the solum: 36 to 70 inches
Depth to bedrock: More than 60 inches
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 or 5, chroma of 3 to 8
Texture—silt loam, silty clay loam
2Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 or 5, chroma of 3 to 6
Texture—silty clay or clay with strata of silty clay loam
2C horizon:
Color—hue of 7.5YR to 5Y, value of 3 to 5, chroma of 3 to 6
Texture—silty clay loam, silty clay, clay

McGary Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Slow or very slow
Parent material: Lacustrine deposits
Landform: Lake plains, terraces
Position on the landform: Treads
Slope: 0 to 2 percent
Commonly adjacent soils: Licking, Wyatt

Taxonomic class: Fine, mixed, mesic Aeric Ochraqualfs

Typical Pedon

McGary silt loam, 0 to 2 percent slopes; in Ross County, about 2.5 miles east-southeast of Richmond Dale, in Jefferson Township; about 1,200 feet south and 2,100 feet west of the northeast corner of sec. 11, T. 7 N., R. 20 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

Btg—6 to 13 inches; light brownish gray (10YR 6/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; common faint light brownish gray (10YR 6/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt1—13 to 22 inches; yellowish brown (10YR 5/6) silty clay; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few medium roots; many distinct grayish brown (10YR 5/2) clay films on faces of peds; few very dark brown (10YR 2/2) stains of iron and manganese oxides; very strongly acid; clear smooth boundary.

Bt2—22 to 36 inches; dark yellowish brown (10YR 4/4) silty clay; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; many distinct dark grayish brown (10YR 5/2) clay films on faces of peds; strongly acid in the upper part of the horizon grading to neutral in the lower part; clear wavy boundary.

BC—36 to 42 inches; yellowish brown (10YR 5/4), stratified silty clay loam and silty clay; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium platy; firm; slight effervescence, mildly alkaline; clear smooth boundary.

Cg—42 to 80 inches; grayish brown (10YR 5/2), stratified clay and silty clay loam; many distinct light brownish gray (10YR 6/2) and dark yellowish brown (10YR 4/4) mottles; massive; many nodules of secondary lime; slight effervescence, mildly alkaline.

Range in Characteristics

Thickness of the solum: 24 to 42 inches
Depth to carbonates: 20 to 55 inches
Ap horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 1 to 3
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silty clay loam, silty clay
C horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 1 to 6
Texture—stratified clay, silty clay loam, or silty clay

Newark Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Chagrin, Philo

Taxonomic class: Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents

Typical Pedon

Newark silt loam, frequently flooded; about 1.5 miles southeast of Creola, in Swan Township; 1,540 feet east and 1,200 feet north of the southwest corner of sec. 35, T. 12 N., R. 17 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; few fine faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) and few fine prominent dark gray (10YR 4/1) mottles; weak medium subangular blocky structure parting to moderate fine granular; friable; common fine roots; few fine prominent very dark brown (10YR 2/2) concretions and stains of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Bw—10 to 16 inches; brown (10YR 5/3) silt loam; many fine prominent yellowish brown (10YR 5/8), common fine faint grayish brown (10YR 5/2), and few coarse prominent gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; few medium roots; few fine prominent very dark brown (10YR 2/2) concretions of iron and manganese oxide; moderately acid; clear smooth boundary.

Bg1—16 to 24 inches; grayish brown (2.5Y 5/2) silt loam; many coarse prominent brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; few fine roots; few fine prominent very dark brown (10YR 2/2) stains of iron and manganese oxide; moderately acid; abrupt smooth boundary.

Bg2—24 to 38 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; common fine prominent very dark brown (10YR 2/2) concretions of iron and manganese oxide; moderately acid; clear smooth boundary.

Cg—38 to 52 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct brown (10YR 5/3) mottles; massive; friable; moderately acid; clear smooth boundary.

C—52 to 58 inches; yellowish brown (10YR 5/4), stratified silt loam and loam; many medium prominent grayish brown (2.5Y 5/2) mottles; massive; friable; few prominent very dark brown (10YR 2/2) stains of iron and manganese oxide; strongly acid; clear smooth boundary.

C′g—58 to 80 inches; grayish brown (2.5Y 5/2), stratified silt loam to sandy loam; many medium distinct brown (10YR 5/3) and common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 50 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: Ap horizon and B horizon above a depth of 30 inches—0 to 5 percent; B horizon below a depth of 30 inches and C horizon—0 to 15 percent
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam, loam

Bw horizon:
Color—hue of 10YR or 2.5Y, value of 4 or 5, chroma of 3 or 4
Texture—silt loam, silty clay loam

Bg horizon:
Color—hue of 10YR or 2.5Y or is neutral; value of 4 to 7; chroma of 0 to 2
Texture—silt loam, silty clay loam

C horizon:
Color—hue of 10YR or 2.5Y or is neutral; value of 4 to 7; chroma of 0 to 4
Texture—silt loam, silty clay loam ranging to fine sandy loam

Omulga Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate above the fragipan; slow in the fragipan
Parent material: Loess over colluvium and alluvium
Landform: Terraces
Position on the landform: Treads, risers
Slope: 0 to 15 percent
Commonly adjacent soils: Doles, Licking

Taxonomic class: Fine-silty, mixed, mesic Typic Fragiudalfs

Typical Pedon

Omulga silt loam, 2 to 6 percent slopes; in the village of Wilkesville, in Wilkesville Township; 2,000 feet west and 400 feet north of the southeast corner of sec. 4, T. 8 N., R. 16 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and few medium roots; strongly acid; abrupt smooth boundary.

BE—6 to 10 inches; yellowish brown (10YR 5/6) silt loam; moderate thin platy structure; friable; common fine roots; few faint yellowish brown (10YR 5/4) silt coatings on faces of peds; very few fine and medium prominent black (10YR 2/1) concretions of iron and manganese oxide; about 20 percent Ap material filling an old animal burrow; very strongly acid; clear smooth boundary.

Bt1—10 to 18 inches; yellowish brown (10YR 5/6) silt loam; few fine faint yellowish brown (10YR 5/4) mottles; moderate medium and fine subangular blocky structure; firm; common fine roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; few fine and medium prominent black (10YR 2/1) concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt2—18 to 23 inches; yellowish brown (10YR 5/4) silt loam; common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; very firm; few fine roots; many prominent brown (10YR 5/3) clay films on faces of peds; few fine and medium prominent black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

B/E—23 to 30 inches; yellowish brown (10YR 5/6) silt loam; common coarse prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to strong medium and coarse subangular blocky; very firm, some brittleness; very few fine roots in seams; many prominent brown (10YR 5/3) clay films on faces of peds; common fine black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Btx1—30 to 42 inches; yellowish brown (10YR 5/6) silt loam; common coarse prominent light gray (10YR 7/1) mottles; moderate very coarse prismatic structure parting to strong medium and coarse angular blocky; very firm, brittle; very few fine roots in seams; common prominent light brownish gray (10YR 6/2) clay films on faces of peds; common medium and coarse black (10YR 2/1) concretions of iron and manganese oxide; strongly acid; gradual smooth boundary.

Btx2—42 to 54 inches; yellowish brown (10YR 5/6) silty clay loam; common medium prominent light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium and coarse angular blocky; very firm, brittle; common prominent brown (10YR 5/3) clay films on faces of peds; many coarse black (10YR 2/1) concretions of iron and manganese oxide, mainly on faces of peds and prism ped coatings; very strongly acid; gradual smooth boundary.

BC—54 to 62 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent light brownish gray (10YR 6/2) and common fine prominent strong brown (7.5YR 4/6) mottles; moderate coarse angular blocky structure; very firm; common prominent brown (10YR 5/3) clay films on faces of peds; few fine black (10YR 2/1) concretions of iron and manganese oxide; strongly acid; abrupt wavy boundary.

2C—62 to 80 inches; brown (7.5YR 5/4) clay; common coarse prominent light brownish gray (2.5Y 6/2) mottles; massive; very firm; neutral.

Range in Characteristics

Thickness of the solum: 50 to 100 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: Ap and Bt horizons—0 to 5 percent; Btx and BC horizons—0 to 10 percent; 2C horizon—0 to 15 percent
Depth to top of fragipan: 24 to 36 inches
Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 6
Texture—silt loam, silty clay loam
Btx horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—silt loam, silty clay loam
2C horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silty clay loam ranging to clay

Orrville Series

Depth class: Very deep
Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Philo, Piopolis, Pope

Taxonomic class: Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents

Typical Pedon

Orrville silt loam, frequently flooded; about 1 mile south of Mt. Pleasant, in Swan Township; 620 feet west and 50 feet north of the southeast corner of sec. 4, T. 12 N., R. 17 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and few medium roots; few sandstone pebbles; moderately acid; clear smooth boundary.

Bw—8 to 16 inches; brown (10YR 5/3) silt loam; moderate medium distinct grayish brown (10YR 5/2) and common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium and fine subangular blocky structure; friable; few fine and medium roots; many prominent dark brown (7.5YR 4/4) stains of iron and manganese oxide; few sandstone pebbles; strongly acid; clear smooth boundary.

Bg—16 to 33 inches; light brownish gray (10YR 6/2) loam; common fine prominent yellowish brown (10YR 5/6) and common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; very few fine roots; common fine very dark brown (10YR 2/2) concretions of iron and manganese oxide; few sandstone pebbles; strongly acid; clear smooth boundary.

Cg—33 to 60 inches; grayish brown (2.5Y 5/2), stratified loam and sandy loam; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; friable; very few fine roots; few prominent very dark brown (10YR 2/2) concretions of iron and manganese oxide; few sandstone pebbles; strongly acid.

Range in Characteristics

Thickness of the solum: 24 to 50 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: Ap horizon—0 to 5 percent; B horizon—0 to 15 percent; C horizon—0 to 25 percent
Ap horizon:
Color—hue of 10YR or 2.5Y, value of 4, chroma of 2 or 3
Texture—silt loam, loam, or, less commonly, fine sandy loam
B horizon:
Color—hue of 10YR or 2.5Y or is neutral; value of 4 to 6; chroma of 0 to 6
Texture—silt loam or loam with subhorizons of sandy loam or fine sandy loam in some pedons
C horizon:
Color—hue of 10YR or 2.5Y or is neutral; value of 4 to 7; chroma of 0 to 6
Texture—stratified silt loam, loam, or sandy loam in the fine-earth fraction

Philo Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Orrville, Piopolis

Taxonomic class: Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts

Typical Pedon

Philo silt loam, frequently flooded; about 3.4 miles east of Dundas, in Richland Township; 1,040 feet south and 2,275 feet east of the northwest corner of sec. 36, T. 9 N., R. 18 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; moderately acid; clear wavy boundary.

A—7 to 12 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure parting to moderate fine granular; friable; common fine roots; about 5 percent sandstone gravel; very strongly acid; abrupt wavy boundary.

Bw1—12 to 19 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct yellowish brown (10YR 5/4) and common fine prominent pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure parting to moderate fine granular; friable; very strongly acid; clear wavy boundary.

Bw2—19 to 34 inches; yellowish brown (10YR 5/4) loam; many medium prominent strong brown (7.5YR 5/6) and many fine prominent light brownish gray (10YR 6/2) mottles; moderate medium and coarse angular blocky structure; firm; common fine roots; few prominent black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bw3—34 to 48 inches; dark yellowish brown (10YR 4/4) and brown (10YR 4/3 and 5/3) fine sandy loam; many medium prominent strong brown (7.5YR 5/6) and many fine prominent light brownish gray (10YR 6/2) mottles; weak coarse and medium subangular blocky structure; friable; few fine roots; few fine prominent black (10YR 2/1) concretions of iron and manganese oxide; very strongly acid; clear wavy boundary.

2C1—48 to 68 inches; brown (10YR 5/3 and 4/3) loamy sand; many medium distinct grayish brown (10YR 5/2) mottles; massive; friable; many coarse black (10YR 2/1) concretions of iron and manganese oxide; moderately acid; abrupt wavy boundary.

2C2—68 to 80 inches; brown (10YR 5/3) and gray (10YR 6/1) gravelly sandy loam; massive; friable; about 20 percent sandstone gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to 48 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: A horizon—0 to 10 percent; B and C horizons—0 to 20 percent
A horizon:
Color—hue of 10YR or 7.5YR, value of 4, chroma of 2 or 3
Texture—silt loam, loam, or sandy loam
Bw horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—silt loam, loam, sandy loam, or fine sandy loam in the fine-earth fraction
2C horizon:
Color—hue of 7.5YR to 2.5Y or is neutral; value of 4 to 6; chroma of 0 to 4
Texture—silt loam to loamy sand in the fine-earth fraction

Piopolis Series

Depth class: Very deep
Drainage class: Poorly drained and very poorly drained
Permeability: Slow
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Cuba, Orrville, Pope

Taxonomic class: Fine-silty, mixed, acid, mesic Typic Fluvaquents

Typical Pedon

Piopolis silt loam, frequently flooded; in Jackson County, about 1.2 miles west-northwest of Clay, in Franklin Township; 1,400 feet north and 1,225 feet west of the southeast corner of sec. 35, T. 6 N., R. 18 W.

Ap—0 to 7 inches; grayish brown (10YR 5/2) silt loam; moderate coarse granular structure; friable; many fine roots; common fine dark brown (7.5YR 4/4) concretions and stains of iron and manganese oxide; moderately acid; abrupt smooth boundary.

Cg1—7 to 12 inches; gray (5Y 6/1) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; few faint light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine dark brown (7.5YR 4/4) concretions and stains of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg2—12 to 26 inches; gray (5Y 6/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; few faint light brownish gray (2.5Y 6/2) silt coatings on vertical faces of peds; many fine and medium distinct dark brown (7.5YR 4/4) concretions and stains of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg3—26 to 40 inches; gray (10YR 6/1) silty clay loam; common medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; common fine and medium distinct dark brown (7.5YR 4/4) and very dark grayish brown (10YR 3/2) concretions and stains of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg4—40 to 60 inches; light gray (10YR 7/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; firm; many medium distinct dark brown (7.5YR 3/2) concretions and stains of iron and manganese oxide; strongly acid.

Range in Characteristics

Depth to bedrock: More than 60 inches

Ap horizon:

Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3

Texture—silt loam, silty clay loam

Cg horizon:

Color—hue of 10YR to 5Y, value of 5 to 7, chroma of 1 or 2

Texture—silty clay loam with thin layers of silty clay or clay

Pope Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate or moderately rapid

Parent material: Alluvium

Landform: Flood plains

Position on the landform: Steps of flood plains

Slope: 0 to 2 percent

Commonly adjacent soils: Orrville, Philo

Taxonomic class: Coarse-loamy, mixed, mesic Fluventic Dystrochrepts

Typical Pedon

Pope loam, frequently flooded; about 1 mile east of Eagle Mills, in Eagle Township; 1,848 feet east and 1,043 feet south of the northwest corner of sec. 23, T. 10 N., R. 19 W.

Ap1—0 to 7 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; very friable; strongly acid; abrupt smooth boundary.

Ap2—7 to 12 inches; dark yellowish brown (10YR 4/4) loam; moderate medium granular structure; friable; many fine and few medium roots; strongly acid; abrupt smooth boundary.

Bw1—12 to 30 inches; dark yellowish brown (10YR 4/6) fine sandy loam; weak coarse subangular blocky structure; friable; few fine and very few medium roots; very strongly acid; gradual smooth boundary.

Bw2—30 to 45 inches; dark yellowish brown (10YR 4/6) fine sandy loam; weak coarse subangular blocky structure; friable; very few fine roots; very strongly acid; gradual smooth boundary.

C1—45 to 55 inches; yellowish brown (10YR 5/4) fine sandy loam; common medium distinct brown (10YR 5/3) and few fine prominent grayish brown (10YR 5/2) mottles; massive; friable; few fine prominent reddish brown (5YR 5/4) stains of iron and manganese oxide; strongly acid; clear smooth boundary.

C2—55 to 67 inches; brown (10YR 5/3) sandy loam; common medium distinct grayish brown (10YR 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; about 5 percent sandstone gravel; strongly acid; abrupt smooth boundary.

C3—67 to 80 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; many medium prominent grayish brown (10YR 5/2) mottles; massive; very friable; about 50 percent sandstone gravel; very strongly acid.

Range in Characteristics

Thickness of the solum: 30 to 50 inches

Depth to bedrock: More than 60 inches

Content of coarse fragments: Ap horizon—0 to 20 percent, Bw horizon—0 to 30 percent, C horizon—0 to 60 percent

Ap horizon:

Color—hue of 10YR, value of 4 or 5, chroma of 2 to 6

Texture—loam, silt loam, sandy loam, or fine sandy loam in the fine-earth fraction

Bw horizon:

Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6

Texture—fine sandy loam, sandy loam, loam, or silt loam in the fine-earth fraction

C horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—loamy sand, loamy fine sand, fine sandy loam, sandy loam, loam, or sandy clay loam in the fine-earth fraction

Rarden Series

Depth class: Moderately deep
Drainage class: Moderately well drained
Permeability: Slow
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope: 6 to 40 percent
Commonly adjacent soils: Gilpin, Wharton

Taxonomic class: Fine, mixed, mesic Aquultic Hapludalfs

Typical Pedon

Rarden silt loam, in an area of Gilpin-Rarden complex, 15 to 25 percent slopes; about 0.5 mile south of Wilkesville, in Wilkesville Township; 2,600 feet east and 1,400 feet south of the northwest corner of sec. 3, T. 8 N., R. 16 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; many fine roots; about 5 percent siltstone and sandstone gravel; slightly acid; abrupt wavy boundary.

Bt1—5 to 9 inches; yellowish red (5YR 5/6) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; many prominent brown (10YR 5/3) organic coatings on faces of peds; many fine prominent black (10YR 2/1) concretions and stains of iron and manganese oxide; about 10 percent sandstone and siltstone gravel; strongly acid; clear wavy boundary.

Bt2—9 to 17 inches; yellowish red (5YR 5/6) silty clay; few medium prominent light brownish gray (10YR 6/2) and few fine distinct red (2.5YR 4/8) mottles; strong medium subangular blocky structure; firm; few fine roots; many prominent reddish brown (5YR 5/3) clay films on faces of peds; common medium prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; strongly acid; clear wavy boundary.

Bt3—17 to 25 inches; red (2.5YR 4/8) clay; many medium and coarse prominent gray (10YR 6/1) and common medium prominent light yellowish brown (2.5Y 6/4) mottles; weak medium subangular blocky structure; firm; very few fine roots; common prominent gray (10YR 6/1) clay films on faces of peds; very strongly acid; abrupt wavy boundary.

BC—25 to 30 inches; yellowish brown (10YR 5/6) channery silty clay loam; many coarse prominent light brownish gray (10YR 6/2), few medium prominent red (2.5YR 4/8), and common medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; very few fine roots; few fine prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; about 20 percent siltstone and sandstone channers; very strongly acid; clear smooth boundary.

Cr—30 to 33 inches; partially weathered, interbedded siltstone and shale bedrock.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: 20 to 40 inches
Content of rock fragments: Ap and Bt horizons—0 to 15 percent; BC horizon—0 to 30 percent
A horizon (if it occurs):
Color—hue of 10YR or 7.5YR, value of 3 or 4, chroma of 2 or 3
Texture—silt loam
Ap horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam; silty clay loam in eroded areas
E horizon (if it occurs):
Color—hue of 10YR or 7.5YR, value of 5 or 6, chroma of 2 to 4
Texture—silt loam
Bt horizon:
Color—hue of 7.5YR to 2.5YR, value of 3 to 7, chroma of 4 to 8
Texture—silty clay or clay with thin subhorizons of silty clay loam in the fine-earth fraction
BC and C horizons:
Color—hue of 10YR to 5YR, value of 5 or 6, chroma of 4 to 6
Texture—silty clay, clay, or silty clay loam in the fine-earth fraction

Richland Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate

Parent material: Colluvium
Landform: Hills
Position on the landform: Footslopes
Slope: 15 to 40 percent
Commonly adjacent soils: Gilpin, Steinsburg

Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludalfs

Typical Pedon

Richland loam, 15 to 25 percent slopes; in Athens County, about 3 miles west-southwest of Nelsonville, in York Township; 2,000 feet south and 700 feet east of the northwest corner of sec. 35, T. 12 N., R. 15 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate medium and fine granular structure; friable; many fine roots; 5 percent sandstone and siltstone fragments; strongly acid; clear wavy boundary.
Bt1—7 to 13 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; friable; common fine roots; few faint clay films on faces of peds; few prominent grayish brown (10YR 5/2) fillings in old root channels; 10 percent sandstone and siltstone fragments; strongly acid; clear wavy boundary.
Bt2—13 to 28 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few prominent clay films on faces of peds; 10 percent sandstone fragments; strongly acid; clear wavy boundary.
Bt3—28 to 43 inches; dark yellowish brown (10YR 4/4) channery silt loam; moderate medium subangular blocky structure; friable; few faint clay films on faces of peds; 25 percent sandstone channers; strongly acid; clear wavy boundary.
C—43 to 60 inches; yellowish brown (10YR 5/4) channery clay loam; massive; firm; 30 percent sandstone channers; strongly acid.

Range in Characteristics

Thickness of the solum: 43 to 60 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: A horizon and upper part of the Bt horizon—5 to 20 percent; lower part of the Bt horizon—20 to 35 percent; C horizon—20 to 55 percent
A horizon:
Color—hue of 10YR, value of 4, chroma of 2 or 3
Texture—loam, silt loam
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 4 to 6
Texture—loam, silt loam, or clay loam in the fine-earth fraction
C horizon:
Color—hue of 10YR or 7.5YR, value of 5, chroma of 3 to 6
Texture—clay loam or silty clay loam in the fine-earth fraction

Sewell Series

Depth class: Very deep
Drainage class: Somewhat excessively drained
Permeability: Moderately rapid or rapid
Parent material: Noncalcareous regolith from surface mining
Landform: Hills
Position on the landform: Backslopes
Slope: 20 to 40 percent
Commonly adjacent soils: Germano, Gilpin, Steinsburg

Taxonomic class: Loamy-skeletal, mixed, acid, mesic Typic Udorthents

Typical Pedon

Sewell channery fine sandy loam, 20 to 40 percent slopes; about 2.5 miles east of New Plymouth, in Brown Township; about 850 feet east and 1,175 feet south of the northwest corner of sec. 12, T. 12 N., R. 17 W.

Oi—1 inch to 0; pine needle duff.
A—0 to 2 inches; brown (10YR 4/3) channery fine sandy loam; weak medium granular structure; friable; many fine and few medium roots; about 20 percent sandstone gravel; extremely acid; clear smooth boundary.
C1—2 to 18 inches; yellowish brown (10YR 5/4) very channery fine sandy loam; massive; friable; many fine and medium roots; many fine faint yellowish brown (10YR 5/6) lithochromatic mottles; about 35 percent shale and sandstone channers, includes a 2-inch layer of weathered shale; extremely acid; gradual wavy boundary.
C2—18 to 48 inches; yellowish brown (10YR 5/4) very channery fine sandy loam; massive; friable; common medium roots; about 45 percent shale and sandstone channers; extremely acid; gradual wavy boundary.
C3—48 to 80 inches; yellowish brown (10YR 5/4) very channery loam; massive; friable; about 45 percent shale and sandstone channers; extremely acid.

Range in Characteristics

Depth to bedrock: More than 60 inches
Content of rock fragments: A horizon—15 to 35 percent; C horizon—35 to 80 percent
A horizon:
Color—hue of 7.5YR or 10YR, value of 3 to 5, chroma of 2 to 6
Texture—sandy loam or loam in the fine-earth fraction
C horizon:
Color—hue of 7.5YR or 10YR, value of 2 to 6, chroma of 1 to 8
Texture—sandy loam or loam in the fine-earth fraction

Shelocta Series

Depth class: Deep and very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Colluvium
Landform: Hills
Position on the landform: Backslopes
Slope: 25 to 70 percent
Commonly adjacent soils: Berks, Brownsville, Gilpin

Taxonomic class: Fine-loamy, mixed, mesic Typic Hapludults

Typical Pedon

Shelocta silt loam, in an area of Shelocta-Brownsville association, very steep; about 2.4 miles southwest of Ratcliffburg, in Harrison Township; 1,950 feet east and 2,010 feet south of the northwest corner of sec. 27, T. 9 N., R. 19 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; about 10 percent sandstone gravel; very strongly acid; abrupt smooth boundary.

E—2 to 7 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; common fine and few medium roots; about 10 percent sandstone gravel; strongly acid; clear smooth boundary.

BE—7 to 14 inches; light yellowish brown (10YR 6/4) gravelly loam; moderate medium subangular blocky structure; friable; common fine and very few medium roots; few faint yellowish brown (10YR 5/4) clay films on faces of peds; about 20 percent sandstone and siltstone gravel; strongly acid; clear smooth boundary.

Bt1—14 to 22 inches; light yellowish brown (10YR 6/4) channery loam; moderate medium subangular blocky structure; friable; few fine and medium roots; few distinct yellowish brown (10YR 5/4) clay films on faces of peds; about 20 percent sandstone and siltstone channers; very strongly acid; abrupt wavy boundary.

Bt2—22 to 27 inches; light yellowish brown (10YR 6/4) channery loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct brown (7.5YR 5/4) clay films on faces of peds; about 20 percent sandstone and siltstone channers; strongly acid; clear wavy boundary.

Bt3—27 to 35 inches; light olive brown (2.5Y 5/4) silt loam; moderate fine and medium subangular blocky structure; firm; very few fine roots; many prominent strong brown (7.5YR 5/6) clay films on faces of peds; about 10 percent sandstone channers; very strongly acid; abrupt wavy boundary.

Bt4—35 to 46 inches; light yellowish brown (2.5Y 6/4) silt loam; moderate coarse subangular blocky structure; firm; very few fine roots; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; few prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent sandstone channers; very strongly acid; clear wavy boundary.

BC—46 to 55 inches; yellowish brown (10YR 5/4) channery silt loam; many medium prominent light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; common distinct strong brown (7.5YR 5/6) clay films on faces of peds; about 20 percent sandstone channers; very strongly acid; gradual wavy boundary.

C—55 to 75 inches; yellowish brown (10YR 5/6) extremely channery silt loam; few fine distinct light yellowish brown (2.5Y 6/4) mottles; massive; firm; about 65 percent sandstone channers; abrupt smooth boundary.

R—75 to 78 inches; thinly bedded, medium grained sandstone bedrock.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches
Depth to bedrock: More than 48 inches
Content of coarse fragments: A and E horizons—2 to 20 percent; B horizon—5 to 35 percent; C horizon—15 to 70 percent

A horizon:
Color—hue of 10YR or 2.5Y, value of 3 or 4, chroma of 1 to 3
Texture—silt loam or loam in the fine-earth fraction

E horizon:
Color—hue of 10YR or 2.5Y, value of 5 to 7, chroma of 2 to 4
Texture—silt loam or loam in the fine-earth fraction

Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 4 to 8
Texture—silt loam, loam, or silty clay loam in the fine-earth fraction

C horizon:
Color—hue of 10YR or 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silt loam, loam, silty clay loam, or clay loam in the fine-earth fraction

Skidmore Series

Depth class: Deep and very deep
Drainage class: Well drained
Permeability: Moderately rapid
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Brownsville, Pope, Shelocta

Taxonomic class: Loamy-skeletal, mixed, mesic, Dystric Fluventic Eutrochrepts

Typical Pedon

Skidmore gravelly loam, frequently flooded; in Jackson County, about 1.1 miles north-northwest of Limerick, in Jackson Township; 1,400 feet north and 1,100 feet west of the southeast corner of sec. 30, T. 8 N., R. 19 W.

Ap—0 to 5 inches; brown (10YR 5/3) gravelly loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; many fine roots; 15 percent gravel; moderately acid; abrupt smooth boundary.

Bw1—5 to 12 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium and coarse subangular blocky structure; friable; few fine roots; brown (10YR 4/3) fillings in root channels; 15 percent gravel; moderately acid; clear smooth boundary.

Bw2—12 to 20 inches; strong brown (7.5YR 5/6) very gravelly sandy loam; weak medium subangular blocky structure; very friable; few fine roots; 35 percent rock fragments; moderately acid; clear wavy boundary.

C1—20 to 36 inches; yellowish brown (10YR 5/4) very gravelly sandy loam; massive; very friable; 55 percent gravel; moderately acid; gradual wavy boundary.

C2—36 to 60 inches; light yellowish brown (10YR 6/4) extremely gravelly loamy sand; single grain; loose; 60 percent gravel; moderately acid.

Range in Characteristics

Thickness of the solum: 20 to 40 inches
Depth to bedrock: More than 40 inches
Content of rock fragments: A horizon—0 to 35 percent; Bw horizon—10 to 50 percent; C horizon—35 to 70 percent

Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam or loam in the fine-earth fraction

Bw horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, chroma of 3 to 6
Texture—loam, clay loam, fine sandy loam, and sandy loam in the fine-earth fraction

C horizon:
Color—hue of 7.5YR or 10YR, value of 4 to 6, chroma of 3 to 6
Texture—loam, clay loam, fine sandy loam, sandy loam, and loamy sand in the fine-earth fraction

Steinsburg Series

Depth class: Moderately deep
Drainage class: Well drained
Permeability: Moderately rapid
Parent material: Residuum
Landform: Hills
Position on the landform: Backslopes
Slope: 25 to 70 percent
Commonly adjacent soils: Gilpin, Germano, Rarden

Taxonomic class: Coarse-loamy, mixed, mesic Typic Dystrochrepts

Typical Pedon

Steinsburg sandy loam, in an area of Steinsburg-Gilpin association, very steep; about 2.4 miles east of Hope Furnace, in Brown Township; 130 feet west and 225 feet north of the southeast corner of sec. 3, T. 11 N., R. 16 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; about 10 percent sandstone gravel; very strongly acid; gradual smooth boundary.
A2—2 to 6 inches; brown (10YR 4/3) sandy loam; weak medium granular structure; friable; common fine and medium roots; about 10 percent sandstone fragments; very strongly acid; clear smooth boundary.
Bw—6 to 18 inches; yellowish brown (10YR 5/4) channery sandy loam; weak coarse subangular blocky structure; friable; few fine roots; about 20 percent sandstone channers; very strongly acid; clear smooth boundary.
C—18 to 22 inches; yellowish brown (10YR 5/4) very channery sandy loam; massive; friable; few fine roots; about 50 percent sandstone channers; very strongly acid; abrupt wavy boundary.
R—22 to 25 inches; yellowish brown (10YR 5/6), coarse grained sandstone bedrock.

Range in Characteristics

Thickness of the solum: 12 to 20 inches
Depth to bedrock: 20 to 40 inches
Content of rock fragments: A and Bw horizons—0 to 20 percent; C horizon—15 to 60 percent
A horizon:
Color—hue of 10YR, value of 3 or 4, chroma of 2 to 4
Texture—sandy loam or fine sandy loam in the fine-earth fraction
Bw horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—loam, sandy loam, or fine sandy loam in the fine-earth fraction
C horizon:
Color—hue of 10YR or 7.5YR, value of 4 to 6, chroma of 3 to 6
Texture—sandy loam, fine sandy loam, or loamy sand in the fine-earth fraction

Tarhollow Series

Depth class: Deep and very deep
Drainage class: Moderately well drained
Permeability: Slow or moderately slow
Parent material: Loess over residuum
Landform: Hills
Position on the landform: Summits, shoulders
Slope: 2 to 15 percent
Commonly adjacent soils: Gilpin, Wharton
Taxonomic class: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Tarhollow silt loam, 6 to 15 percent slopes; in a wooded area of Ross County, about 7 miles south of Adelphi, in Harrison Township; about 930 feet south and 1,740 feet east of the northwest corner of sec. 12, T. 10 N., R. 20 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common medium and many fine roots; very strongly acid; clear smooth boundary.
A2—2 to 5 inches; brown (10YR 4/3) silt loam; moderate fine and medium granular structure; friable; few medium and many fine roots; common distinct very dark grayish brown (10YR 3/2) coatings on faces of peds; very strongly acid; clear smooth boundary.
BE—5 to 9 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; friable; few medium and common fine roots; few faint strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear smooth boundary.
Bt1—9 to 12 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable; few medium and common fine roots; common faint strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear smooth boundary.
Bt2—12 to 27 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few medium and common fine roots; common faint strong brown (7.5YR 5/6) clay films on faces of peds; common distinct black (N 2/) stains of iron and manganese oxide; common distinct brown (10YR 5/3) silt coatings on faces of peds; very strongly acid; clear smooth boundary.
Bt3—27 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; common faint strong brown (7.5YR 5/6) clay films and few fine light yellowish brown (10YR 6/4) silt coatings on faces of peds; 1 percent pebbles; very strongly acid; clear smooth boundary.
2Bt4—31 to 34 inches; strong brown (7.5YR 5/6) channery silty clay; many medium distinct yellowish red (5YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common faint strong brown

(7.5YR 5/6) clay films on faces of peds; about 20 percent channers; very strongly acid; clear wavy boundary.

2Bt5—34 to 44 inches; strong brown (7.5YR 5/6) channery silty clay; common medium distinct light grayish brown (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; common faint strong brown (7.5YR 5/6) clay films and common distinct pale brown (10YR 6/3) silt coatings on faces of peds; about 20 percent channers; very strongly acid; clear wavy boundary.

2BC—44 to 55 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate coarse subangular blocky structure; firm; about 1 percent channers; strongly acid; clear smooth boundary.

2Cr—55 to 60 inches; soft siltstone bedrock.

Range in Characteristics

Thickness of the solum: 40 to 72 inches
Depth to bedrock: 40 to 80 inches
Thickness of the loess mantle: 20 to 40 inches
Content of rock fragments: A and Bt horizons—0 to 5 percent; 2Bt and 2BC horizons—0 to 20 percent; 2C horizon—0 to 30 percent

A horizon:
Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4
Texture—silt loam

Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 4 to 6
Texture—silt loam, silty clay loam

2Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 or 5, chroma of 4 to 6
Texture—silty clay loam, silty clay, or clay in the fine-earth fraction

2BC and 2C horizons:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silty clay loam or silty clay in the fine-earth fraction

Tilsit Series

Depth class: Deep and very deep
Drainage class: Moderately well drained
Permeability: Moderate above the fragipan; slow in the fragipan
Parent material: Loess over residuum
Landform: Hills
Position on the landform: Summits
Slope: 3 to 8 percent
Commonly adjacent soils: Germano, Rarden, Wellston, Wharton

Taxonomic class: Fine-silty, mixed, mesic Typic Fragiudults

Typical Pedon

Tilsit silt loam, 3 to 8 percent slopes; in Jackson County, about 2.2 miles southeast of Mulga, in Milton Township; 2,400 feet east and 1,625 feet north of the southwest corner of sec. 12, T. 9 N., R. 17 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium and coarse granular structure; friable; common fine and medium roots; slightly acid; abrupt wavy boundary.

BA—10 to 16 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; few faint dark grayish brown (10YR 4/2) organic coatings on faces of peds; strongly acid; clear wavy boundary.

Bt1—16 to 24 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few faint brown (7.5YR 5/4) clay films on faces of peds; few faint yellowish brown (10YR 5/4) silt coatings on faces of peds; few fine dark brown (7.5YR 3/2) concretions and stains of iron and manganese oxide; strongly acid; clear wavy boundary.

2Bt2—24 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct brown (10YR 5/3) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; common faint brown (7.5YR 4/4) clay films on faces of peds; common faint very pale brown (10YR 7/3) silt coatings on faces of peds; few fine strong brown (7.5YR 5/6) concretions of iron and manganese oxide; 2 percent rock fragments; strongly acid; clear wavy boundary.

2Btx1—29 to 36 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure parting to moderate medium platy; very firm and brittle; few fine roots; common faint brown (7.5YR 4/4) clay films on vertical faces of peds; common faint light yellowish brown (10YR 6/4) silt coatings on vertical faces of peds; few fine dark brown (7.5YR 3/2) concretions and stains of iron and manganese oxide; 2 percent rock fragments; very strongly acid; gradual wavy boundary.

2Btx2—36 to 42 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct gray (10YR 5/1) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure;

very firm and brittle; common faint brown (7.5YR 4/4) clay films on faces of peds; common faint light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; few fine dark brown (7.5YR 3/2) concretions and stains of iron and manganese oxide; 2 percent shale channers; very strongly acid; gradual wavy boundary.

2Btx3—42 to 51 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct gray (10YR 6/1) and common medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm and brittle; common faint brown (7.5YR 5/4) clay films on faces of peds; common faint light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; common fine and medium strong brown (7.5YR 5/8) stains of iron and manganese oxide; 2 percent rock fragments; very strongly acid; clear wavy boundary.

2Btx4—51 to 58 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct gray (10YR 6/1) and common fine distinct strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure; very firm and brittle; common faint brown (7.5YR 5/4) clay films on vertical faces of peds; few fine and medium strong brown (7.5YR 5/6) stains of iron and manganese oxide; 5 percent shale channers; very strongly acid; clear wavy boundary.

2Cr—58 to 60 inches; thinly bedded, rippable shale bedrock.

Range in Characteristics

Thickness of the solum: 40 to 60 inches
Depth to bedrock: More than 40 inches
Depth to top of fragipan: 18 to 28 inches
Content of rock fragments: Ap and Bt horizons—0 to 10 percent; 2Bt horizon—0 to 40 percent

Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam

Bt horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 4 to 6
Texture—silt loam, loam, or silty clay loam in the fine-earth fraction

2Bt and 2Btx horizons:
Color—hue of 10YR, value of 5 or 6, chroma of 3 to 6
Texture—silt loam, silty clay loam, sandy clay loam, or clay loam in the fine-earth fraction

Tioga Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate or moderately rapid in the subsoil; moderate to rapid in the substratum
Parent material: Alluvium
Landform: Flood plains
Position on the landform: Steps of flood plains
Slope: 0 to 2 percent
Commonly adjacent soils: Chavies, Glenford, Pope

Taxonomic class: Coarse-loamy, mixed, mesic Dystric Fluventic Eutrochrepts

Typical Pedon

Tioga fine sandy loam, frequently flooded; about 4.4 miles southwest of Eagle Mills, in Eagle Township; 1,300 feet east and 924 feet north of the southwest corner of sec. 6, T. 10 N., R. 19 W.

Ap—0 to 9 inches; brown (10YR 4/3) fine sandy loam, very pale brown (10YR 7/3) dry; weak medium granular structure; friable; few fine roots; neutral; gradual smooth boundary.

Bw1—9 to 23 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; very few fine roots; common faint brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—23 to 35 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak very coarse subangular blocky structure; friable; few faint brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

C—35 to 80 inches; dark yellowish brown (10YR 4/4), stratified silt loam and fine sandy loam; massive; friable; neutral.

Range in Characteristics

Thickness of the solum: 18 to 40 inches
Depth to bedrock: More than 60 inches
Content of rock fragments: Ap and Bw horizons—0 to 25 percent; C horizon—0 to 35 percent

Ap horizon:
Color—hue of 10YR, value of 3 to 5, chroma of 2 to 4
Texture—fine sandy loam to silt loam

Bw horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam to loamy sand in the fine-earth fraction

C horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam to loamy sand in the fine-earth fraction

Wellston Series

Depth class: Deep and very deep
Drainage class: Well drained
Permeability: Moderate
Parent material: Loess over residuum
Landform: Hills
Position on the landform: Summits, shoulders
Slope: 6 to 15 percent
Commonly adjacent soils: Gilpin, Latham, Tarhollow, Wharton

Taxonomic class: Fine-silty, mixed, mesic Ultic Hapludalfs

Typical Pedon

Wellston silt loam, 6 to 15 percent slopes; about 3.5 miles north of Creola, in Swan Township; 1,250 feet east and 750 feet north of the southwest corner of sec. 9, T. 12 N., R. 17 W.

Oi—1 inch to 0; partially decomposed hardwood leaf litter.
Ap—0 to 6 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine and few medium roots; moderately acid; clear smooth boundary.
BE—6 to 10 inches; brown (10YR 5/3) silt loam; moderate coarse subangular blocky structure; friable; common medium roots; common faint brown (10YR 4/3) silt coatings on faces of peds; strongly acid; clear wavy boundary.
Bt1—10 to 15 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few medium and fine roots; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.
Bt2—15 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct brown (10YR 5/3) silt coatings on faces of peds; strongly acid; clear wavy boundary.
2Bt3—27 to 33 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine and medium roots; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent siltstone fragments; common distinct brown (10YR 5/3) silt coatings on faces of peds; strongly acid; gradual wavy boundary.
2C—33 to 42 inches; yellowish brown (10YR 5/6) sandy loam; massive; friable; few fine and medium roots; common distinct dark yellowish brown (10YR 4/4) clay films on soft sandstone fragments; few distinct grayish brown (2.5Y 5/2) silt coatings in vertical seams; about 10 percent soft sandstone channers; strongly acid; diffuse smooth boundary.
2R—42 to 45 inches; hard sandstone bedrock.

Range in Characteristics

Thickness of the solum: 32 to 50 inches
Depth to bedrock: 40 to 72 inches
Content of rock fragments: Ap, BE, and Bt horizons—0 to 10 percent; 2Bt horizon—0 to 35 percent; 2C horizon—0 to 60 percent
Ap horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 2 to 6
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 8
Texture—silt loam, silty clay loam
2Bt horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 8
Texture—silt loam, silty clay loam, loam, or clay loam in the fine-earth fraction
2C horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 or 5, chroma of 3 to 6
Texture—silt loam, loam, clay loam, sandy clay loam, or sandy loam in the fine-earth fraction

Wharton Series

Depth class: Deep and very deep
Drainage class: Moderately well drained
Permeability: Slow or moderately slow
Parent material: Residuum
Landform: Hills
Position on the landform: Summits, shoulders, backslopes
Slope: 6 to 35 percent
Commonly adjacent soils: Cruze, Latham, Rarden

Taxonomic class: Fine-loamy, mixed, mesic Aquic Hapludults

Typical Pedon

Wharton silt loam, in an area of Wharton-Latham complex, 15 to 25 percent slopes; about 1.2 miles north of Stella, in Jackson Township; 850 feet east and 1,800 feet south of the northwest corner of sec. 2, T. 10 N., R. 18 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—7 to 16 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few faint yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—16 to 22 inches; yellowish brown (10YR 5/6) silt loam; many medium distinct strong brown (7.5YR 5/6) and common medium distinct brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; common faint brown (10YR 5/3) silt coatings on faces of peds; few fine prominent very dark brown (10YR 2/2) stains of iron and manganese oxide; about 10 percent siltstone pebbles; very strongly acid; clear smooth boundary.

Bt3—22 to 30 inches; yellowish brown (10YR 5/4) channery silty clay loam; common coarse prominent grayish brown (10YR 5/2), common medium distinct brown (10YR 5/3) and few medium distinct strong brown (7.5YR 5/6) mottles; moderate medium and fine subangular blocky structure; firm; many distinct yellowish brown (10YR 5/4) clay films on faces of peds; common fine prominent very dark brown (10YR 2/2) stains of iron and manganese oxide; common soft sandstone channers; about 15 percent siltstone channers; very strongly acid; clear smooth boundary.

Bt4—30 to 40 inches; yellowish brown (10YR 5/4) channery silty clay loam; common medium prominent grayish brown (10YR 5/2) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; many distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) clay films on faces of peds; many coarse prominent black (10YR 2/1) stains and concretions of iron and manganese oxide; common soft sandstone fragments; about 20 percent siltstone channers; extremely acid; clear smooth boundary.

BC—40 to 48 inches; yellowish brown (10YR 5/6) channery silty clay loam; many fine prominent grayish brown (2.5Y 5/2) and few medium distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure with coarse platy rock structure in places; firm; many distinct yellowish brown (10YR 5/4) clay films on faces of peds; common medium prominent black (10YR 2/1) stains of iron and manganese oxide; common soft sandstone fragments; about 20 percent siltstone channers; extremely acid; clear smooth boundary.

C—48 to 55 inches; yellowish brown (10YR 5/4) channery silty clay loam; many medium prominent light brownish gray (2.5Y 6/2) and many medium distinct strong brown (7.5YR 5/8) mottles; massive with moderate coarse platy structure in places; firm; few distinct brown (10YR 5/3) clay films on soft fragments; few medium prominent black (10YR 2/1) stains of iron and manganese oxide; common soft sandstone fragments; about 20 percent siltstone channers; very strongly acid; clear smooth boundary.

Cr—55 to 58 inches; weathered, thinly bedded light brownish gray (10YR 6/2) siltstone and brownish yellow (10YR 6/8) sandstone bedrock.

Range in Characteristics

Thickness of the solum: 30 to 60 inches
Depth to bedrock: 40 to 72 inches
Content of rock fragments: Ap horizon—0 to 10 percent; Bt horizon—0 to 20 percent; BC horizon—5 to 35 percent; C horizon—20 to 60 percent
Ap horizon:
Color—hue of 10YR, value of 3 to 6, chroma of 2 to 4
Texture—silt loam, silty clay loam
Bt horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silt loam, silty clay loam, or clay loam in the fine-earth fraction; subhorizons of silty clay in some pedons
C horizon:
Color—hue of 7.5YR to 2.5Y, value of 4 to 6, chroma of 2 to 6
Texture—silt loam, clay loam, silty clay loam, or silty clay in the fine-earth fraction

Wyatt Series

Depth class: Very deep
Drainage class: Moderately well drained
Permeability: Slow or very slow
Parent material: Lacustrine deposits
Landform: Terraces

Position on the landform: Treads, risers
Slope: 2 to 15 percent
Commonly adjacent soils: Doles, Omulga

Taxonomic class: Fine, illitic, mesic Aquic Hapludalfs

Typical Pedon

Wyatt silt loam, 2 to 6 percent slopes; in Jackson County, about 0.9 mile north-northeast of Camba, in Franklin Township; about 2,200 feet west and 1,000 feet south of the northeast corner of sec. 22, T. 6 N., R. 18 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 15 inches; yellowish brown (10YR 5/4) silty clay; weak fine angular and subangular blocky structure; firm; few fine roots; few faint strong brown (7.5YR 5/6) clay films on faces of peds; few faint very pale brown (10YR 7/3) silt coatings on vertical faces of peds; very strongly acid; clear wavy boundary.

Bt2—15 to 19 inches; yellowish brown (10YR 5/6) silty clay; few fine distinct pale brown (10YR 6/3) mottles; moderate medium angular and subangular blocky structure; firm; few fine roots; few faint strong brown (7.5YR 5/6) clay films on faces of peds; few faint very pale brown (10YR 7/3) silt coatings on vertical faces of peds; very strongly acid; clear wavy boundary.

Bt3—19 to 32 inches; yellowish brown (10YR 5/4) clay; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt4—32 to 37 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak medium angular blocky; firm; few fine roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct gray (10YR 6/1) stress surfaces on faces of peds; strongly acid; clear smooth boundary.

BC—37 to 53 inches; yellowish brown (10YR 5/4) clay; common coarse prominent gray (5Y 6/1) and common fine distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure; very firm; very strongly acid; clear smooth boundary.

C—53 to 63 inches; brown (10YR 5/3) clay with thin lenses of silty clay and silty clay loam; few medium distinct gray (5Y 5/1) mottles; massive parting to platy structure where laminated; very firm; moderately acid in the upper part of the horizon and neutral in the lower part.

Range in Characteristics

Thickness of the solum: 36 to 60 inches
Depth to bedrock: More than 60 inches
Thickness of the loess mantle: 0 to 12 inches
Content of rock fragments: Ap, Bt, and C horizons—0 to 2 percent

Ap horizon:
Color—hue of 10YR, value of 4 or 5, chroma of 2 or 3
Texture—silt loam, silty clay loam

Bt horizon:
Color—hue of 10YR or 2.5Y, value of 4 or 5, chroma of 3 to 6
Texture—silty clay or clay with thin subhorizons of silty clay loam in some pedons

BC horizon:
Color—hue of 10YR or 2.5Y, value of 4 or 5, chroma of 3 or 4
Texture—silty clay or clay

C horizon:
Color—hue of 10YR or 2.5Y, value of 3 to 5, chroma of 3 or 4
Texture—silty clay or clay with thin subhorizons of silty clay loam or silt loam in some pedons

Zanesville Series

Depth class: Deep and very deep
Drainage class: Well drained and moderately well drained
Permeability: Moderate above the fragipan; slow or moderately slow in the fragipan
Parent material: Loess over residuum
Landform: Hills
Position on the landform: Summits
Slope: 2 to 6 percent
Commonly adjacent soils: Aaron, Gilpin, Tarhollow, Wharton

Taxonomic class: Fine-silty, mixed, mesic Typic Fragiudalfs

Typical Pedon

Zanesville silt loam, 2 to 6 percent slopes; about 0.5 mile east of Mt. Pleasant, in Swan Township;

300 feet south and 2,450 feet east of the northwest corner of sec. 3, T. 12 N., R. 17 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; common distinct black (N 2/) stains; few sandstone fragments; neutral; abrupt smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/6) silt loam; strong medium angular blocky structure; firm; common fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; few distinct black (N 2/) stains of iron and manganese oxide; moderately acid; clear smooth boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light yellowish brown (2.5Y 6/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few distinct black (N 2/) stains of iron and manganese oxide; common faint brown (10YR 5/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt3—21 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common distinct dark yellowish brown (10YR 4/4) and few distinct grayish brown (10YR 5/2) clay films on faces of peds; few prominent black (10YR 2/1) stains of iron and manganese oxide; common faint brown (10YR 5/3) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

2Btx1—26 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; weak thick platy structure parting to moderate medium subangular blocky; firm and brittle; common distinct grayish brown (10YR 5/2) and few faint dark yellowish brown (10YR 4/3) clay films on faces of peds; few prominent black (10YR 2/1) and few distinct brown (10YR 3/3) concretions of iron and manganese oxide; gray (10YR 5/1) seams between peds; strongly acid; clear smooth boundary.

2Btx2—30 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; strong very coarse prismatic structure parting to medium thick platy; very firm and very brittle; common faint grayish brown (10YR 5/2) clay films on faces of peds and common faint dark yellowish brown (10YR 4/4) clay flows in pores; few distinct dark brown (10YR 3/3) concretions of iron and manganese oxide and reddish brown (5YR 5/4) stains; gray (10YR 5/1) seams between prisms; about 5 percent rock fragments; strongly acid; gradual wavy boundary.

2B′t—45 to 60 inches; yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure parting to moderate medium angular blocky; firm; common distinct brown (10YR 5/3) clay films on faces of peds; few distinct dark yellowish brown (10YR 4/4) clay flows in pores; few soft sandstone fragments; gray (10YR 5/1) seams between prisms; moderately acid; abrupt smooth boundary.

2R—60 to 63 inches; hard sandstone bedrock.

Range in Characteristics

Thickness of the solum: 50 to 70 inches
Depth to top of fragipan: 20 to 32 inches
Depth to bedrock: 40 to 80 inches
Content of rock fragments: Ap, Bt, and Btx horizons—0 to 15 percent

Ap horizon:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 2 to 4
Texture—silt loam

Bt horizon:
Color—hue of 10YR to 7.5YR, value of 4 or 5, chroma of 4 to 6
Texture—silt loam, silty clay loam

2Btx and 2B′t horizons:
Color—hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 6
Texture—silty clay loam, silt loam, loam, clay loam

Formation of the Soils

This section describes how the major factors of soil formation have affected the soils in Vinton County and explains some of the processes in soil formation.

Factors of Soil Formation

Soils form through processes acting on deposited or accumulated geologic material. The major factors of soil formation are parent material, climate, relief, living organisms, and time.

Climate and living organisms, particularly plants, are active forces in soil formation. Their effect on the parent material is modified by relief and by the length of time that the parent material has been acted upon. The relative importance of each factor differs from place to place. The interaction of all five factors generally determines the kind of soil that forms, but in some areas one dominant factor determines most of the soil properties.

Parent Material

Parent material is the raw material acted upon by the other soil-forming factors. It largely determines the soil texture, which in turn affects the permeability and available water capacity of the soil. The soils in Vinton County formed in different kinds of parent material. Many formed in residuum, which is mineral material weathered from bedrock in place, while others formed in colluvium, which is material that collected at the base of steep slopes as a result of geologic erosion. Soils on flood plains formed in alluvium, which is material deposited by flowing streams in relatively recent times. Some soils formed in lacustrine material, which is lake bottom sediment. The sediment was deposited by lakes that formed during the Ice Age when glaciers, or the deposits they left behind, blocked streams flowing out of the county. Other soils formed in loess, which is material deposited by the wind. Coal-mining activities have produced soils that formed in spoil material from strip mines.

Residuum is the most extensive parent material in the county. Steinsburg, Germano, Brownsville, Gilpin, Rarden, and Guernsey soils formed in this parent material. Steinsburg and Germano soils formed in residuum derived from coarse grained sandstone bedrock, while Brownsville and Gilpin soils formed in residuum derived from siltstone and finer grained sandstone. Rarden and Guernsey soils formed in shale residuum.

Colluvium forms at the bottom of many slopes in the county. Shelocta and Richland soils formed in colluvial material.

Alluvium is deposited on the flood plains when rivers and streams flood. It has been washed from soils farther upstream in the watershed. Since the frequency, duration, and speed of the floodwater vary within small areas on the flood plain, alluvial deposits commonly vary in texture within short distances. They are made up of a number of thin layers, each of which was deposited by a different flood. Soils formed in alluvium have weakly developed horizons since the soil-forming process starts over with each new deposition. Bonnie, Chagrin, and Pope soils formed in alluvium.

Lacustrine deposits are moderately extensive in the county. These deposits have a high content of silt and a narrow range of particle sizes because of the slow, even deposition of sediment in relatively still water. Doles, Fitchville, Omulga, and Glenford soils formed in lacustrine material.

In some areas of the county, the upper part of the soils formed in windblown silty deposits called loess (Paschall and others 1938). In these areas the loess cap is as much as 36 inches deep over residuum. Tarhollow, Wellston, and Zanesville are the principal soils that are capped by loess in the county.

Coal-mining activities in the county have produced large areas of soils formed in mine spoil. These soils have undergone little, if any, development. Soils in areas that have not been reclaimed differ from those in reclaimed areas. Their surface texture differs, and there are major differences in topography. In many areas large additions of lime are needed to overcome the acid condition of the soil before plants can be established. Bethesda, Fairpoint, and Sewell are examples of soils that formed in spoil from surface mines.

Climate

Climate influences the formation of soils in many ways. Rainfall is the most important climatic element in the formation of soils. Water dissolves soluble materials and is responsible for the leaching process. It is necessary for the growth and development of plants, which contribute organic matter to the soil. It also physically ruptures the soil when it freezes.

Temperature also has a great influence on the formation of soils. It exerts a major influence on the type and quality of vegetation that the soil can support. Chemical reactions within the soil increase as the temperature increases.

The climate in an area the size of Vinton County is almost a constant factor of soil formation, but it may be modified in and around certain soils or because of topographic differences. For example, the lower lying alluvial and lacustrine soils are wetter and cooler than the soils in areas around them. Soils on south- and west-facing slopes are generally warmer and receive more sunlight than soils in nearly level areas. These contrasts account for some of the differences in microclimates within the same general climatic region. These differences can affect the amount of available moisture and the quantity and quality of vegetation. More information about the climate is available under the heading "General Nature of the County."

Relief

The topography of Vinton County has a great influence on the formation of soils. It influences soil formation through its effect on drainage, runoff, and erosion. If a slope is steep, more water runs off the surface and less soaks into the soil. This results in less downward movement of water through the soil layers, thereby decreasing the amount of clays that are translocated within the soil profile, which is a major factor in soil development.

Geologic erosion is a constant factor on the steeper slopes because material is being continually removed, exposing unweathered underlying material. Steinsburg and Brownsville soils, which are on steep slopes, show little internal soil development. Soils on the gentler slopes, where water has more of a chance to infiltrate through the soil, show a greater degree of soil development. Glenford and Chavies soils, which are on lacustrine and stream terraces, are examples of these soils.

Even though soils have formed in the same parent material, they may be different because of the influence of topography on internal drainage. For example, Fitchville and Glenford soils both formed in the same silty lacustrine deposits. Glenford soils are moderately well drained and have a seasonal high water table that generally is at a depth of more than 24 inches. Water passes through these soils readily. Fitchville soils, which are in the lower areas, are somewhat poorly drained and have a seasonal high water table within a depth of 12 inches.

Topography also has a great effect on the formation of soils because many areas receive soil material, or colluvium, from the steeper slopes above. Many of the soils in the county formed in colluvium. Examples of these soils are those in the Shelocta, Guernsey, and Richland series. Also, soils that have a bouldery or stony surface phase formed partially in colluvial material.

Living Organisms

Plant and animal life are important factors in the formation of soils. The type of vegetation under which a soil forms has an influence on the color, structure, and organic matter content of the soil. Soils formed under forest vegetation generally have a lower content of organic matter and are lighter in color than soils formed under grass.

Most of the soils in Vinton County formed under hardwood forest vegetation. Brownsville, Germano, Gilpin, and Rarden soils formed under a hardwood forest consisting mainly of oaks, maples, beech, and hickory. Most of the somewhat poorly drained and poorly drained soils are dominated by trees that can tolerate the wetness. They include the Fitchville, Doles, Orrville, and McGary soils.

As plants grow and die, their remains are added to the soil. Burrowing animals, earthworms, bacteria, and fungi help to convert those raw plant remains into organic matter. Microorganisms transform organic matter into humus from which plants can obtain nutrients. Burrowing animals and earthworms help to make the soil more porous, and, as a result, water moves through the soil more rapidly. The burrowing of animals also constantly mixes the soil.

Human activities also affect soil formation. Cultivating, surface mining, and land clearing accelerate erosion and change soil development. Many areas of the wetter soils, such as those in the Fitchville, Doles, and McGary series, have been drained, ensuring that their future development will take place under drier conditions. Applying lime, fertilizer, and other chemicals changes the chemistry of soils to some degree.

Time

The relative length of time the parent material is exposed to the other soil-forming factors plays a great role in the overall development of a soil. In Vinton County, parent material has been exposed to the soil-forming factors for various lengths of time. For example, surface mine spoil, such as that of the Bethesda soils, was so recently exposed that little soil development has taken place, whereas soils that formed in residuum, such as those in the Gilpin series, have strongly expressed horizons because they have been exposed to the soil-forming factors for long periods of time. Other young soils throughout the county are those that formed in recent alluvium, such as those in the Orrville and Pope series. These soils show minimal development because sediment continues to be deposited on them during periods of flooding. Soils formed in lacustrine sediments, such as those in the Omulga and Glenford series, show a high degree of soil development. The age of these soils falls between those of soils formed in residuum and those formed in alluvium.

Processes of Soil Formation

The process of soil formation is a complex sequence of events. It includes additions of organic and mineral materials to the soil as solids, liquids, and gases; losses of these materials from the soil; transformations of mineral and organic substances within the soil; and translocations of materials from one point to another within the soil (Simonson 1959). Plants, animals, and mineral constituents are all part of a dynamic system that helps to play a role in the processes of soil formation.

There are several types of additions of organic and mineral materials that affect soil formation in Vinton County. One of the most important is the addition of organic matter that has been decomposed from plant material by biologic activity. Organic matter is responsible for the darkened color of the surface layer as compared to that of the subsoil. Additions can also come in the form of sediments being deposited during floods or by materials eroding at one spot and being deposited at another.

Losses or removals from the soil occur mainly as a result of chemical changes within the soil or as a loss of water from evapotranspiration. Nitrogen transferred from the organic to inorganic form and the loss of carbon as a result of the oxidation of organic matter are chemical reactions that account for losses within the soil.

Transformations within the soil are largely mineral transformations and the reduction of particle size by weathering. Structure and the formation of concretions are transformations that are tied to chemical reactions. In the wetter soils, iron is reduced, thus forming reddish brown concretions of varying sizes within the soil profile. The structure of different soils is expressed in varying degrees depending on the parent material. Older soils on more stable landscapes generally have stronger expressed horizonation than that of soils on flood plains or on less stable landscapes.

Translocation of materials generally occurs as a result of downward movement of water carrying suspended compounds and soil particles. Leaching of calcium carbonate has occurred in many soils throughout the county. Chavies, Cruze, Gilpin, Omulga, Pope, and Westmoreland are all soils that have been leached free of calcium carbonate. The translocation of silicate clays is a major morphological feature in many of the soils in the county. Many soils have a zone of eluviation, known as an E horizon. The E horizon has platy structure and is lighter in color than the B horizon, which lies directly below the E horizon. The B horizon is a zone of illuviation or clay enrichment from the zone above. Soils in the county that have this very definitive morphological feature within their horizonation include those in the Chavies, Gilpin, Fitchville, Glenford, Guernsey, Shelocta, Rarden, and Wellston series.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hillslope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4.5 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees generally are reeled in while one end is lifted or the entire log is suspended.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Cement rock. Shaly limestone used in the manufacture of cement.

Channery soil material. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

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.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax plant community. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Concretions. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.

Conglomerate. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters in diameter. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—*excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained,* and *very poorly drained.* These classes are defined in the "Soil Survey Manual."

Drainage, surface. Runoff, or surface flow of water, from an area.

Draw. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic).—Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated).—Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.

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.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine earth. That portion of the soil consisting of particles less than 2 millimeters in diameter. Particles and rock fragments 2 millimeters in diameter or larger are not included.

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fluvial. Of or pertaining to rivers; produced by river action, as a fluvial plain.

Footslope. The position that forms the inner, gently inclined surface at the base of a hillslope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of the material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Head out. To form a flower head.

Head slope. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Interfluve. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent
Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it generally is low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pebble. A rounded or angular fragment of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. A collection of pebbles is referred to as gravel.

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 movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permafrost. Layers of soil, or even bedrock, occurring in arctic or subarctic regions, in which a temperature below freezing has existed continuously for a long time.

Permeability. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Extremely slow	0.0 to 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

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.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly 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

Red beds. Sedimentary strata that are mainly red and are made up largely of shale.

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hillslope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 2 percent
Nearly level and gently sloping	0 to 8 percent
Gently sloping	2 to 6 percent
Gently sloping	3 to 8 percent
Sloping	6 to 15 percent
Sloping and moderately steep	8 to 20 percent
Moderately steep	12 to 20 percent
Moderately steep	15 to 25 percent
Steep	20 to 35 percent
Steep	20 to 40 percent
Steep	25 to 40 percent
Very steep	40 to 70 percent

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10

Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope. It has a nearly level (planar or only slightly convex) surface.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hillslope continuum that grades to valley or closed-depression floors.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Windthrow. The uprooting and tipping over of trees by the wind.