United States Department of Agriculture

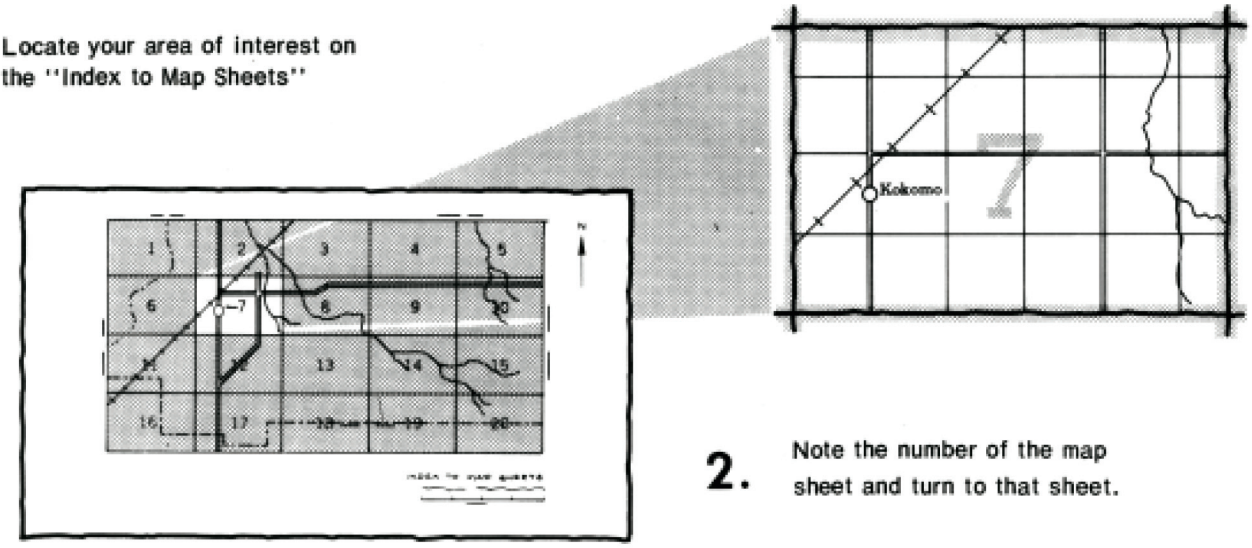
Soil Conservation Service

In cooperation with
Pennsylvania State University
College of Agriculture
and
Pennsylvania Department of Environmental Resources,
State Conservation Commission

Soil Survey of Clearfield County, Pennsylvania

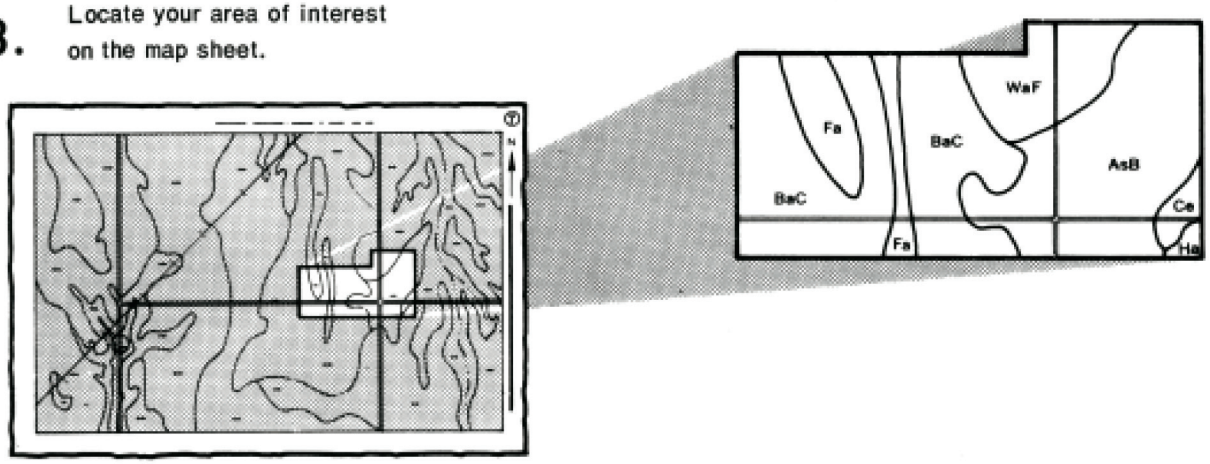
HOW TO USE

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



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

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



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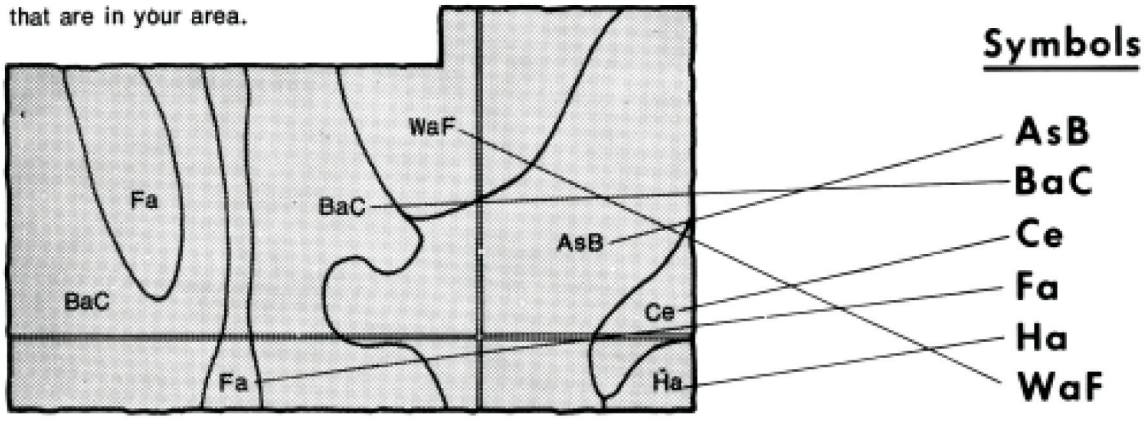
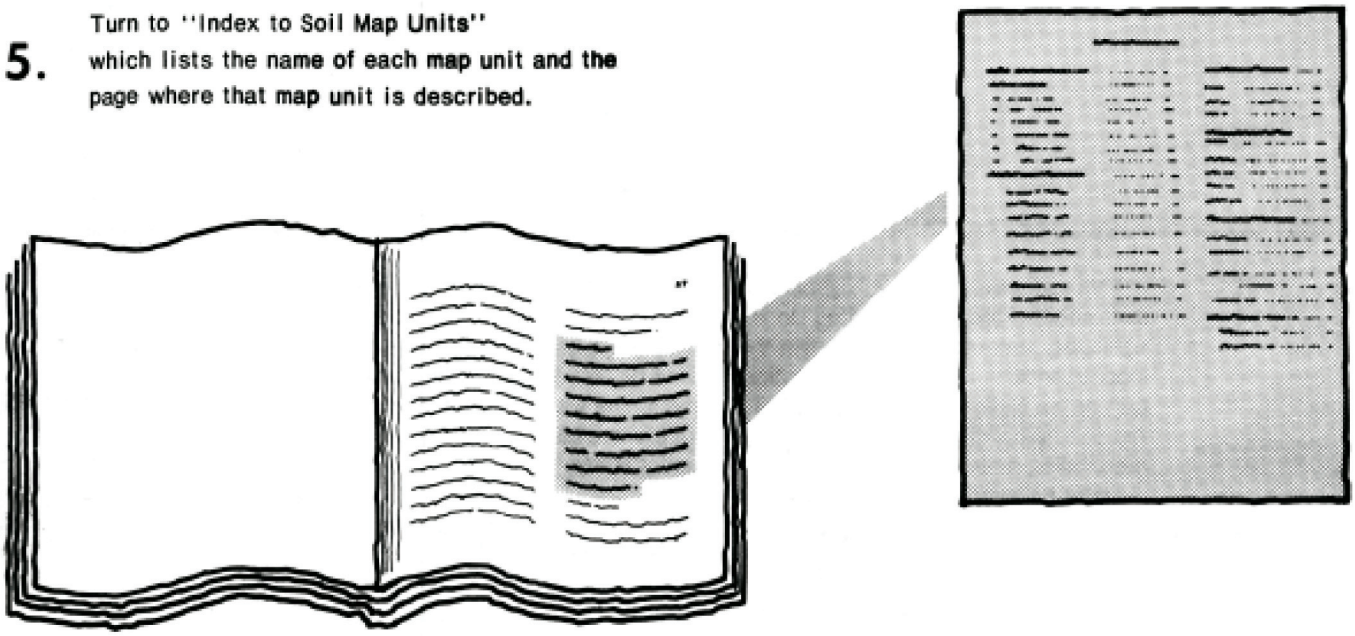
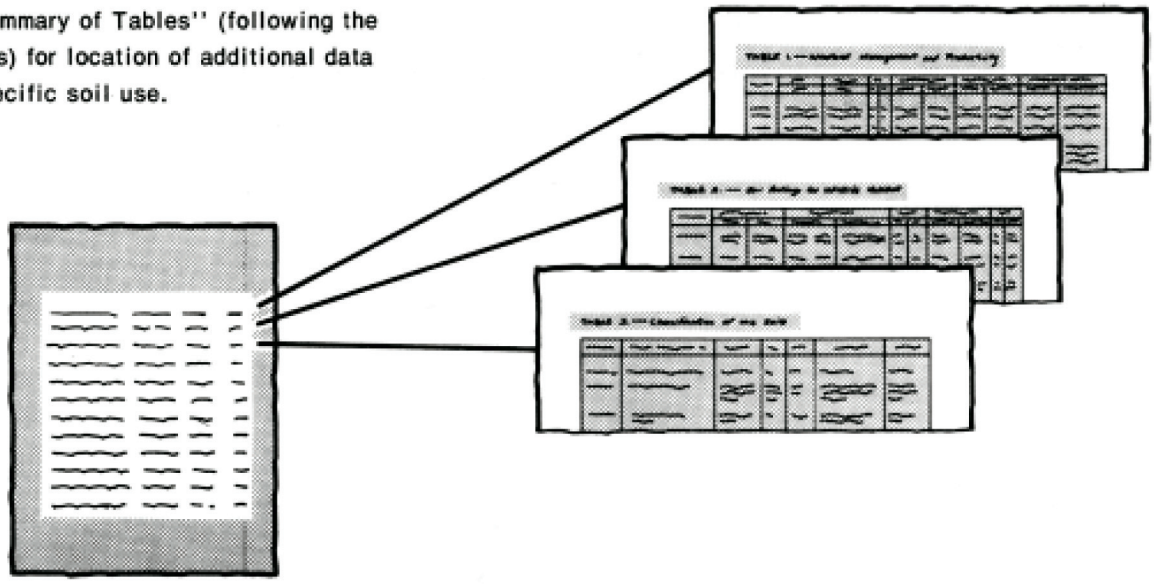


THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service; the Pennsylvania State University College of Agriculture; and the Pennsylvania Department of Environmental Resources, State Conservation Commission. The survey is part of the technical assistance furnished to the Clearfield County Conservation District. The Clearfield County Board of Commissioners and the United States Department of Housing and Urban Development helped to finance the survey.

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

Cover: Contour stripcropping on Gilpin channery silt loam, 8 to 15 percent slopes.

Contents

Soil Series

August 1988

Index to Map Units

Summary of Tables

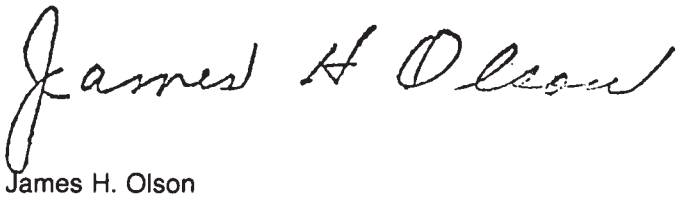
Foreword

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

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

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

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



James H. Olson
State Conservationist
Soil Conservation Service

Soil Survey of Clearfield County, Pennsylvania

By Joseph S. Hallowich, Soil Conservation Service

Fieldwork by Joseph S. Hallowich, Alexander R. Topalanchik, Ernest L. Jensen, William L. Braker, and Ned B. Ellenberger, Soil Conservation Service

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

CLEARFIELD COUNTY is just west of the center of Pennsylvania, on the western slope of the Allegheny Mountains (fig. 1). The county is 37 miles from north to south and 40 miles from east to west. With an area of about 1,144 square miles, or 732,160 acres, it is the fourth largest county in the State. Some 500 farms in the county cover about 6 percent of the land area, and nearly 80 percent of the acreage in the county is wooded.

The topography of Clearfield County is steeply rolling to hilly. The county has no distinct mountain ranges, but there are ridges and hills broken by valleys and streams. The elevation ranges from a low of 789 feet above sea level where the West Branch of the Susquehanna River leaves the county to a high of 2,405 feet on Chestnut Ridge.

The West Branch of the Susquehanna River and tributaries of the West Branch form the principal drainage system for most of the county. An area in the northwestern corner of the county drains into the Allegheny River.

The population of Clearfield County, listed in the 1980 census, is 79,600. Clearfield, the county seat, and DuBois are the main population centers.

The mineral-producing industries, mostly coal and clay, play a significant role in the county's economy, and surface-mining is or has been done on about 13 percent of the land area. Coal production exceeds 6 million tons annually, and large deposits of soft coal and high-grade clay are in the county.

The main automotive routes are Interstate 80, which runs east-west in the middle of the county; State Routes 879, 53, 453; and U.S. Routes 322, 219, and 119.

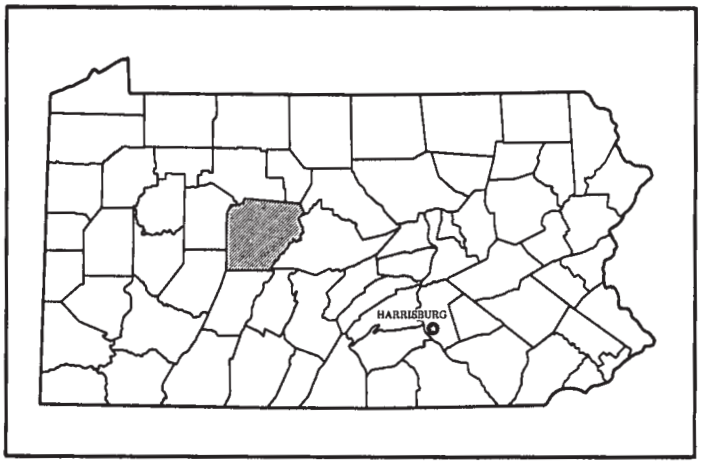


Figure 1.—Location of Clearfield County in Pennsylvania.

General Nature of the Survey Area

This section provides information about some of the natural and cultural factors that influence the soils of Clearfield County.

Climate

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

Table 1 gives data on temperature and precipitation for the survey area as recorded at Madera in the period 1951 to 1978. 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 24 degrees F, and the average daily minimum temperature is 14 degrees. The lowest temperature on record, which occurred at Madera on February 27, 1963, is -24 degrees. In summer the average temperature is 65 degrees, and the average daily maximum temperature is 79 degrees. The highest recorded temperature, which occurred at Madera on September 3, 1953, is 99 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 38 inches. Of this, 23 inches, or 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 13 inches. The heaviest 1-day rainfall during the period of record was 5.81 inches at Madera on June 23, 1976. Thunderstorms occur on about 35 days each year, and most occur in summer.

The average seasonal snowfall is 49 inches. The greatest snow depth at any one time during the period of record was 28 inches. On an average of 47 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 60 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the west-southwest. Average windspeed is highest, 11 miles per hour, in spring.

Heavy rains, which occur at any time of the year, and severe thunderstorms in summer cause flash flooding, particularly in the narrow valleys.

Geology

Joseph N. Van, geologist, Soil Conservation Service, helped prepare this section and the section "Water Supply."

Clearfield County is in the Appalachian Plateaus physiographic province. The northern quarter of the county is in the Allegheny High Plateau, and the rest is in the Pittsburgh Plateau.

The highest elevation in the county, 2,405 feet above sea level, is at Chestnut Ridge in the north-central part. The lowest elevation in the county is 789 feet above sea level where the West Branch of the Susquehanna River leaves the county at the northeastern corner. The greatest local relief is along the deeply incised West Branch of the Susquehanna River.

Except for a small area drained by Sandy Lick Creek, Mahoning Creek, and other tributaries of the Allegheny River, Clearfield County is drained mainly by the West Branch of the Susquehanna River. The principal tributaries of the West Branch are Moshannon Creek, Clearfield Creek, Chest Creek, and Bennett Branch of Sinnemahoning Creek.

The principal structure folds in the county are in a northeast trend. Along the southeastern county boundary, a large number of closely spaced, northwest-trending, high-angle tear faults cross to the folds and are accompanied by numerous cross faults. Apparent vertical displacement along these strike-slip faults ranges from a few inches to about 400 feet.

The age of the sedimentary rocks at the surface in Clearfield County ranges from Upper Devonian-Lower Mississippian to the Conemaugh Group of the Upper Pennsylvanian (*7*). A very small part of the oldest rocks is exposed in the deep stream channels in the northwestern part of the county. Those rocks consist of sandstone, siltstone, and gray shales of the Shenango-Oswayo Formations of the Upper Devonian-Lower Mississippian Systems. Overlying those formations in several of the deep valleys are flaggy, fine-grained sandstones and a few red shale interbeds of the Huntley Mountain Formation. The Lower Mississippian Burgoon sandstone member of the Pocono Group is of median-grained, crossbedded sandstone with conglomerate at the base and is exposed in most of the channel bottoms. Above the Pocono Group, the Mauch Chunk Formation of the Upper Mississippian is along the southeastern county boundary and consists of grayish red shale, siltstone, sandstone, and some conglomerate.

The basal Pennsylvanian Group is the Pottsville, consisting of Elliott Park and Curwensville Formations which contain massive sandstones, conglomerate, shale, limestone, claystone, coal, and clays. The Allegheny Group consists of cyclic sequences of sandstone, shale, thin limestones, several commercial coal zones, and underclays. The Allegheny Group consists of the following formations: Clearfield Creek, Millstone Run, Mineral Springs, Laurel Run, and Glen Richey. The

Glenshaw Formation of the Lower Conemaugh Group overlies the Glen Richey Formation and contains beds of sandstone, siltstone, shale, thin limestones, and thin nonpersistent coal layers with thin Ames limestone at top. The youngest surface rocks in the county are in the Cassleman Formation of the Conemaugh Group, which is Upper Pennsylvanian in age. These geologic units consist of cyclic sequences of shale, siltstone, sandstone, red beds, thin impure limestones, and thin nonpersistent coals.

Colluvium is along the lower part of some of the steep slopes and consists of an unconsolidated mass of soil and disaggregated rock deposits from landsliding, mudflow, and general sheetwash. Large sandstone float blocks, some more than 20 feet in length, are included in these colluvial deposits.

The valley bottoms of the main tributaries are floored by substantial deposits of unconsolidated alluvial silts, clays, and gravel and sand. The alluvium is as much as 50 feet thick in places.

Mineral Resources

Coal is the major mineral commodity in the county; Clearfield County ranks third in the State in bituminous coal production (*3*). The coal seams do not exist as single, identifiable sheets across wide areas but are intricate complexes of splits and lenses, each of which is of limited extent. In the Pennsylvania System about 18 different coal beds are in the Pottsville, Allegheny, and Conemaugh Groups, and most of the commercial coal beds are in the Allegheny Group.

Clearfield County is the leading producer of clay in Pennsylvania. The many clay zones that have been mined for years are underneath the different coal layers. The common mined clays are the lower Mercer hard clay and the Clarion (Bigler) clay. These refractory clays are used for making decorative brick tile and chimney flue tile. Other potential underclays are below all the other coals, from the Upper Mercer to the Mahoning.

Shale is the most common lithologic type exposed at the surface. It is widely distributed throughout most geologic units and is commonly above all coal seams. The Pocono Formation (Sub-Burgoon), the Allegheny Group, and particularly the Conemaugh Group are all potential sources of shale and siltstone. The material from those areas has been quarried and is generally well suited to use as road fill on low-use secondary roads and for random fill.

At least ten sandstone bodies are contained in thick sandstone sections that are abundant throughout the stratigraphic section. These bodies are a source of crushed and broken stone for road metal, railroad ballast, riprap, concrete aggregate, and miscellaneous aggregate. The lower Kittanning sandstone was quarried for silica sand. Most of the sandstone bodies are massive and have been quarried for dimension or building stone. The most massive sandstone section (up to 36 feet in thickness) is the Homewood sandstone in the Curwensville Formation. Loyalhanna calcareous sandstone of the Burgoon Member is generally coarser textured than the other sandstones.

Although not continuous, several thin marine and freshwater limestone beds are throughout the geologic section. The marine Vanport limestone has been mined or quarried for road material, and analysis indicates that this rock is a potential source of agricultural lime, concrete aggregate, road metal, cement, flux stone, riprap, and railroad ballast. The Upper Kittanning limestone, the Lower and Upper Freeport limestone, the Mahoning limestone, and the Brush Creek limestone have been used for agricultural lime.

Sand and gravel exist in some of the recent alluvial deposits in the county. These make up a potential source of material used in construction.

Natural Gas

Several fields in the northwestern part of Clearfield County produce natural gas (methane). Gas production from the Upper Devonian, or younger, sandstones is classified as shallow, and gas produced from Middle and Lower Devonian rocks of the Onondaga and Oriskany Groups is classified as deep.

Most gas production is from deep reservoirs. The main examples are Onondaga chert, which is 40 to 80 feet thick, and the 10- to 20-foot underlying Ridgeley Sandstone Member of the Oriskany Formation. One of the largest gas fields is the Rockton Field, discovered in 1955. The other main gas production areas in the county are the Penfield, DuBois, Sabula, and Hollywood pools; the Punxsutawney-Driftwood field and the Salem, Tyler, and Benezette pools; and the Helvetia pool (*4*). Some of the depleted shallow fields are used for gas storage reservoirs.

Water Supply

Most of Clearfield County depends on ground water. Practically all domestic water supplies for rural and urban communities are from springs or wells. Reservoirs are used by the larger communities and storage tanks by the smaller.

Iron sulfite and iron pyrite are throughout the county and are in some domestic wells, making them too acidic. The ground water in areas of heavy coal mining activity sometimes receives high concentrations of acidic solutions.

The average rainfall for the area is 38 inches per year, but much of this is lost by evaporation and transpiration and into streams as runoff. This leaves only a small amount, about 10 inches, to filter through the soil and recharge the ground-water supply.

History

What is now Clearfield County was formed in 1804 from parts of Lycoming and Huntingdon Counties and was known as Chincleclamouche Township, which for several years was attached to Centre County. In 1812 the Pennsylvania Assembly passed a law organizing Clearfield County and authorizing its citizens to elect officials.

The first permanent settlement in Clearfield County was in the extreme western part of the county in 1785. Only very scattered settlement took place in the next 25 years, principally along the West Branch of the Susquehanna River. Most of the land in the county was surveyed and divided into large tracts of 250 to 1,100 acres, of which a large part was given to the soldiers of the Pennsylvania line for their services in the Revolutionary War. The early settlers came largely from the eastern part of the State. In later years many immigrants came directly from Europe.

Practically all the early settlers were farmers. Later, the abundance of timber caused the development of extensive lumbering and greatly increased the immigration of people active in that industry. Following the development of the mineral resources, chiefly coal, large numbers of laborers came into the county.

How This Survey Was Made

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

The soil scientists recorded the characteristics of the profiles they studied and compared those profiles with others in nearby counties and in more distant places. They classified and named the soils according to nationwide uniform procedures. They drew the boundaries of the soils on aerial photographs. These photographs show trees, buildings, fields, roads, and other details that help in drawing boundaries accurately. The soil maps at the back of this publication were prepared from aerial photographs. This survey provides updated and additional information to a soil survey of Clearfield County that was published in 1919, and the maps show the soils in greater detail (*8*).

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General Soil Map Units" and "Detailed Soil Map Units."

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

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each association on the general soil map is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in other associations 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 general soil 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 association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Soil Descriptions

1. Rayne-Gilpin-Ernest association

Well drained and moderately well drained, deep and moderately deep, gently sloping to very steep soils on hilltops, ridges, hillsides, and foot slopes

This association consists of irregularly shaped and long and narrow hilltops, hillsides with long, benched slopes, long and narrow ridges, and foot slopes generally adjacent to drainageways. Slopes are dominantly 3 to 65 percent.

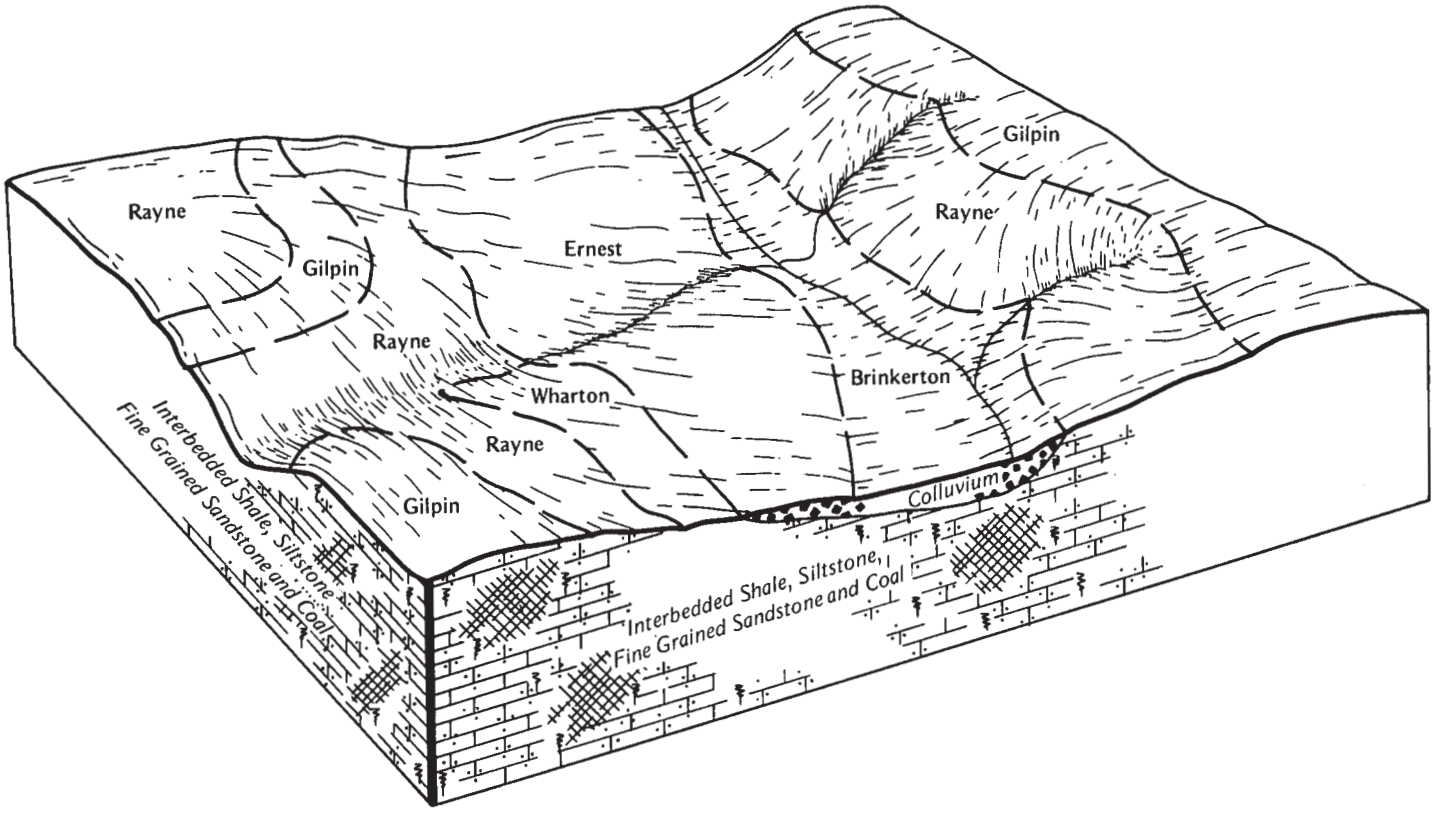


Figure 2.—Typical pattern of soils and underlying material in the Rayne-Gilpin-Ernest association.

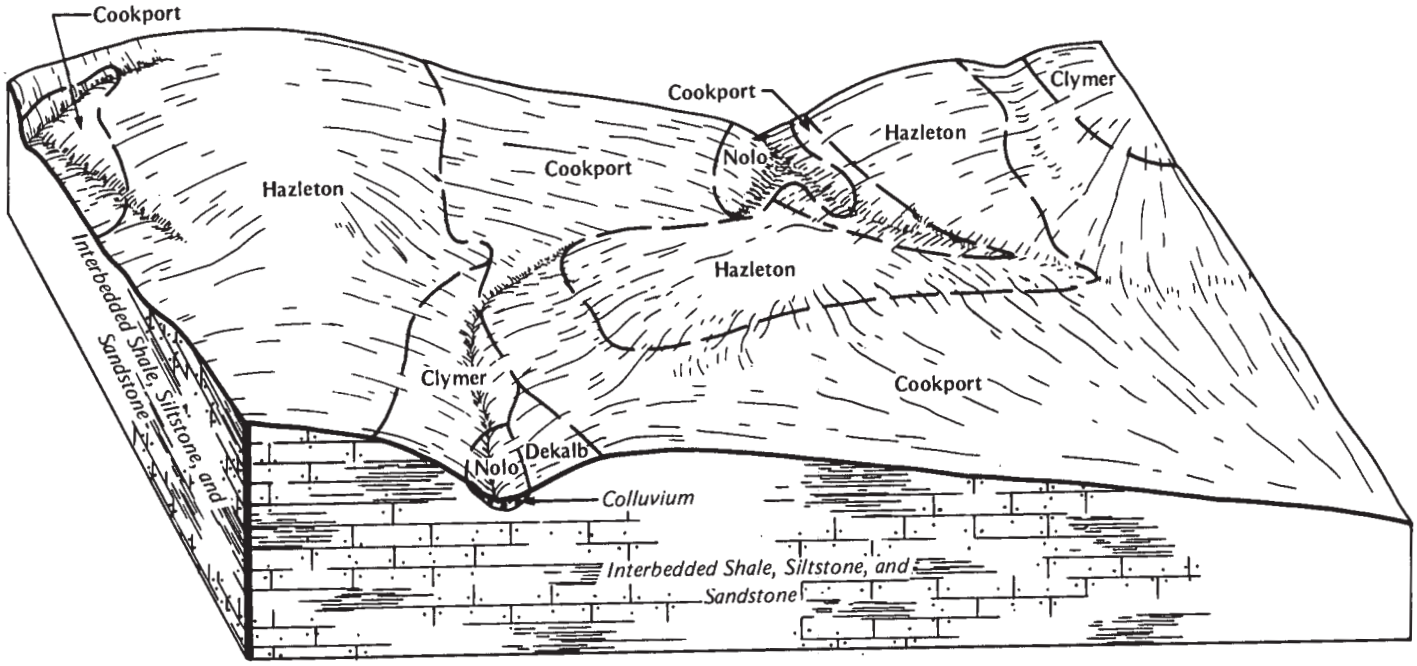


Figure 3.—Typical pattern of soils and underlying material in the Cookport-Hazleton-Clymer association.

This association makes up about 48 percent of the survey area. The association is about 30 percent Rayne soils, 20 percent Gilpin soils, 20 percent Ernest soils, and 30 percent minor soils (fig. 2).

The Rayne soils are on gently sloping to very steep hilltops, benches, and ridges but are dominantly on the moderately steep to very steep hillsides. The soils are deep and well drained and formed in residuum weathered from shale, siltstone, and fine-grained sandstone.

The Gilpin soils are on gently sloping to moderately steep hilltops, hillsides, benches, and ridges. The soils are moderately deep and well drained and formed in residuum weathered from shale, siltstone, and fine-grained sandstone.

The Ernest soils are on gently sloping to moderately steep foot slopes adjacent to drainageways. The soils are deep and moderately well drained and formed in colluvium from shale, siltstone, and sandstone. They have a seasonal high water table at a depth of 18 to 36 inches.

Of minor extent are deep, moderately well drained Wharton soils on benches and hilltops; deep, somewhat poorly drained Cavode soils and deep, poorly drained Armagh soils in depressions; deep, poorly drained Brinkerton soils on foot slopes; and Udorthents in surface-mined areas.

Most areas of this association are in woodland, mostly mixed hardwoods. Some areas on hillsides are used for pasture and hay, and some hilltops and benches are used for cultivated crops, hay, and pasture.

The soils of this association are suited to farming. Slope, erosion, and the seasonal high water table are the main limitations. Controlling erosion and improving drainage are the main management concerns.

The soils are suited to trees, and potential productivity is high. Slope, erosion, and the seasonal high water table are the main limitations.

The seasonal high water table, slope, the depth to bedrock and slow and moderately slow permeability are limitations of the soils for most nonfarm uses.

2. Cookport-Hazleton-Clymer association

Moderately well drained and well drained, deep, nearly level to moderately steep soils on broad uplands, on ridges, and on hillsides on the Allegheny Plateau

This association consists of irregularly shaped uplands, narrow ridges, and hillsides that have long, smooth slopes. Slopes are dominantly 0 to 25 percent.

This association makes up about 28 percent of the county. The association is about 28 percent Cookport soils, 28 percent Hazleton soils, 18 percent Clymer soils, and 26 percent minor soils (fig. 3).

The Cookport soils are on nearly level to moderately steep hillsides and broad uplands. The soils are moderately well drained and have a seasonal high water table at a depth of 18 to 30 inches. They formed in

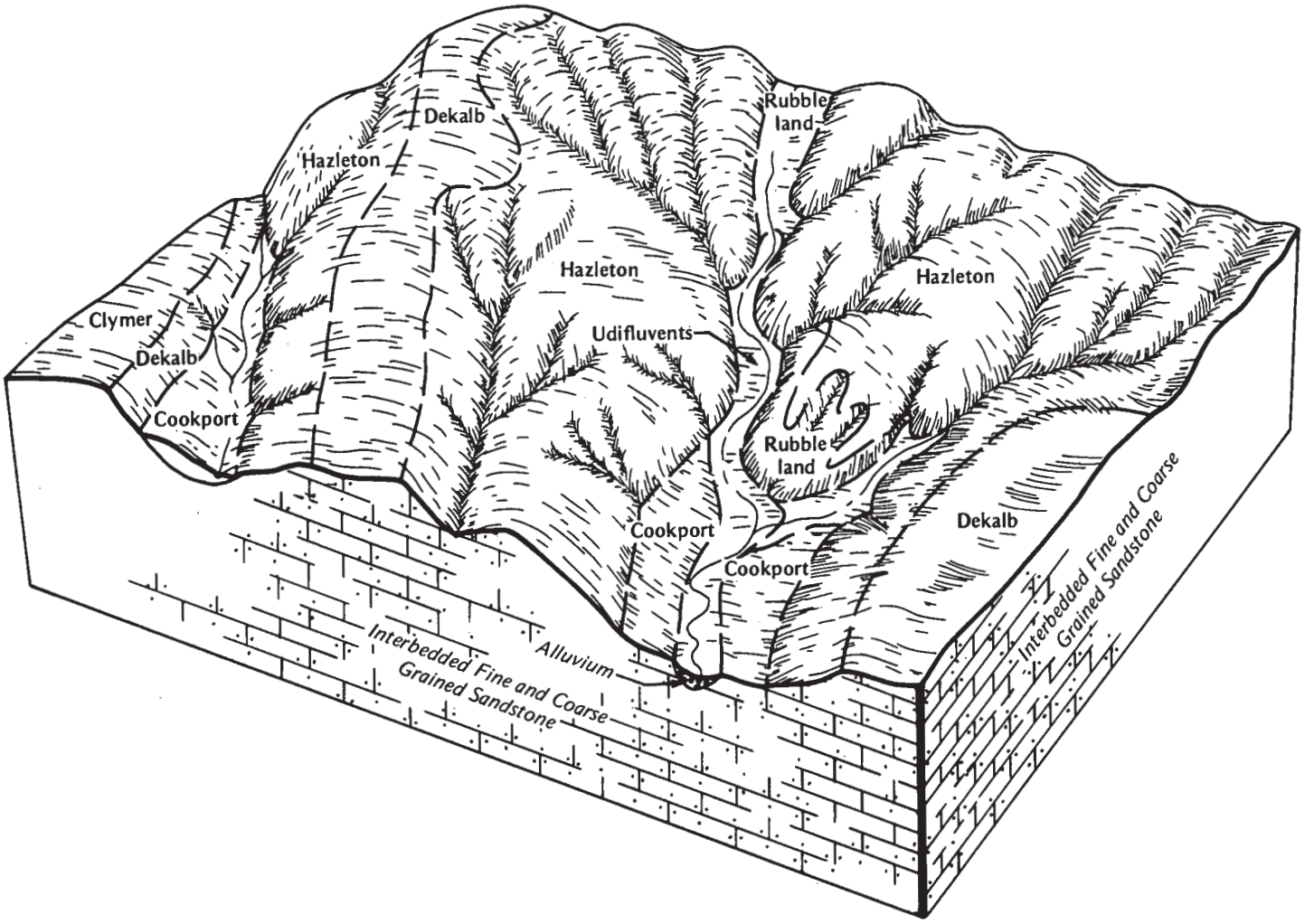


Figure 4.—Typical pattern of soils and underlying material in the Hazleton-Dekalb association.

residuum weathered from fine-grained and coarse-grained sandstone.

The Hazleton soils are on nearly level to moderately steep broad uplands, ridges, and hillsides. The soils are well drained. They formed in residuum weathered from fine-grained and coarse-grained sandstone.

The Clymer soils are on nearly level to sloping broad uplands, ridges, and hillsides. They are well drained. They formed in residuum weathered from fine-grained and coarse-grained sandstone.

Of minor extent are well drained, moderately deep Dekalb soils on the tops and sides of ridges and deep, poorly drained Nolo soils in depressional areas on broad ridgetops.

Most areas of this association are in mixed hardwoods or are reverting to woodland.

The soils are suited to farming. Slope, stones on the surface, erosion, the seasonal high water table, and a generally short growing season are the main limitations.

The soils are suited to trees. Potential productivity is high or moderately high. Slope, erosion, stones on the surface, and the seasonal high water table are the main limitations.

The stones on the surface, the seasonal high water table, slope, and moderately slow permeability limit the soils of this association for most nonfarm uses.

3. Hazleton-Dekalb association

Well drained, deep and moderately deep, moderately steep to very steep soils on hillsides

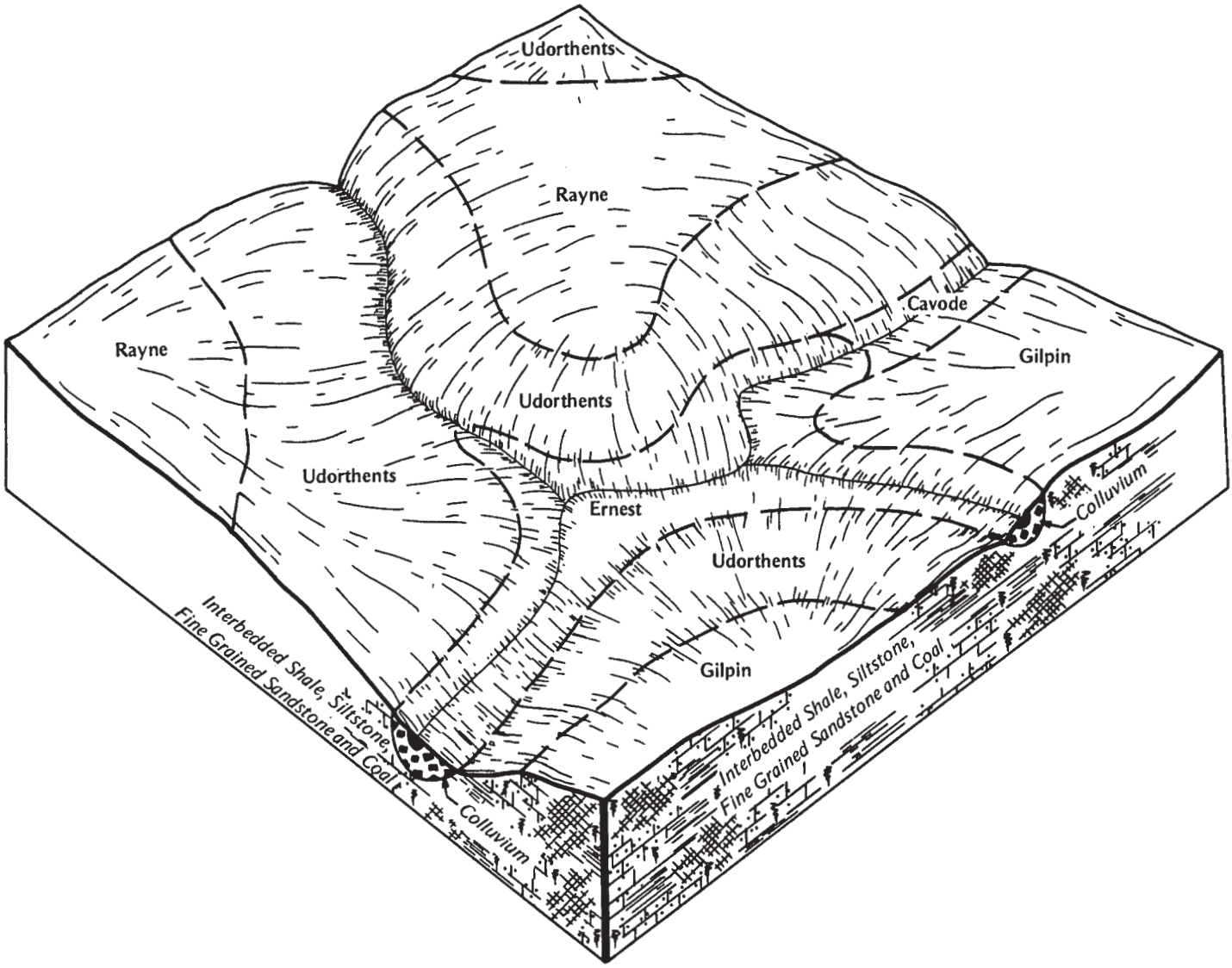


Figure 5.—Typical pattern of soils and underlying material in the Udorthents-Gilpin-Rayne association.

This association is along the major drainageways in the survey area. The soils generally have long, benched slopes. Slopes are dominantly 25 to 80 percent.

This association makes up about 7 percent of the county. The association is about 75 percent Hazleton soils, 10 percent Dekalb soils, and 15 percent minor soils (fig. 4).

The Hazleton soils generally are on moderately steep to very steep smooth hillsides. They are deep. They formed in residuum weathered from fine-grained and coarse-grained sandstone. The surface is generally very stony.

The Dekalb soils are on the moderately steep sides of ridges and at the top of smooth hillsides. The soils are moderately deep. They formed in residuum weathered from fine-grained and coarse-grained sandstone.

Of minor extent are moderately deep, well drained Gilpin soils on the sides of ridges and benches; deep, well drained Clymer soils and deep, moderately well drained Cookport soils on the less sloping areas of the association; and Udifluvents on flood plains.

Slope and stones on the surface make this association generally unsuited to farming.

The soils of this association are suited to trees, and all areas are wooded. Potential productivity is moderate. Slope, stones on the surface, and erosion are the main limitations.

Slope and stones on the surface limit the soils of this association for most nonfarm uses.

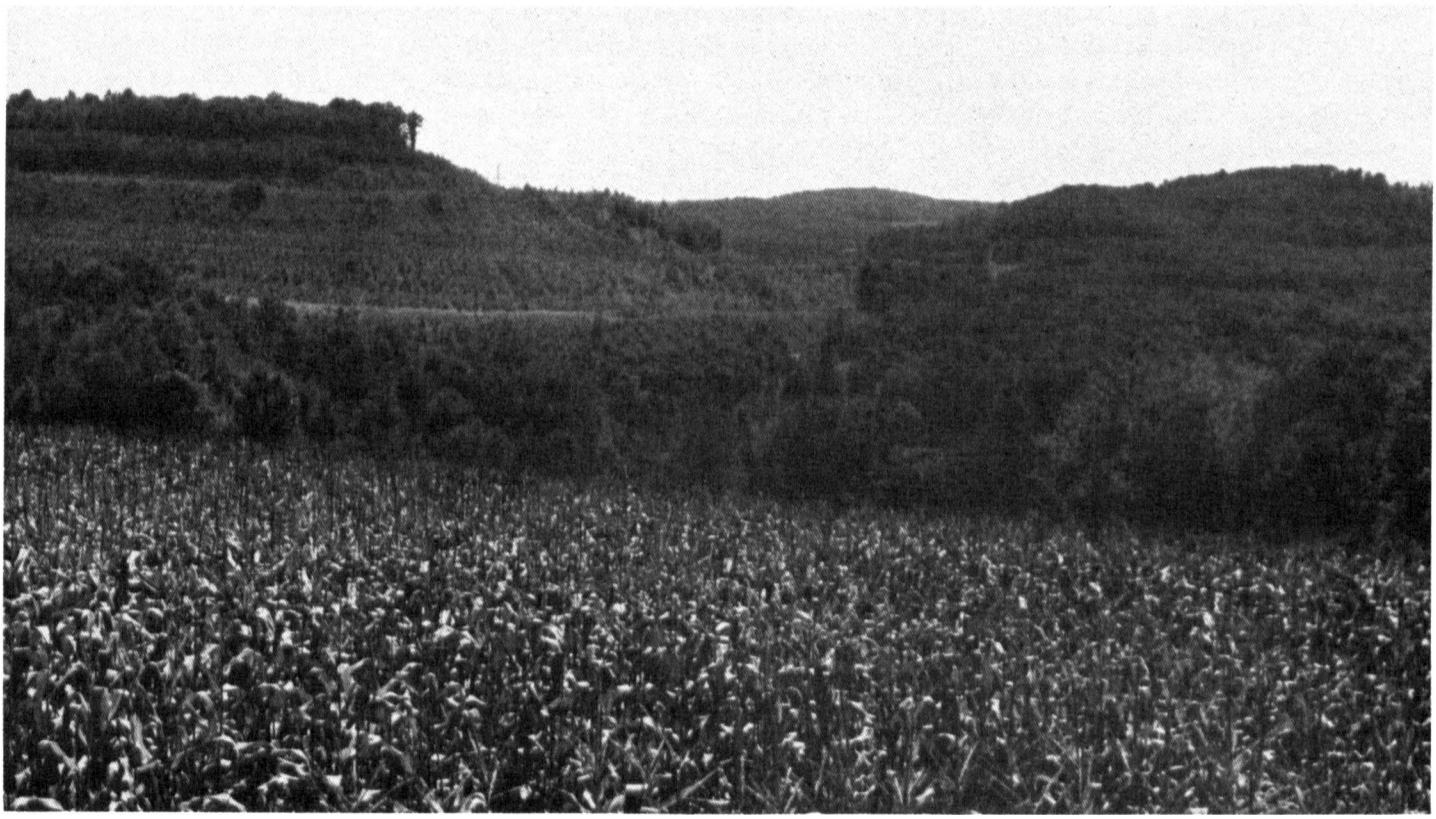


Figure 6.—A typical landscape in the Udorthents-Gilpin-Rayne association.

4. Udorthents-Gilpin-Rayne association

Well drained to somewhat poorly drained, shallow to deep, nearly level to very steep soils on hilltops, ridges, benches, and foot slopes

This association consists mostly of areas disturbed during surface-mining. The areas that have not been disturbed consist of long, smooth slopes and short, narrow ridges. The surface mines commonly follow narrow contours around hills, but some large areas are disturbed. Slopes range from 2 to 80 percent.

This association makes up about 13 percent of the survey area. The association is about 60 percent Udorthents, 15 percent Gilpin soils, 15 percent Rayne soils, and 10 percent minor soils (fig. 5).

The Udorthents are on nearly level to very steep hillsides and hilltops. They are shallow to deep and are well drained to somewhat poorly drained. Udorthents formed in material that was disturbed during and after surface-mining. In some areas a seasonal high water table is at a depth of about 24 to 36 inches.

The Gilpin soils are mostly on gently sloping to moderately steep ridges and hillsides above and below the Udorthents. They are moderately deep and well drained. They formed in residuum weathered from shale, siltstone, and fine-grained sandstone.

The Rayne soils are on gently sloping to very steep ridges and hilltops but are mostly moderately steep to very steep. They are deep and well drained. They formed in residuum weathered from shale, siltstone, and fine-grained sandstone.

Of minor extent are deep, moderately well drained Wharton soils on hilltops and benches; deep, somewhat poorly drained Cavode soils and deep, poorly drained Armagh soils in depressions; and deep, moderately well drained Ernest soils and deep, poorly drained Brinkerton soils in colluvial areas.

Most of the areas of this association that have not been surface-mined are wooded or reverting to woodland. Some areas are used for pasture and hay (fig. 6).

The soils of this association are suited to farming, but the Udorthents generally require reclamation. Slope, erosion, and the seasonal high water table are the main limitations.

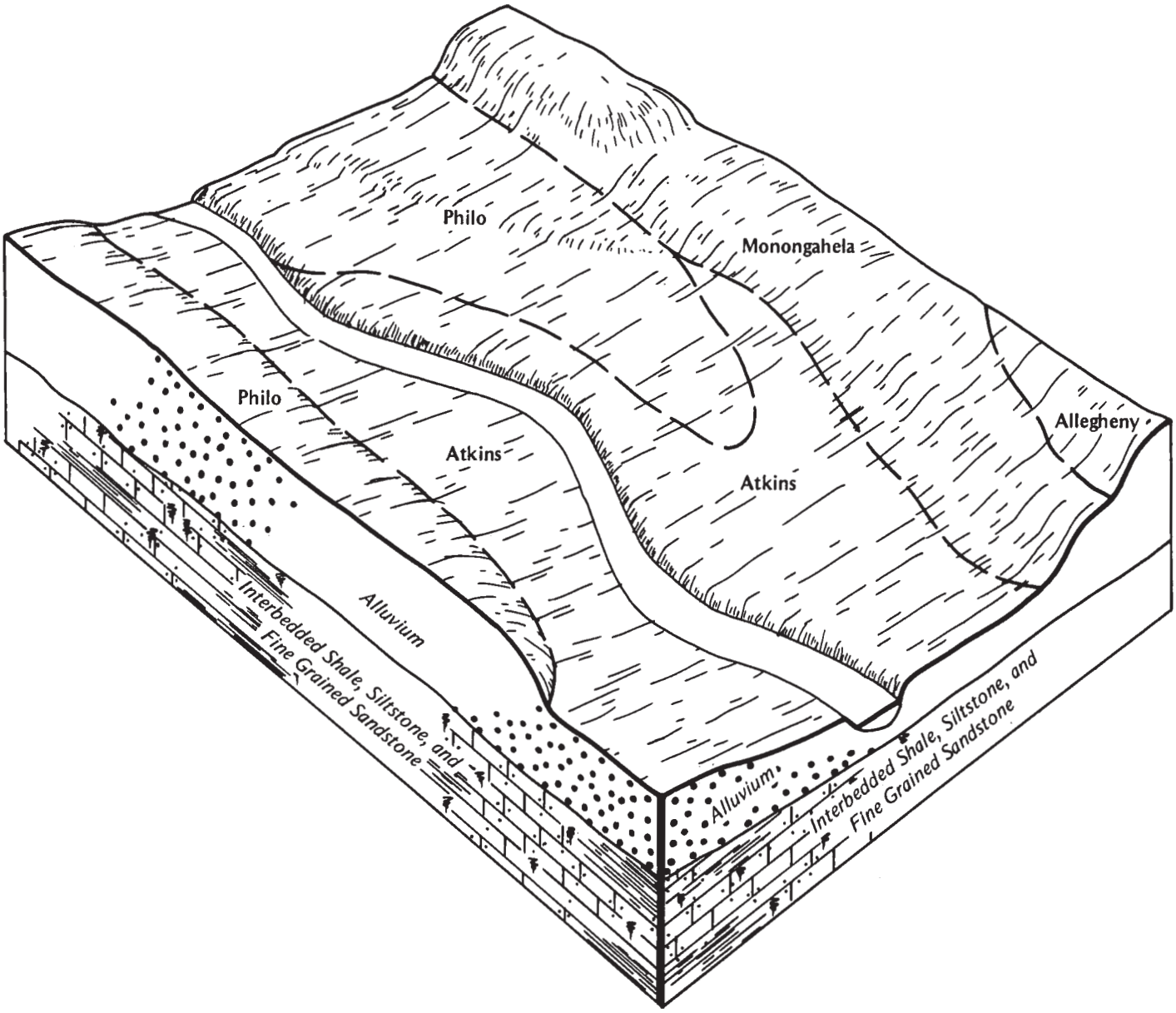


Figure 7.—Typical pattern of soils and underlying material in the Atkins-Philo-Monongahela association.

The soils are suited to trees. Potential productivity is high. Slope, erosion, and the seasonal high water table are the main limitations.

The seasonal high water table, slope, and slow and moderately slow permeability limit the soils of this association for most nonfarm uses.

5. Atkins-Philo-Monongahela association

Poorly drained to moderately well drained, deep, nearly level and gently sloping soils on flood plains and terraces

This association consists of nearly level flood plains and gently sloping terraces. Slopes range from 0 to 8 percent.

This association makes up about 4 percent of the survey area. The association is about 30 percent Atkins soils, 22 percent Philo soils, 13 percent Monongahela soils, and 35 percent minor soils (fig. 7).

The Atkins soils are on the nearly level flood plains. They are poorly drained and have a water table at or

near the surface. They formed in recent alluvium from sandstone, siltstone, and shale.

The Philo soils are on the nearly level flood plains. They are moderately well drained and have a seasonal high water table at a depth of 15 to 36 inches. They formed in recent alluvium from sandstone, siltstone, and shale.

The Monongahela soils are on the gently sloping terraces adjacent to the larger streams and rivers in the survey area. The soils are moderately well drained and have a seasonal high water table at a depth of 18 to 36 inches. They formed in old alluvium weathered from acid shale and sandstone.

Of minor extent are deep, well drained Pope soils on flood plains and deep, well drained Allegheny soils, deep, somewhat poorly drained Tyler soils, and deep, poorly drained and very poorly drained Purdy soils on terraces.

Much of the acreage of this association is wooded or used for urban development. Some areas are used for cultivated crops, hay, and pasture.

The soils of this association are suited to farming. Erosion, the seasonal high water table, and flooding are the main limitations. Erosion control and improved drainage are needed in many areas.

The soils are suited to trees. Potential productivity is very high or moderately high. Erosion, the high water table, and flooding are the main limitations.

The soils of this association are limited for most nonfarm uses by the seasonal high water table and flooding.

Detailed Soil Map Units

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

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

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

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

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

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

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

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

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

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

Soil Descriptions

AlB—Allegheny silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and well drained. It is on terraces. Slopes generally are smooth and convex and are 200 to 600 feet long. The areas of this soil are irregular in shape or oblong and range mainly from 4 to 40 acres.

Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is yellowish brown and is about 36 inches thick. The upper 6 inches of the subsoil is silt loam, and the lower 30 inches is silty clay loam. The substratum is yellowish brown clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Monongahela, Tyler, and Purdy soils. Also included are areas of nearly level Allegheny soils and sloping Allegheny soils. Inclusions make up about 25 percent of this unit.

The permeability of this Allegheny soil is moderate, and available water capacity is high. Runoff is medium. In unlimed areas reaction in the surface layer and upper part of the subsoil is strongly acid to very strongly acid. The hazard of erosion is moderate.

Most areas of this soil are cultivated. The other areas are used for pasture, woodland, and housing and industrial sites.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and

the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

This soil has few limitations for most nonfarm uses.

Capability subclass IIe; woodland ordination 2o.

Ar—Armagh silt loam. This soil is nearly level, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are 150 to 400 feet long. The areas of this soil are oval or irregular in shape and range mainly from 2 to 20 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark gray silt loam 4 inches thick. The subsoil is mottled and light gray and is 38 inches thick. The upper 15 inches of the subsoil is silty clay loam, and the lower 23 inches is silty clay loam and silty clay. The substratum is mottled, light gray shaly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Brinkerton and Cavode soils. Also included are areas of very stony Armagh soils. Inclusions make up about 25 percent of this unit.

The permeability of this Armagh soil is slow and moderately slow, and available water capacity is high. Runoff is slow, and water is ponded on some areas during wet periods. Reaction in unlimed areas is strongly acid to very strongly acid throughout. A seasonal high water table is between the surface and a depth of 6 inches. The hazard of erosion is slight.

Most areas of this soil are in native vegetation or are used as woodland. A few areas are used for cultivated crops.

This soil is suited to some cultivated crops that tolerate seasonal wetness. Subsurface drainage increases the suitability of the soil for most crops.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to water-tolerant trees, and potential productivity is moderately high. The rate of seedling mortality is high. Wetness limits the use of equipment, but machine planting is practical on larger areas.

This soil has limitations for most nonfarm uses because of the permeability, the high water table, and low strength. The permeability and the high water table limit use of the soil as a site for onsite waste disposal. Low strength is a limitation for construction of roads.

Capability subclass IVw; woodland ordination 3w.

At—Atkins silt loam. This soil is nearly level, deep, and poorly drained. It is on flood plains that are frequently flooded. Slopes generally are smooth and slightly concave and range from 50 to 600 feet in length. The areas of this soil are long and narrow and range mainly from 2 to 50 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is dark gray silt loam about 8 inches thick. The subsoil is gray and light gray, mottled silt loam about 42 inches thick. The substratum is olive gray loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Philo and Pope soils. Also included is a soil similar to this Atkins soil but that is very poorly drained. Inclusions make up about 20 percent of this unit.

The permeability of this Atkins soil is slow to moderate in the subsoil and moderately slow to rapid in the substratum. Available water capacity is high. Runoff is very slow. Reaction in unlimed areas is strongly acid or very strongly acid. A seasonal high water table is between the surface and a depth of 1 foot. The hazard of erosion is slight.

Most areas of this soil are in native vegetation or woodland. Some areas are used for hay, and a few are used for cultivated crops.

This soil is suited to cultivated crops that tolerate seasonal wetness and brief, frequent flooding. Subsurface drainage and protection from flooding are needed to increase the suitability of the soil for cultivated crops.

This soil is suited to pasture. Overgrazing, flooding, and the seasonal high water table are major concerns of pasture management. The main pasture management practices are use of proper stocking rates, rotational grazing, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness will help to prevent the compaction of the topsoil.

This soil is suited to trees, and potential productivity is very high. Seasonal wetness limits the use of equipment and causes a high rate of seedling mortality. Machine planting is practical on larger areas.

Flooding and the high water table limit this soil for most nonfarm uses, especially for onsite waste disposal.

Capability subclass IIIw; woodland ordination 1w.

BeB—Berks shaly silt loam, 3 to 8 percent slopes. This soil is gently sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 300 feet long. The areas of this soil are oval or irregular in shape and range mainly from 4 to 20 acres.

Typically, the surface layer is dark brown shaly silt loam 9 inches thick. The subsoil is yellowish brown and is about 14 inches thick. The upper 9 inches of the subsoil is shaly loam, and the lower 5 inches is very shaly loam. The substratum is yellowish brown very shaly loam 7 inches thick. Shale and fine-grained sandstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are a few small areas of Gilpin and Dekalb soils. Also included are small areas of a soil similar to this Berks soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Berks soil is moderate to moderately rapid in the subsoil and moderately rapid in the substratum. Available water capacity is low. Runoff is medium to rapid. Reaction in unlimed areas is strongly acid or very strongly acid in the surface layer and subsoil. The hazard of erosion is moderate.

Most areas of this soil are cultivated or in permanent hayland. Some areas are used for pasture, woodland, and housing.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Machine planting is practical on larger areas.

The depth to bedrock is the main limitation of this soil for most nonfarm uses, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 3f.

BeC—Berks shaly silt loam, 8 to 15 percent slopes. This soil is sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas of this soil are long and narrow and range mainly from 4 to 20 acres.

Typically, the surface layer is dark brown shaly silt loam 9 inches thick. The subsoil is yellowish brown and is about 14 inches thick. The upper 9 inches of the subsoil is shaly loam, and the lower 5 inches is very shaly loam. The substratum is yellowish brown very shaly loam 7 inches thick. Shale and fine-grained sandstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are a few small areas of Gilpin and Dekalb soils. Also included are small areas of a soil similar to this Berks soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Berks soil is moderate to moderately rapid in the subsoil and moderately rapid in the substratum. Available water capacity is low. Runoff is medium to rapid. Reaction in unlimed areas is strongly acid or very strongly acid in the surface layer and subsoil. The hazard of erosion is severe.

Most areas of this soil are in woodland. Some areas are in cultivated crops or hay and pasture or in native vegetation.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Placing roads on the contour helps to control erosion during timber harvesting.

Slope and the depth to bedrock are the main limitations of this soil for nonfarm use.

Capability subclass IIIe; woodland ordination 3f.

BeD—Berks shaly silt loam, 15 to 25 percent slopes. This soil is moderately steep, moderately deep, and well drained. It is on uplands. Slopes generally are convex and are 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is dark brown shaly silt loam 9 inches thick. The subsoil is yellowish brown and is about 14 inches thick. The upper 9 inches of the subsoil is shaly loam, and the lower 5 inches is very shaly loam. The substratum is yellowish brown very shaly loam 7 inches thick. Shale and fine-grained sandstone bedrock are at a depth of 30 inches.

Included with this soil in mapping are a few small areas of Gilpin and Dekalb soils. Also included are small areas of a soil similar to this Berks soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Berks soil is moderate to moderately rapid in the subsoil and moderately rapid in the substratum. Available water capacity is low. Runoff is medium to rapid. Reaction in unlimed areas is strongly acid or very strongly acid in the surface layer and subsoil. The hazard of erosion is very severe.

Most areas of this soil are in woodland. Some areas are in hay and pasture or native vegetation.

Use of this soil for cultivated crops is limited because of the hazard of erosion and slope.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Machine planting is practical on larger areas. Placing roads on the contour helps to control erosion during timber harvesting.

Slope and the depth to bedrock are the main limitations of the soil for nonfarm use.

Capability subclass IVe; woodland ordination 3f.

BrA—Brinkerton silt loam, 0 to 3 percent slopes. This soil is nearly level, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are 100 to 300 feet long. The areas of this soil are irregular in shape and range mainly from 4 to 20 acres.

Typically, the surface layer is black silt loam 2 inches thick. The subsurface layer is light brownish gray, mottled silt loam 5 inches thick. The subsoil is 40 inches thick. The upper 21 inches of the subsoil is gray silt loam and silty clay loam and is mottled. The lower 19 inches is mottled, firm, gray loam. The substratum is grayish brown loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Ernest, Armagh, and Cavode soils. Also included are a few small very poorly drained areas. Inclusions make up 25 percent of this unit.

The permeability of this Brinkerton soil is moderate above the firm part of the subsoil and moderately slow and slow in the firm part. Runoff is slow. Reaction in unlimed areas is medium acid to very strongly acid. The seasonal high water table is between the surface and a depth of 6 inches. The hazard of erosion is slight.

Most areas of this soil are in woodland. Some areas are cultivated or are in native vegetation.

This soil is suited to some cultivated crops that tolerate seasonal wetness. Subsurface drainage is needed in some areas that contain wet spots. Growing cover crops, using crop residue, and growing grasses and legumes that tolerate wetness are practices that help to maintain organic matter content and tilth. Contour stripcropping, conservation tillage, grassed waterways, and using cover crops and hay in the crop rotation will help to reduce runoff and control the hazard of erosion.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. Seasonal wetness limits the use of equipment and causes a high rate of seedling mortality.

The seasonal high water table and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVw; woodland ordination 2w.

BrB—Brinkerton silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are about 100 to 400 feet long. The areas of this soil are irregular in shape and range from 4 to 40 acres.

Typically, the surface layer is black silt loam 2 inches thick. The subsurface layer is light brownish gray, mottled silt loam 5 inches thick. The subsoil is 40 inches thick. The upper 21 inches of the subsoil is gray silt loam and silty clay loam and is mottled. The lower 19 inches is mottled, firm gray loam. The substratum is grayish brown loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Ernest, Armagh, and Cavode soils. Also included are a few small very poorly drained areas. Inclusions make up 25 percent of this unit.

The permeability of this Brinkerton soil is moderate above the firm part of the subsoil and moderately slow and slow in the firm part. Runoff is slow. Reaction in unlimed areas is medium acid to very strongly acid. The seasonal high water table is between the surface and a depth of 6 inches. The hazard of erosion is moderate.

Most areas of this soil are in woodland. Some areas are cultivated or in native vegetation.

This soil is suited to some cultivated crops that tolerate seasonal wetness. Subsurface drainage is needed in some areas that contain wet spots. Growing cover crops, using crop residue, and growing grasses and legumes that tolerate wetness are practices that help to maintain organic matter content and tilth. Contour stripcropping, conservation tillage, grassed waterways, and using cover crops and hay in the crop rotation will help to reduce runoff and control the hazard of erosion.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. Seasonal wetness limits the use of equipment and causes a high rate of seedling mortality.

The seasonal high water table and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVw; woodland ordination 2w.

BxB—Brinkerton very stony silt loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are about 100 to 500 feet long. The areas of this soil are irregular in shape and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is black silt loam 2 inches thick. The subsurface layer is light brownish gray, mottled silt loam 5 inches thick. The subsoil is 40 inches thick. The upper 21 inches of the subsoil is gray silt loam and silty clay loam and is mottled. The lower 19 inches is mottled, firm gray loam. The substratum is grayish brown loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Ernest, Armagh, and Cavode soils. Also included are a few small very poorly drained areas. Inclusions make up 25 percent of this unit.

The permeability of this Brinkerton soil is moderate above the firm part of the subsoil and moderately slow and slow in the firm part. Runoff is slow. Reaction in unlimed areas is medium acid to very strongly acid. The seasonal high water table is between the surface and a depth of 6 inches. The hazard of erosion is slight.

The stones on the surface make this soil generally unsuited to cultivated crops, pasture, or hay.

The soil is suited to trees, and potential productivity is high. Most areas are wooded. The seasonal high water table limits the use of equipment and causes a high rate of seedling mortality. The stones on the surface interfere with machine planting.

The seasonal high water table and the permeability of the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIIs; woodland ordination 2w.

CaB—Cavode silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and somewhat poorly drained. It is on uplands. Slopes generally are smooth and concave and are 100 to 300 feet long. The areas of this soil are oval and range mainly from 2 to 50 acres.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is mottled, yellowish brown silt loam 5 inches thick. The subsoil is mottled silty clay loam 35 inches thick. The upper 9 inches of the subsoil is yellowish brown, and the lower 26 inches is gray. The substratum extends to a depth of 60 inches or more. It is gray shaly silty clay loam and very shaly silty clay loam.

Included with this soil in mapping are small areas of Armagh, Brinkerton, Ernest, and Wharton soils. Also included is a soil similar to this Cavode soil but that has stones on the surface and is nearly level. Inclusions make up about 25 percent of this unit.

The permeability of this Cavode soil is slow, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid. The hazard of erosion is moderate. A seasonal high water table is at a depth of 6 to 18 inches.

Most areas of this soil are used for woodland, hay, or pasture. A few areas are used for cultivated crops.

This soil is suited to some cultivated crops that tolerate seasonal wetness. Subsurface drainage is needed in some areas that contain wet spots. Growing cover crops, using crop residue, and growing grasses and legumes that tolerate wetness are practices that help to maintain organic matter content and tilth. Contour stripcropping, conservation tillage, grassed waterways, and using cover crops and hay in the crop rotation will help to reduce runoff and control the hazard of erosion.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to woodland, and potential productivity is high. Seasonal wetness limits the use of equipment and causes a high rate of seedling mortality. Machine planting is practical on larger areas.

The permeability, the seasonal high water table, and low strength limit this soil for most nonfarm uses. The permeability and seasonal high water table limit use of the soil for onsite waste disposal. The low strength is a limitation for construction of roads.

Capability subclass IIIw; woodland ordination 2w.

CaC—Cavode silt loam, 8 to 15 percent slopes. This soil is sloping, deep, and somewhat poorly drained. It is on uplands. Slopes generally are smooth and concave and are 150 to 400 feet long. The areas of this soil are oval or irregular in shape and range mainly from 2 to 15 acres.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is mottled, yellowish brown silt loam 5 inches thick. The subsoil is mottled silty clay loam 35 inches thick. The upper 9 inches of the subsoil is yellowish brown, and the lower 26 inches is gray. The substratum extends to a depth of 60 inches or more. It is gray shaly silty clay loam and very shaly silty clay loam.

Included with this soil in mapping are small areas of Armagh, Brinkerton, Ernest, and Wharton soils. Also included is a soil similar to this Cavode soil but that has stones on the surface and is sloping to moderately steep. Inclusions make up about 25 percent of this unit.

The permeability of this Cavode soil is slow, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid or very

strongly acid. The hazard of erosion is moderate. A seasonal high water table is at a depth of 6 to 18 inches.

Most areas of this soil are used for woodland, hay, or pasture. A few areas are used for cultivated crops.

This soil is suited to some cultivated crops that tolerate seasonal wetness. Subsurface drainage is needed in some areas that contain wet spots. Growing cover crops, using crop residue, and growing grasses and legumes that tolerate wetness are practices that help to maintain organic matter content and tilth. Contour stripcropping, conservation tillage, grassed waterways, and using cover crops and hay in the crop rotation will help to reduce runoff and control the hazard of erosion.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to woodland, and potential productivity is high. Slope and seasonal wetness limit the use of equipment. Machine planting is practical on larger areas. Placing roads on the contour helps to control erosion during timber harvesting.

The permeability, the seasonal high water table, and low strength limit this soil for most nonfarm uses. The permeability and seasonal high water table limit use of the soil for onsite waste disposal. The low strength is a limitation for construction of roads.

Capability subclass IIIe; woodland ordination 2w.

ClB—Clymer channery loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape and range mainly from 4 to 40 acres.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are small areas of Hazleton and Cookport soils. Also included are small areas of nearly level Clymer soils that have stones on the surface. Inclusions make up about 20 percent of this unit.

The permeability of this Clymer soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is moderate.

Most areas of this soil are in woodland. Some areas are cultivated or in hay or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The depth to bedrock is the main limitation of the soil for nonfarm use.

Capability subclass IIe; woodland ordination 2o.

ClC—Clymer channery loam, 8 to 15 percent slopes. This soil is sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 40 acres.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are small areas of Hazleton and Cookport soils. Also included are small areas of Clymer soils with stones on the surface. Inclusions make up about 20 percent of this unit.

The permeability of this Clymer soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is severe.

Most areas of this soil are in woodland. Some areas are cultivated or in hay or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

Slope and the depth to bedrock are the main limitations of the soil for nonfarm use.

Capability subclass IIIe; woodland ordination 2o.

CmB—Clymer very stony loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas of this soil are irregular in shape and range from about 4 to 100 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are small areas of Hazleton and Cookport soils that have stones on the surface. Also included are small areas of Clymer soils with no stones on the surface and Clymer soils where stones cover more than 15 percent of the surface. Inclusions make up about 15 percent of this unit.

The permeability of this Clymer soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is slight.

The stones on the surface make this soil generally unsuitable for cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. In places, stones on the surface interfere with machine planting.

The depth to bedrock is the main limitation of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2o.

CmC—Clymer very stony loam, 8 to 15 percent slopes. This soil is sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are small areas of Hazleton and Cookport soils that have stones on the surface. Also included are small areas of Clymer soils with no stones on the surface and Clymer soils where stones cover more than 15 percent of the surface. Inclusions make up about 15 percent of this unit.

The permeability of this Clymer soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is slight.

Slope and the stones on the surface make this soil generally unsuitable for cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. In places, the stones on the surface interfere with the use of machinery for planting and harvesting.

Slope and the depth to bedrock are the main limitations of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2o.

CoB—Cookport channery loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and moderately well drained. It is on uplands. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of the soil are irregular in shape and range from about 4 to 100 acres.

Typically, the surface layer is dark brown channery loam 1 inch thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is about 37 inches thick. The upper 19 inches is yellowish brown loam, sandy loam, and clay loam. The lower 18 inches is firm, mottled, yellowish brown and strong brown channery sandy loam. The substratum is dark yellowish brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are areas of Clymer, Hazleton, and Nolo soils. Also included are nearly level Cookport soils and Cookport soils that have stones on the surface. Inclusions make up 20 percent of this unit.

The permeability of this Cookport soil is moderate above the firm part of the subsoil, slow in the firm part, and moderately slow in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. A seasonal high water table is at a depth of 18 to 30 inches. The hazard of erosion is moderate.

Most areas of this soil are in woodland (fig. 8). Some areas are in cultivated crops or native vegetation.

This soil is suited to cultivated crops. Subsurface drainage is needed in some areas to drain wet spots. Contour stripcropping, conservation tillage, grassed waterways, and cover crops help to reduce runoff and control erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

Figure 8.—Woodland on Cookport channery loam, 3 to 8 percent slopes.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The seasonal high water table and the slow permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 2w.

CoC—Cookport channery loam, 8 to 15 percent slopes. This soil is sloping, deep, and moderately well drained. It is on uplands. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range from about 4 to 40 acres.

Typically, the surface layer is dark brown channery loam 1 inch thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is about 37 inches thick. The upper 19 inches is yellowish brown loam, sandy loam, and clay loam. The lower 18 inches is firm, mottled, yellowish brown and strong brown channery sandy loam. The substratum is dark yellowish brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are areas of Clymer, Hazleton, and Nolo soils. Also included are moderately steep Cookport soils and Cookport soils with stones on the surface. Inclusions make up 20 percent of this unit.

The permeability of this Cookport soil is moderate above the firm part of the subsoil, slow in the firm part, and moderately slow in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. A seasonal high water table is at a depth of 18 to 30 inches. The hazard of erosion is severe.

Most areas of this soil are in woodland. Other areas are idle or in cultivated crops.

This soil is suited to cultivated crops. Subsurface drains are needed in some areas to drain wet spots. Contour stripcropping, conservation tillage, grassed waterways, and using cover crops and hay in the crop rotation will help to reduce runoff and control erosion. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high.

The seasonal high water table, slope, and the slow permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIIe; woodland ordination 2w.

CxB—Cookport very stony loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, deep, and moderately well drained. It is on uplands. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape and range from about 4 to 100 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is dark brown channery loam 1 inch thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is about 37 inches thick. The upper 19 inches is yellowish brown loam, sandy loam, and clay loam. The lower 18 inches is firm, mottled, yellowish brown and strong brown channery sandy loam. The substratum is dark yellowish brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are areas of Clymer, Hazleton, and Nolo soils. Also included are areas of Cookport soils with no stones on the surface. Inclusions make up about 20 percent of this unit.

The permeability of this Cookport soil is moderate above the firm part of the subsoil, slow in the firm part, and moderately slow in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. A seasonal high water table is at a depth of 18 to 30 inches. The hazard of erosion is slight.

The stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. In places, the stones on the surface interfere with machine planting.

The seasonal high water table and the slow permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2w.

CxD—Cookport very stony loam, 8 to 25 percent slopes. This soil is sloping and moderately steep, deep, and moderately well drained. It is on uplands. Slopes generally are smooth and concave or convex and are about 100 to 400 feet long. The areas of the soil range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is dark brown channery loam 1 inch thick. The subsurface layer is brown channery loam about 2 inches thick. The subsoil is about 37 inches thick. The upper 19 inches is yellowish brown loam, sandy loam, and clay loam. The lower 18 inches is a firm, mottled, yellowish brown and strong brown channery sandy loam. The substratum is dark yellowish brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with this soil in mapping are areas of Clymer, Hazleton, and Nolo soils. Also included are nearly level Cookport soils and Cookport soils that have stones on the surface. Inclusions make up 20 percent of this unit.

The permeability of this Cookport soil is moderate above the firm part of the subsoil, slow in the firm part, and moderately slow in the substratum. Available water

capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. A seasonal high water table is at a depth of 18 to 30 inches. The hazard of erosion is moderate.

The stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. In places, the stones on the surface interfere with machine planting. Placing roads on the contour helps to control erosion during timber harvesting.

The seasonal high water table, slope, and the slow permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2w.

DeB—Dekalb channery loam, 3 to 8 percent slopes. This soil is gently sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range from about 4 to 50 acres.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is pale brown channery loam about 2 inches thick. The subsoil is yellowish brown and is about 20 inches thick. It is channery loam in the upper 9 inches and very channery loam in the lower 11 inches. The substratum is yellowish brown very channery sandy loam 8 inches thick. Sandstone bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Cookport, Clymer, Hazleton, and Gilpin soils. Also included are small areas of a soil similar to this Dekalb soil but that is less than 20 inches deep to bedrock. Inclusions make up about 15 percent of this unit.

The permeability of this Dekalb soil is moderately rapid to rapid in the subsoil and rapid in the substratum. Available water capacity is low. Runoff is medium. Reaction is extremely acid to strongly acid in unlimed areas. The hazard of erosion is moderate.

Most areas of this soil are in woodland. Some areas are used for pasture, hay, or cultivated crops.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Machine planting is practical on larger areas.

The depth to bedrock is the main limitation of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 3o.

DeC—Dekalb channery loam, 8 to 15 percent slopes. This soil is sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas of this soil are oval, irregular in shape, or long and narrow and range from about 4 to 50 acres.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is pale brown channery loam about 2 inches thick. The subsoil is yellowish brown and is about 20 inches thick. It is channery loam in the upper 9 inches and very channery loam in the lower 11 inches. The substratum is yellowish brown very channery sandy loam 8 inches thick. Sandstone bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Cookport, Clymer, Hazleton, and Gilpin soils. Also included are small areas of a soil similar to this Dekalb soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Dekalb soil is moderately rapid to rapid in the subsoil and rapid in the substratum. Available water capacity is low. Runoff is medium. Reaction is extremely acid to strongly acid in unlimed areas. The hazard of erosion is severe.

Most areas of this soil are in woodland or brushland. Some areas are used for pasture or hay, and a few areas are used for cultivated crops.

This soil is suited to some cultivated crops, but slope and the hazard of erosion are major limitations. Contour stripcropping, conservation tillage, cover crops, and using mainly hay in the crop rotation will help to reduce runoff and control erosion in cultivated areas. Using cover crops and grasses and legumes in the cropping system and using crop residue will help to maintain organic matter content and tilth.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Machine planting is practical on larger areas.

Slope, the permeability, and the depth to bedrock are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIIe; woodland ordination 3o.

DeD—Dekalb channery loam, 15 to 25 percent slopes. This soil is moderately steep, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The

areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is pale brown channery loam about 2 inches thick. The subsoil is yellowish brown and is about 20 inches thick. It is channery loam in the upper 9 inches and very channery loam in the lower 11 inches. The substratum is yellowish brown very channery sandy loam 8 inches thick. Sandstone bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Cookport, Clymer, Hazleton, and Gilpin soils. Also included are small areas of a soil similar to this Dekalb soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Dekalb soil is moderately rapid to rapid in the subsoil and rapid in the substratum. Available water capacity is low. Runoff is rapid. Reaction is extremely acid to strongly acid in unlimed areas. The hazard of erosion is severe.

Most areas of this soil are in woodland or brushland. Some areas are used for pasture or hay.

This soil is suited to some cultivated crops, but slope and the hazard of erosion are major limitations. Contour stripcropping, conservation tillage, cover crops, and using mainly hay in the crop rotation will help to reduce runoff and control erosion in cultivated areas. Using cover crops and grasses and legumes in the cropping system and using crop residue will help to maintain organic matter content and tilth.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas. Constructing roads on the contour helps to control erosion during timber harvesting.

Slope, the permeability, and the depth to bedrock are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVe; woodland ordination 2r.

DxB—Dekalb very stony loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is pale brown channery loam about 2 inches thick. The subsoil is yellowish brown and is about 20 inches thick. It is channery loam in the upper 9 inches and very channery loam in the lower 11 inches. The substratum is yellowish brown very channery sandy loam 8 inches thick. Sandstone bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Cookport, Clymer, Hazleton, and Gilpin soils. Also included are areas of Dekalb soils with no stones on the surface or where stones cover more than 15 percent of the surface and soils similar to this Dekalb soil but that are less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Dekalb soil is moderately rapid to rapid in the subsoil and rapid in the substratum. Available water capacity is low. Runoff is medium. Reaction is extremely acid to strongly acid in unlimed areas. The hazard of erosion is slight.

The stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is moderately high. Most areas are wooded. In places, the stones on the surface interfere with machine planting.

The depth to bedrock is the main limitation of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 3o.

DxD—Dekalb very stony loam, 8 to 25 percent slopes. This soil is sloping and moderately steep, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 300 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark brown channery loam about 1 inch thick. The subsurface layer is pale brown channery loam about 2 inches thick. The subsoil is yellowish brown and is about 20 inches thick. It is channery loam in the upper 9 inches and very channery loam in the lower 11 inches. The substratum is yellowish brown very channery sandy loam 8 inches thick. Sandstone bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Cookport, Clymer, Hazleton, and Gilpin soils. Also included are areas of Dekalb soils with no stones on the surface or where stones cover more than 15 percent of the surface and soils similar to this Dekalb soil but that are less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Dekalb soil is moderately rapid to rapid in the subsoil and rapid in the substratum. Available water capacity is low. Runoff is medium. Reaction is extremely acid to strongly acid in unlimed areas. The hazard of erosion is moderate.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. Placing roads on the contour helps to control erosion.

Slope, the depth to bedrock, and the permeability limit the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2r.

ErB—Ernest silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and moderately well drained. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper 21 inches of the subsoil is yellowish brown silt loam and channery silt loam. The lower 23 inches is firm, mottled, yellowish brown and dark brown silt loam. The substratum is dark brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Wharton, Cavode, and Brinkerton soils. Also included are Ernest soils that are nearly level or have stones on the surface, or both. Inclusions make up 25 percent of this unit.

The permeability of this Ernest soil is moderate above the firm part of the subsoil and moderately slow or slow in the firm part and in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is moderate.

Most areas of this soil are in woodland. Some areas are cultivated or in native vegetation.

This soil is suited to cultivated crops. Subsurface drains are needed in some areas that contain wet spots. Contour stripcropping, conservation tillage, grassed waterways, and cover crops will help to reduce runoff and control erosion. Using crop residue and using cover crops and grasses and legumes in the cropping system help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The seasonal high water table and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 2o.

ErC—Ernest silt loam, 8 to 15 percent slopes. This soil is sloping, deep, and moderately well drained. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper 21 inches of the subsoil is yellowish brown silt loam and channery silt loam. The lower 23 inches is firm, mottled, yellowish brown and dark brown silt loam. The substratum is dark brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Wharton, Cavode, and Brinkerton soils. Also included are soils similar to this Ernest but that have stones on the surface. Inclusions make up 25 percent of this unit.

The permeability of this Ernest soil is moderate above the firm part of the subsoil and moderately slow or slow in the firm part and in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is severe.

Most areas of this soil are in woodland. Some areas are in cultivated crops or hay or in native vegetation.

This soil is suited to cultivated crops. Subsurface drains are needed in some areas that contain wet spots. Contour stripcropping, conservation tillage, grassed waterways, cover crops, and using mainly hay in the crop rotation will help to reduce runoff and control erosion. Using crop residue and using cover crops and grasses and legumes in the cropping system will help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The seasonal high water table and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIIe; woodland ordination 2r.

ErD—Ernest silt loam, 15 to 25 percent slopes. This soil is moderately steep, deep, and moderately well drained. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper 21 inches of the subsoil is yellowish brown silt loam and channery silt loam. The lower 23

inches is firm, mottled, yellowish brown and dark brown silt loam. The substratum is dark brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Wharton and Cavode soils. Also included are soils similar to this Ernest soil but that have stones on the surface. Inclusions make up 25 percent of this unit.

The permeability of this Ernest soil is moderate above the firm part of the subsoil and moderately slow or slow in the firm part and in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is very severe.

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

This soil is suited to some cultivated crops, but slope and the hazard of erosion are major limitations. Subsurface drains are needed in some areas that contain wet spots. Contour stripcropping, conservation tillage, cover crops and using mainly hay in the crop rotation will help to reduce runoff and control erosion in cultivated areas. Using crop residue and using cover crops and grasses and legumes in the cropping system will help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is well suited to trees, and potential productivity is high. Slope limits the use of equipment. Placing roads on the contour helps to control erosion during timber harvesting.

Slope, the seasonal high water table, and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVe; woodland ordination 2r.

ExB—Ernest very stony silt loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, deep, and moderately well drained. Slopes generally are smooth and concave or convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper 21 inches of the subsoil is yellowish brown silt loam and channery silt loam. The lower 23 inches is firm, mottled, yellowish brown and dark brown silt loam. The substratum is dark brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Wharton, Cavode, and Brinkerton soils. Also included are Ernest soils with no stones on the surface. Inclusions make up about 20 percent of this unit.

The permeability of this Ernest soil is moderate above the firm part of the subsoil and moderately slow or slow in the firm part and in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is moderate.

The stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is well suited to trees, and potential productivity is high. Most areas are wooded. In places, the stones on the surface interfere with machine planting.

The seasonal high water table and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2o.

ExD—Ernest very stony silt loam, 8 to 25 percent slopes. This soil is sloping and moderately steep, deep, and moderately well drained. Slopes generally are smooth and concave or convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark gray silt loam about 3 inches thick. The subsoil is about 44 inches thick. The upper 21 inches of the subsoil is yellowish brown silt loam and channery silt loam. The lower 23 inches is firm, mottled, yellowish brown and dark brown silt loam. The substratum is dark brown channery silt loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Wharton, Cavode, and Brinkerton soils. Also included are Ernest soils with no stones on the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Ernest soil is moderate above the firm part of the subsoil and moderately slow or slow in the firm part and in the substratum. Available water capacity is moderate, and runoff is medium. Reaction in unlimed areas is strongly acid or very strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is moderate.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. Slope and the stones on the surface limit the use of equipment. Placing roads on the contour helps to control erosion during timber harvesting.

Slope, the seasonal high water table, and the permeability in the firm part of the subsoil limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIs; woodland ordination 2r.

GlB—Gilpin channery silt loam, 3 to 8 percent slopes. This soil is gently sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 200 to 600 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 9 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 10 inches of the subsoil is channery silt loam, and the lower 7 inches is very channery silt loam. The substratum is yellowish brown very channery loam 5 inches thick. Shale bedrock is at a depth of 31 inches (fig. 9).

Included with this soil in mapping are small areas of Dekalb, Berks, Rayne, and Wharton soils. Also included are small areas of nearly level Gilpin soils and a soil similar to this Gilpin soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Gilpin soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid throughout. The hazard of erosion is moderate.

Most areas of this soil are in native vegetation or woodland. Some areas are in cultivated crops, hay, or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The depth to bedrock is the main limitation of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 2o.

GlC—Gilpin channery silt loam, 8 to 15 percent slopes. This soil is sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is dark grayish brown channery silt loam about 9 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 10 inches of the subsoil is channery silt loam, and the lower 7 inches is very channery silt loam. The substratum is yellowish brown very channery loam 5 inches thick. Shale bedrock is at a depth of 31 inches.

Included with this soil in mapping are a few small areas of Dekalb, Berks, Rayne, and Wharton soils. Also included are small areas of a soil similar to this Gilpin soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Gilpin soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid throughout. The hazard of erosion is moderate.

Most areas of this soil are in woodland. Some areas are in cultivated crops, hay, or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on larger areas.

The depth to bedrock and slope limit this soil for some nonfarm uses, especially for onsite waste disposal.

Capability subclass IIIe; woodland ordination 2o.

GmB—Gilpin very stony silt loam, 2 to 8 percent slopes. This soil is gently sloping, moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is dark grayish brown channery silt loam about 9 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 10 inches of the subsoil is channery silt loam, and the lower 7 inches is very channery silt loam. The substratum is yellowish brown very channery loam 5 inches thick. Shale bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Dekalb, Berks, Rayne, and Wharton soils. Also included are areas of Gilpin soils with no stones on the surface and a soil similar to this Gilpin soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

Figure 9.—A road cut in Gilpin channery silt loam, 3 to 8 percent slopes.

The permeability of this Gilpin soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid throughout. The hazard of erosion is slight.

This soil is well suited to trees, and potential productivity is high. Most areas are wooded.

The depth to bedrock is the main limitation of this soil for nonfarm use.

Capability subclass VIs; woodland ordination 2o.

GmD—Gilpin very stony silt loam, 8 to 25 percent slopes. This soil is sloping and moderately steep,

moderately deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 300 feet long. The areas of this soil are long and narrow and range mainly from 4 to 100 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is dark grayish brown channery silt loam about 9 inches thick. The subsoil is yellowish brown and is about 17 inches thick. The upper 10 inches of the subsoil is channery silt loam, and the lower 7 inches is very channery silt loam. The substratum is yellowish brown very channery loam 5 inches thick. Shale bedrock is at a depth of 31 inches.

Included with this soil in mapping are small areas of Dekalb, Berks, Rayne, and Wharton soils. Also included are areas of Gilpin soils with no stones on the surface and a soil similar to this Gilpin soil but that is less than 20 inches deep to bedrock. Inclusions make up about 25 percent of this unit.

The permeability of this Gilpin soil is moderate, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid throughout. The hazard of erosion is moderate.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is well suited to trees, and potential productivity is high. Most areas are wooded. Slope and the stones on the surface limit the use of equipment. Placing roads on the contour helps to control erosion.

Slope and the depth to bedrock are the main limitations of the soil for nonfarm use.

Capability subclass VIs; woodland ordination 2r.

HaD—Hazleton channery loam, 15 to 25 percent slopes. This soil is moderately steep, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas are irregular in shape or long and narrow and range mainly from 4 to 50 acres.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery loam and very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are small areas of Clymer and Cookport soils. Also included are small areas of Hazleton soils with stones on the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Hazleton soil is moderately rapid to rapid, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is severe.

Most areas of this soil are in woodland. Some areas are used for pasture or hay.

This soil is suited to some cultivated crops, but slope and the hazard of erosion are major limitations.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is moderately high. Erosion is a hazard, and slope limits the use of equipment. Machine planting is practical on larger areas. Constructing roads on the contour helps to control erosion during timber harvesting.

Slope and the permeability are the main limitations of the soil for nonfarm use.

Capability subclass IVe; woodland ordination 3f.

HbD—Hazleton very stony loam, 8 to 25 percent slopes. This soil is sloping and moderately steep, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 100 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery loam and very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are small areas of Clymer and Cookport soils with stones on the surface. Also included are small areas of Hazleton soils where stones cover less than 3 percent or more than 15 percent of the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Hazleton soil is moderately rapid to rapid, and available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is moderate.

Slope and the stones on the surface make this soil generally unsuited to cultivated crops, hay, or pasture.

This soil is suited to trees, and potential productivity is moderately high. Erosion is a hazard, and slope and the stones on the surface limit the use of equipment.

Slope and the permeability are the main limitations of the soil for nonfarm use.

Capability subclass VIs; woodland ordination 3f.

HbF—Hazleton very stony loam, 25 to 80 percent slopes. This soil is steep and very steep, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 500 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 500 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery loam and very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are small areas of Dekalb and Gilpin soils and Rubble land and Dystrochrepts. Also included are Hazleton soils that do not have stones on the surface. Inclusions make up about 20 percent of this unit.

The permeability of this Hazleton soil is moderately rapid to rapid, and available water capacity is moderate. Runoff is medium. Reaction is strongly to extremely acid. The hazard of erosion is moderate.

Slope and the stones on the surface make this soil generally unsuitable for farming and are major limitations for nonfarm use.

This soil is suited to trees, and potential productivity is moderately high. Erosion is a hazard, and the slope and stones on the surface limit the use of equipment.

Capability subclass VIIs; woodland ordination 3f.

HcB—Hazleton-Clymer channery loams, 3 to 8 percent slopes. This unit consists of gently sloping, deep, well drained soils on uplands. Slopes generally are smooth and convex and are 100 to 400 feet long. The areas of the unit are irregular in shape and range mainly from 4 to 100 acres. These soils were mapped together because they are so intermingled that it was not practical to map them separately. This unit is about 60 percent Hazleton soils, 30 percent Clymer soils, and 10 percent other soils.

Typically, the surface layer of the Hazleton soils is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Typically, the Clymer soils have a surface layer of very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam and channery loam about 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with these soils in mapping are small areas of nearly level to sloping Hazleton and Clymer soils and areas of Hazleton and Clymer soils that have stones on the surface. Also included are areas of moderately well drained Cookport soils and moderately deep, well drained Dekalb soils.

Permeability is moderately rapid to rapid in these Hazleton soils and moderate in these Clymer soils. Available water capacity is moderate. Reaction in unlimed areas is strongly acid to extremely acid. Runoff is medium, and the erosion hazard is moderate.

Most areas of these soils are in woodland. Some areas are cultivated or in hay or pasture.

These soils are suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

These soils are suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

These soils are suited to trees, and potential productivity is moderately high to high. Machine planting is practical in larger areas.

The main limitations for nonfarm use in this unit are the depth to bedrock in the Clymer soils and the permeability of the Hazleton soils.

Capability subclass IIe; woodland ordination is 3f in the Hazleton soils and 2o in the Clymer soils.

HcC—Hazleton-Clymer channery loams, 8 to 15 percent slopes. This unit consists of sloping, deep, well drained soils on uplands. Slopes generally are smooth and convex and are 100 to 500 feet long. The areas of the unit are irregular in shape and range mainly from 4 to 50 acres. These soils were mapped together because they are so intermingled that it was not practical to map them separately. This unit is about 65 percent Hazleton

soils, 25 percent Clymer soils, and 10 percent other soils.

Typically, the surface layer of the Hazleton soils is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Typically, the Clymer soils have a surface layer of very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam and channery loam about 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with these soils in mapping are small areas of gently sloping to moderately steep Hazleton and Clymer soils and areas of Hazleton and Clymer soils that have stones on the surface. Also included are areas of moderately well drained Cookport soils, moderately deep Dekalb soils, and soils similar to these Hazleton soils but which have more sand and less silt in the surface layer and subsoil.

Permeability is moderately rapid to rapid in these Hazleton soils and moderate in these Clymer soils. Available water capacity is moderate. Reaction in unlimed areas is strongly acid to extremely acid. Runoff is medium, and the erosion hazard is moderate.

Most areas of these soils are in woodland. Some areas are cultivated or in hay or pasture.

These soils are suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

These soils are suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

These soils are suited to trees, and potential productivity is moderately high to high. Machine planting is practical in larger areas.

Slope is a limitation of this unit for nonfarm use. The depth to bedrock in the Clymer soils and the permeability of the Hazleton soils are additional limitations for nonfarm use.

Capability subclass IIIe; woodland ordination is 3f for the Hazleton soils and 2o for the Clymer soils.

HdB—Hazleton-Clymer very stony loams, 0 to 8 percent slopes. This unit consists of nearly level and gently sloping, deep, well drained soils on uplands. Slopes generally are smooth and convex and are about 100 to 400 feet long. The areas of this soil are irregular in shape and range mainly from 4 to 100 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface. These soils were mapped together because they are so intermingled that it was not practical to map them separately. This unit is about 60 percent Hazleton soils, 25 percent Clymer soils, and 15 percent other soils.

Typically, the surface layer of the Hazleton soils is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery sandy loam about 2 inches thick. The subsoil is about 42 inches thick. The upper part of the subsoil is dark reddish brown channery loam about 3 inches thick. The middle part is brownish yellow channery loam and very channery loam about 22 inches thick. The lower part is strong brown very channery loam and very channery sandy loam about 17 inches thick. The substratum is strong brown very channery sandy loam 9 inches thick. Sandstone bedrock is at a depth of 55 inches.

Typically, the Clymer soils have a surface layer of very dark brown channery loam about 1 inch thick. The subsurface layer is grayish brown channery loam about 6 inches thick. The subsoil is yellowish brown very channery loam and channery loam about 31 inches thick. The substratum is yellowish brown very channery loam 11 inches thick. Sandstone bedrock is at a depth of 49 inches.

Included with these soils in mapping are small areas of Hazleton and Clymer soils that do not have stones on the surface. Also included are small areas of Cookport and Nolo soils.

Permeability is moderately rapid to rapid in these Hazleton soils and moderate in these Clymer soils. Available water capacity is moderate. Reaction in unlimed areas is strongly acid to extremely acid. Runoff is slow, and the erosion hazard is slight.

The stones on the surface make these soils generally unsuitable for farming and are the main limitation for nonfarm use.

Most areas of this unit are wooded. The soils are suited to trees, and potential productivity is moderately high to high. In places, the stones on the surface interfere with machine planting.

Capability subclass VIs; woodland ordination is 3f for the Hazleton soils and 2o for the Clymer soils.

LeB—Leetonia very stony loamy fine sand, 0 to 12 percent slopes. This soil is nearly level to moderately sloping, deep, and well drained to excessively drained. It

is on ridgetops on uplands. The areas of this soil are irregular in shape and range mainly from 4 to 50 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is gray very gravelly loamy fine sand about 3 inches thick. The subsurface layer is light gray very stony loamy sand about 4 inches thick. The subsoil is about 21 inches thick. The upper part of the subsoil is dark reddish gray and red gravelly loamy fine sand about 2 inches thick. The lower part is brown and strong brown gravelly loamy sand and very gravelly loamy sand about 19 inches thick. The substratum is yellowish brown very stony loamy sand about 13 inches thick. Sandstone bedrock is at a depth of 41 inches.

Included with this soil in mapping are a few areas where stones cover 15 to 50 percent of the surface and small areas of Dekalb, Hazleton, and Clymer soils. Also included are small areas of soils similar to this Leetonia soil but that contain less sand and more silt in the subsoil and fewer rock fragments throughout.

This Leetonia soil has moderately rapid to rapid permeability in the subsoil and rapid permeability in the substratum. Available water capacity is very low. Surface runoff is slow. Reaction is very strongly acid or extremely acid, and natural fertility is low. The hazard of erosion is moderate.

The stones on the surface make this soil generally unsuitable for farming. Although this soil is suited to trees, and most areas are wooded, the available water capacity makes potential productivity low and causes a high rate of seedling mortality.

The depth to bedrock, the permeability, and instability of the sides of excavations are the major limitations of this soil for nonfarm use.

Capability subclass VIs; woodland ordination 5f.

MoB—Monongahela silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and moderately well drained. It is on terraces. Slopes generally are smooth and concave or convex and are 100 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 40 acres.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 17 inches of the subsoil is yellowish brown, friable silt loam. Below that it is a firm layer of pale brown and brownish yellow silt loam and silty clay loam.

Included with this soil in mapping are small areas of Allegheny, Purdy, and Tyler soils. Also included are soils similar to this Monongahela soil but that have slopes of less than 3 percent or more than 8 percent. Inclusions make up about 15 percent of this unit.

The permeability of this Monongahela soil is moderate in the friable part of the subsoil and moderately slow or slow in the firm part. Available water capacity is high, and runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid throughout. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is moderate.

Most of the acreage of this soil is cultivated or in hay. Some areas are used for woodland, pasture, or housing and industrial sites.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, and cover crops will help to reduce runoff and control erosion. Subsurface drainage is needed in some areas that contain wet spots. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is moderately high. Machine planting is practical on larger areas.

The seasonal high water table and the permeability in the lower part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 3o.

NoA—Nolo loam, 0 to 3 percent slopes. This soil is nearly level, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are 100 to 300 feet long. The areas of this soil are oval or irregular in shape and range mainly from 4 to 20 acres.

Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is about 50 inches thick. The upper 12 inches of the subsoil is light brownish gray and gray, friable, mottled loam. The lower 38 inches is a firm layer of olive gray loam and channery loam. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are areas of Cookport soils and Nolo soils with stones on the surface. Also included are soils similar to this Nolo soil but that are better drained. Inclusions make up 25 percent of this unit.

The permeability of this Nolo soil is moderate in the friable part of the subsoil and slow in the firm part. Available water capacity is moderate. Runoff is slow. Reaction in unlimed areas is very strongly acid or extremely acid. A high water table is between the surface and a depth of 6 inches. The hazard of erosion is slight.

This soil is suited to some cultivated crops that tolerate seasonal wetness, but the high water table is a

major limitation. Water sometimes is ponded on the surface during wet seasons.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to woodland, and potential productivity is moderately high. Most areas are wooded. The seasonal high water table limits equipment use and causes a high rate of seedling mortality and a hazard of uprooting during windy periods.

The seasonal high water table and the permeability in the firm part of the subsoil are the main limitations of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVw; woodland ordination 3w.

NoB—Nolo loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are about 100 to 400 feet long. The areas of this soil are oval or irregular in shape and range mainly from 4 to 40 acres.

Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is about 50 inches thick. The upper 12 inches of the subsoil is light brownish gray and gray, friable, mottled loam. The lower 38 inches is a firm layer of olive gray loam and channery loam. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are areas of Cookport soils and Nolo soils with stones on the surface. Also included are soils similar to this Nolo soil but that are better drained. Inclusions make up 25 percent of this unit.

The permeability of this Nolo soil is moderate in the friable part of the subsoil and slow in the firm part. Available water capacity is moderate. Runoff is medium. Reaction in unlimed areas is very strongly acid or extremely acid. A high water table is between the surface and a depth of 6 inches. The hazard of erosion is medium.

This soil is suited to some cultivated crops that tolerate seasonal wetness, but the high water table is a major limitation.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to woodland, and potential productivity is moderately high. Most areas are wooded. The seasonal high water table limits equipment use and causes a high rate of seedling mortality and a hazard of uprooting during windy periods.

The seasonal high water table and the permeability in the firm part of the subsoil are the main limitations of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVw; woodland ordination 3w.

NxB—Nolo very stony loam, 0 to 8 percent slopes. This soil is nearly level and gently sloping, deep, and poorly drained. It is on uplands. Slopes generally are smooth and concave and are about 100 to 400 feet long. The areas of this soil are oval or irregular in shape and range mainly from 4 to 40 acres. Stones that are 3 to 10 inches in diameter cover 3 to 15 percent of the surface.

Typically, the surface layer is very dark grayish brown loam 5 inches thick. The subsoil is about 50 inches thick. The upper 12 inches of the subsoil is light brownish gray and gray, friable, mottled loam. The lower 38 inches is a firm layer of olive gray loam and channery loam. Sandstone bedrock is at a depth of 55 inches.

Included with this soil in mapping are areas of Cookport and Clymer soils and Nolo soils with no stones on the surface. Also included are soils similar to this Nolo soil but that are better drained. Inclusions make up 25 percent of this unit.

The permeability of this Nolo soil is moderate in the friable part of the subsoil and slow in the firm part. Available water capacity is moderate. Runoff is slow. Reaction in unlimed areas is very strongly acid or extremely acid. A high water table is between the surface and a depth of 6 inches. The hazard of erosion is slight.

The stones on the surface and the seasonal high water table make this soil generally unsuitable for farming.

The soil is suited to woodland, and potential productivity is moderately high. Most areas are wooded. The seasonal high water table limits equipment use and causes a high rate of seedling mortality and a hazard of uprooting during windy periods.

The seasonal high water table and the slow permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass VIIs; woodland ordination 3w.

Ph—Philo silt loam. This soil is nearly level, deep, and moderately well drained. It is on flood plains that are commonly flooded. Slopes generally are smooth and convex and are about 200 to 500 feet long. The areas of this soil are long and narrow and range mainly from 4 to 40 acres. Slopes range from 0 to 3 percent.

Typically, the surface is very dark grayish brown silt loam about 9 inches thick. The subsoil is dark yellowish brown silt loam about 34 inches thick and is mottled in

the lower 24 inches. The substratum is grayish brown gravelly sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Pope and Atkins soils. Inclusions make up about 20 percent of this unit.

The permeability of this Philo soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is high. Runoff is slow or very slow. Reaction in unlimed areas is very strongly acid to medium acid. The hazard of erosion is slight. A seasonal high water table is at a depth of 1.5 to 3 feet.

Most areas of this soil are cultivated or in permanent hay or pasture. Some areas are in woodland, and some areas are used for industrial and housing sites.

This soil is suited to cultivated crops. Subsurface drains are needed in some areas that contain wet spots. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is a major concern of pasture management. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Livestock must be removed from some areas of this soil during flooding.

This soil is suited to trees, and potential productivity is very high. Seasonal wetness limits the use of equipment, but machine planting is practical in the larger areas.

Flooding and the seasonal high water table are the main limitations of the soil for nonfarm use.

Capability subclass IIw; woodland ordination 1w.

Po—Pope loam. This soil is nearly level, deep, and well drained. It is on flood plains that are subject to rare flooding. Slopes generally are smooth and convex and are about 200 to 400 feet long. The areas of this soil are long and narrow and range mainly from 4 to 50 acres. Slopes range from 0 to 3 percent.

Typically, the surface layer is a dark yellowish brown loam about 6 inches thick. The subsoil is 34 inches thick. It is dark brown loam in the upper 9 inches, dark brown fine sandy loam in the next 15 inches, and dark yellowish brown sandy loam in the lower 10 inches. The substratum is dark yellowish brown loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Philo and Atkins soils. Inclusions make up about 15 percent of this unit.

The permeability of this Pope soil is moderate to moderately rapid. Available water capacity is high. Runoff is slow. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is slight.

Most areas of this soil are cultivated or in permanent hay or pasture. Some areas are in woodland, and some are used for housing and industrial sites.

This soil is suited to cultivated crops. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical in the larger areas.

Flooding is the main limitation of this soil for most types of nonfarm uses.

Capability class I; woodland ordination 2o.

Pu—Purdy silt loam. This soil is nearly level, deep, and poorly and very poorly drained. It is on terraces. Slopes generally are smooth and slightly concave and are 50 to 400 feet long. The areas of this soil are irregular in shape or long and narrow and range from 4 to 20 acres. Slopes range from 0 to 3 percent.

Typically, this soil has a surface layer of very dark gray silt loam 6 inches thick. The subsoil is mottled, gray silty clay loam and silty clay 38 inches thick. The substratum is dark gray silty clay to a depth of 60 inches or more.

Included with this soil in mapping are small areas of Monongahela, Tyler, and Allegheny soils. Inclusions make up about 25 percent of this unit.

The permeability of this Purdy soil is slow or very slow, and available water capacity is high. Runoff is slow, and ponding is frequent. Reaction in unlimed areas is strongly acid to extremely acid. The hazard of erosion is slight. The seasonal high water table is between the surface and a depth of 1 foot.

Most areas of this soil are in native vegetation or woodland. Some areas are used for pasture.

This soil is suited to some cultivated crops that tolerate seasonal wetness. The main management concerns are keeping natural drainageways open and providing open-ditch drainageways where outlets are available.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees that tolerate seasonal wetness, and potential productivity is very high. The seasonal high water table is the main limitation. It limits the use of equipment, causes a high rate of seedling mortality, and makes trees susceptible to uprooting during windy periods.

The seasonal high water table is the main limitation of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVw; woodland ordination 1w.

RaB—Rayne silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 200 to 600 feet long. The areas of this soil are irregular in shape or long and narrow and range mainly from 4 to 40 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 41 inches thick. The upper 6 inches of the subsoil is dark yellowish brown silt loam, and the lower 35 inches is yellowish brown and dark brown channery silt loam. The substratum is dark brown very channery silt loam 10 inches thick. Shale bedrock is at a depth of 60 inches.

Included with this soil in mapping are small areas of Gilpin and Wharton soils. Also included are small areas of nearly level Rayne soils. Inclusions make up about 15 percent of this unit.

The permeability of this Rayne soil is moderate, and available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. The hazard of erosion is moderate.

Most areas of this soil are in native vegetation or woodland. Some areas are in permanent hay or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical in the larger areas.

This soil has few limitations for most types of nonfarm uses.

Capability subclass IIe; woodland ordination 2o.

RaC—Rayne silt loam, 8 to 15 percent slopes. This soil is sloping, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 500 feet long. The areas are irregular in shape or long and narrow and range mainly from 4 to 40 acres.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 41 inches thick. The upper 6 inches of the subsoil is dark yellowish brown silt loam, and the lower 35 inches is yellowish brown and dark brown channery silt loam. The substratum is dark brown very channery silt loam 10 inches thick. Shale bedrock is at a depth of 60 inches.

Included with this soil in mapping are small areas of Gilpin and Wharton soils. Inclusions make up about 10 percent of this unit.

The permeability of this Rayne soil is moderate, and available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. The hazard of erosion is moderate.

Most areas of this soil are in native vegetation or woodland. Some areas are in permanent hay or pasture.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, diversions, and cover crops help to reduce runoff and control the hazard of erosion. The use of cover crops and grasses and legumes in the cropping system and the use of crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical in the larger areas.

Slope is the main limitation of this soil for nonfarm use.

Capability subclass IIIe; woodland ordination 2o.

RbF—Rayne channery silt loam, 25 to 65 percent slopes. This soil is steep and very steep, deep, and well drained. It is on uplands. Slopes generally are smooth and convex and are about 100 to 500 feet long. The areas of this soil are long and narrow and range mainly from 4 to 500 acres.

Typically, the surface layer is dark brown channery silt loam about 9 inches thick. The subsoil is about 41 inches thick. The upper 6 inches of the subsoil is dark yellowish brown silt loam, and the lower 35 inches is yellowish brown and dark brown channery silt loam. The substratum is dark brown very channery silt loam 10 inches thick. Shale bedrock is at a depth of 60 inches.

Included with this soil in mapping are areas of Gilpin soils and Rayne soils with stones on the surface. Also included are areas of Hazleton and Dekalb soils, Rubble land and Dystrochrepts, and soils similar to this Rayne soil but that are less than 20 inches deep to bedrock. Inclusions make up about 20 percent of this unit.

The permeability of this Rayne soil is moderate, and available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. The hazard of erosion is severe.

This soil is not suited to cultivated crops or pasture because of slope and the severe erosion hazard.

This soil is suited to trees, and potential productivity is high. Most areas are wooded. Erosion is a hazard, and slope limits the use of equipment.

Slope is the main limitation of the soil for nonfarm use.

Capability subclass VIIe; woodland ordination 2r.

RcD—Rayne-Gilpin complex, 15 to 25 percent slopes. This unit consists of moderately steep, well

drained soils on uplands. Slopes generally are smooth and convex and are about 100 to 300 feet long. The areas of the unit are irregular in shape or long and narrow and range mainly from 4 to 100 acres. They are about 60 percent deep Rayne soils, 30 percent moderately deep Gilpin soils, and 10 percent other soils. The soils are so mixed that it was not practical to map them separately.

Typically, the surface layer of the Rayne soils is dark brown silt loam about 9 inches thick. The subsoil is about 41 inches thick. The upper 6 inches of the subsoil is dark yellowish brown silt loam. The lower 35 inches is yellowish brown and dark brown channery silt loam. The substratum is dark brown very channery silt loam 10 inches thick. Shale bedrock is at a depth of 60 inches.

Typically, the surface layer of the Gilpin soils is dark grayish brown channery silt loam about 9 inches thick. The subsoil is about 17 inches thick. The upper 10 inches of the subsoil is yellowish brown channery silt loam. The lower 7 inches is yellowish brown very channery silt loam. The substratum is yellowish brown very channery loam 5 inches thick. Shale bedrock is at a depth of 31 inches.

Included with this unit in mapping are areas of sloping and steep Rayne and Gilpin soils and Berks, Dekalb, and Wharton soils. Also included are a few small areas with stones on the surface and areas of soils similar to this Gilpin soil but that are less than 20 inches deep to bedrock.

The permeability in these Rayne soils is moderate, and available water capacity is moderate to high. Reaction in unlimed areas is very strongly acid or strongly acid. Runoff is rapid, and the hazard of erosion is severe.

The permeability in these Gilpin soils is moderate, and available water capacity is high. Runoff is rapid, and the hazard of erosion is severe. Reaction in unlimed areas is strongly acid to extremely acid.

Most areas of this unit are in woodland. Some areas are in hay, pasture, or native vegetation.

These soils are suited to some cultivated crops, but the hazard of erosion and slope are limitations.

These soils are suited to pasture. Overgrazing is a major concern of pasture management. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This unit is suited to trees, and potential productivity is high. Slope limits the use of equipment. Constructing roads on the contour helps to control erosion during timber harvesting.

The depth to bedrock in the Gilpin soils and slope are the main limitations of the unit for nonfarm use.

Capability subclass IVe; woodland ordination 2r.

Ru—Rubble land-Dystrochrepts complex. This unit consists of gently sloping to very steep, moderately well drained to somewhat excessively well drained soils on mountainsides, hillsides, and benches. Slopes range from 3 to 75 percent. The areas are long and narrow and range from 4 to 300 acres. They consist of about 60 percent Rubble land, 30 percent Dystrochrepts, and 10 percent other soils. The soils are so mixed that it was not practical to map them separately.

Generally, Rubble land is gray or reddish brown sandstone and conglomerate boulders and stones about 1 to 3 feet in diameter. The depth of the material ranges from less than 1 foot to more than 10 feet. The areas are almost free of vegetation.

Dystrochrepts have a cover of stones and boulders. The layer of stones and boulders ranges in thickness from less than 1 foot to 8 feet, and their diameter ranges from 1 to 10 feet. The surface layer consists primarily of leaf litter, roots, and organic matter, and is silt loam, loam, or sandy loam mixed with stones and boulders. The subsoil generally is about half sandy clay loam or sandy loam and half rock fragments. The substratum is about half loam, sandy loam, or loamy sand and about half rock fragments.

Included with this unit in mapping are small areas of Dekalb, Hazleton, Cookport, and Leetonia soils. Also included are small areas of shallow soils. Included soils make up as much as 10 percent of the unit.

Rubble land has very rapid permeability and very low available water capacity. The surface of the Rubble land part of this unit is more than 90 percent stones and boulders. Vegetation is restricted to a sparse growth of hardy plants. Surface runoff is slow to rapid.

The Dystrochrepts part of the unit has slow to very rapid permeability and moderate to very low available water capacity. The surface is about 50 to 90 percent stones and boulders. In some areas tree roots are able to penetrate the stone cover. Surface runoff is slow to rapid.

Slope, the stones and boulders, and the very low available water capacity make this unit generally unsuitable for most types of farm and nonfarm uses. Only the most drought-resistant and hardy plants and trees will grow on the unit.

This unit is not assigned to a capability subclass or woodland ordination group.

TyA—Tyler silt loam, 0 to 3 percent slopes. This soil is nearly level, deep, and somewhat poorly drained. It is on terraces. Slopes generally are smooth, slightly concave, and 100 to 300 feet long. The areas of this soil are oval or irregular in shape and range mainly from 4 to 30 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 13 inches of the subsoil is mottled, yellowish brown and grayish brown silt loam. The lower part is mottled, olive, firm silty clay loam.

Included with this soil in mapping are small areas of Allegheny, Monongahela, and Purdy soils. Inclusions make up about 15 percent of this unit.

The permeability of this Tyler soil is moderately slow above the firm part of the subsoil and slow or very slow in the firm part. Available water capacity is high. Reaction in unlimed areas is strongly acid to extremely acid throughout. A seasonal high water table is at a depth of 6 to 24 inches. The hazard of erosion is slight.

Most areas of this soil are cultivated or in native vegetation. Some areas are in permanent hay or in pasture or woodland.

This soil is suited to cultivated crops. Subsurface drainage is needed in some areas that contain wet spots. Using cover crops and wetness-tolerant grasses and legumes and using crop residue will help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. The seasonal high water table causes a high rate of seedling mortality. Machine planting is practical on larger areas.

The seasonal high water table and the permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIIw; woodland ordination 2d.

TyB—Tyler silt loam, 3 to 6 percent slopes. This soil is gently sloping, deep, and somewhat poorly drained. It is on terraces. Slopes generally are smooth, slightly concave, and 100 to 300 feet long. The areas are oval and range mainly from 4 to 30 acres.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper 13 inches of the subsoil is mottled, yellowish brown and grayish brown silt loam. The lower part is mottled, olive, firm silty clay loam.

Included with this soil in mapping are small areas of Allegheny, Monongahela, and Purdy soils. Also included are small areas with slopes of more than 6 percent. Inclusions make up about 15 percent of this unit.

The permeability of this Tyler soil is moderately slow above the firm part of the subsoil and slow or very slow in the firm part. Available water capacity is high. Reaction in unlimed areas is strongly acid to extremely acid throughout. A seasonal high water table is at a depth of 6 to 24 inches. The hazard of erosion is moderate.

Most areas of this soil are cultivated or in native vegetation. Some areas are in permanent hay or in pasture or woodland.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, cover crops, and using mostly hay in the crop rotation will help to reduce runoff and control erosion. Subsurface drains are needed in some areas that contain wet spots. Using cover crops and wetness-tolerant grasses and legumes and using crop residue will help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. Overgrazing, seasonal wetness, and compaction of the topsoil by equipment and livestock are the major pasture management concerns. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients. Restricting both grazing and the use of equipment during periods of seasonal wetness helps to prevent compaction of the topsoil.

This soil is suited to trees, and potential productivity is high. The seasonal high water table causes a high rate of seedling mortality. Machine planting is practical on larger areas.

The seasonal high water table and the permeability in the firm part of the subsoil are the main limitations of the soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIIw; woodland ordination 2d.

Ud—Udifluvents, sandy. This unit consists of nearly level, deep, moderately well drained to well drained soils on flood plains that are commonly crossed by shallow stream channels. These areas are frequently flooded and contain large amounts of rock fragments on the surface. Slopes are smooth, are long and narrow, and range from 0 to 3 percent. The areas range mainly from 4 to 40 acres.

Generally, these Udifluvents have a brownish, sandy surface layer. The substratum is brownish, stratified, sandy and loamy material.

Included with these soils in mapping are a few small areas of Pope, Philo, and Atkins soils. Inclusions make up about 20 percent of this unit.

The permeability of these Udifluvents is slow to rapid, and available water capacity is low to high. Runoff is slow. Reaction is strongly acid to extremely acid. A seasonal high water table is at a depth of about 24 to 36 inches. The hazard of erosion is slight.

Most areas of these soils are in woodland or brushland.

The stones on the surface, the seasonal high water table, and the frequent flooding make these soils generally unsuitable for farming and are major limitations for nonfarm use.

This soil is suited to some trees, and potential productivity is moderately high. The use of equipment is limited, and the rate of seedling mortality is high.

This unit is not assigned to a capability subclass or woodland ordination group.

Uo—Udorthents, shale. This unit consists of nearly level to very steep, well drained to moderately well drained soils on uplands. The soils are in areas that have been surface-mined (fig. 10). Slopes are smooth or irregular and are 100 to 500 feet long. The areas are irregular in shape and range from about 4 to 200 acres. Slopes range from 0 to 80 percent.

Generally, these Udorthents have a brownish, loamy or clayey surface layer. The substratum in most areas has many rock fragments and consists of loamy or clayey material.

Included with these soils in mapping are soils that have not been altered by mining. Also included are small areas of mine wash, mine dump, sandstone quarries, and sand and gravel pits and small areas of poorly drained and somewhat poorly drained soils. Inclusions make up about 10 percent of this unit.

The permeability of these Udorthents is slow to rapid, and available water capacity is low to high. Runoff is slow to very rapid, depending on slope and cover. Reaction is strongly acid to extremely acid throughout. A seasonal high water table is at a depth of about 24 to 36 inches. The hazard of erosion is moderate to very severe.

Figure 10.—An abandoned surface mine in an area of Udorthents, shale.

Most areas of these soils are in native vegetation or woodland. A few areas are used for cultivated crops or housing.

The wide range in properties of these soils and in degree of reclamation makes onsite investigation necessary to determine the suitability of the unit for any use.

This unit is not assigned to a capability subclass or woodland ordination group.

Up—Udorthents, smoothed. This unit consists of nearly level to very steep, well drained to moderately well drained soils on uplands and flood plains. The areas have been excavated and filled for highway and building construction, sand and gravel pits, and sandstone quarries. Slopes are smooth or irregular and are 100 to 500 feet long. The areas of the unit are irregular in shape and range from about 4 to 100 acres. Slopes range from 0 to 80 percent.

Generally, these Udorthents have a loamy or clayey surface layer. The substratum in most areas has many rock fragments and consists of loamy or clayey material. Some areas consist of bricks, cinders, wood, and industrial waste.

Included with these soils in mapping are small areas of Udorthents, shale; Urban land; undisturbed soils; and poorly drained and somewhat poorly drained soils. Inclusions make up about 15 percent of this unit.

The permeability of these Udorthents is slow to rapid, and available water capacity is low to high. Runoff is slow to very rapid, depending on slope and cover. Reaction is strongly acid to extremely acid throughout. The hazard of erosion is moderate to very severe.

Most areas of these soils have little plant cover. A few areas are used for building sites.

The wide range in properties of these soils and in degree of reclamation makes onsite investigation necessary to determine the suitability of the unit for any use.

This unit is not assigned to a capability subclass or woodland ordination group.

Ur—Urban land. This map unit consists of areas where more than 90 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Most units comprise parking lots, shopping centers, or industrial areas. The areas range from about 4 to 100 acres or more and are nearly level to moderately steep.

Included with this unit in mapping are areas that have been excavated or filled but that do not have an impervious surface. Onsite investigation is needed to determine the suitability of these areas for any use.

This unit is not assigned to a capability subclass or woodland ordination group.

WhB—Wharton silt loam, 3 to 8 percent slopes. This soil is gently sloping, deep, and moderately well drained. It is on uplands. Slopes generally are smooth, slightly concave or convex, and 100 to 300 feet long. The areas of this soil are oval, oblong, or irregular in shape and range from about 2 to 40 acres.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is light yellowish brown silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper 13 inches of the subsoil is yellowish brown silt loam. The lower 29 inches is mottled, yellowish brown and brown silty clay loam. The substratum is dark grayish brown shaly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Cavode, Gilpin, Rayne, and Ernest soils. Also included are a few areas with stones on the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Wharton soil is slow or moderately slow in the subsoil and substratum. Available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is moderate.

Most areas of this soil are in woodland, are cultivated, or are in permanent hay. Some areas are used for pasture, housing, or industrial sites.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, cover crops, and using mostly hay in the crop rotation will help to reduce runoff and control erosion. Subsurface drains are needed in some areas that contain wet spots. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on the larger areas.

The seasonal high water table and the permeability limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 2o.

WhC—Wharton silt loam, 8 to 15 percent slopes. This soil is sloping, deep, and moderately well drained. It is on uplands. Slopes generally are smooth, slightly concave or convex, and 100 to 300 feet long. The areas of this soil are irregular in shape or long and narrow and range from about 4 to 40 acres.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is light yellowish brown silt loam about 6 inches thick. The

subsoil is about 42 inches thick. The upper 13 inches of the subsoil is yellowish brown silt loam. The lower 29 inches is mottled, yellowish brown and brown silty clay loam. The substratum is dark grayish brown shaly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Cavode, Gilpin, Rayne, and Ernest soils. Also included are a few areas with stones on the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Wharton soil is slow or moderately slow in the subsoil and substratum. Available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is severe.

Most areas of this soil are in woodland, are cultivated, or are in permanent hay. Some areas are used for pasture or are in native vegetation.

This soil is suited to cultivated crops. Contour stripcropping, conservation tillage, grassed waterways, cover crops, and using mostly hay in the crop rotation will help to reduce runoff and control erosion. Subsurface drains are needed in some areas that contain wet spots. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Machine planting is practical on the larger areas.

The seasonal high water table and the permeability limit this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IIe; woodland ordination 2o.

WhD—Wharton silt loam, 15 to 25 percent slopes. This soil is moderately steep, deep, and moderately well drained. It is on uplands. Slopes generally are smooth, slightly concave or convex, and 100 to 300 feet long. The areas of this soil are irregular in shape or long and narrow and are about 4 to 40 acres.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is light yellowish brown silt loam about 6 inches thick. The subsoil is about 42 inches thick. The upper 13 inches of the subsoil is yellowish brown silt loam. The lower 29 inches is mottled, yellowish brown and brown silty clay loam. The substratum is dark grayish brown shaly silty clay loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Cavode, Gilpin, Rayne, and Ernest soils. Also included are a few areas with stones on the surface. Inclusions make up about 25 percent of this unit.

The permeability of this Wharton soil is slow or moderately slow in the subsoil and substratum. Available water capacity is high. Runoff is medium. Reaction in unlimed areas is very strongly acid or strongly acid. A seasonal high water table is at a depth of 18 to 36 inches. The hazard of erosion is very severe.

Most areas of this soil are in woodland. Some areas are used for pasture or are in native vegetation.

This soil is suited to some cultivated crops, but slope and the erosion hazard are limitations. Contour stripcropping, conservation tillage, grassed waterways, cover crops, and using mostly hay in the crop rotation will help to reduce runoff and control erosion. Subsurface drains are needed in some areas that contain wet spots. Using cover crops and grasses and legumes in the cropping system and using crop residue help to maintain the organic matter content and tilth of the soil.

This soil is suited to pasture. The prevention of overgrazing is the main pasture management concern. The main pasture management practices are rotational grazing, using proper stocking rates, and applying nutrients.

This soil is suited to trees, and potential productivity is high. Slope limits the use of equipment. Constructing roads on the contour helps to control erosion during timber harvesting.

The seasonal high water table, slope, and the permeability are the main limitations of this soil for nonfarm use, especially for onsite waste disposal.

Capability subclass IVe; woodland ordination 2r.

Prime Farmland

Prime farmland is one of several kinds of important farmlands defined by the U. S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The supply of high quality farmland is limited, and the U. S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, must encourage and facilitate the use of our Nation's prime farmland with wisdom and foresight.

Prime farmland, as defined by the U. S. Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and water supply needed to economically produce a sustained high yield of crops when it is treated and managed using acceptable farming methods. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland may now be in crops, pasture, woodland, or other land but not in urban and built-up land or water areas. It must be used for producing food or fiber or be available for these uses.

Prime farmland usually has an adequate and dependable supply of water from precipitation or irrigation. It also has favorable temperature and growing season and acceptable levels of acidity or alkalinity. It has few or no stones or rock outcrops and is permeable to water and air. Prime farmland is not excessively erodible or saturated with water for long periods and is not flooded during the growing season. The slope range is mainly from 0 to 8 percent. For more detailed information on the criteria for prime farmland, consult the local staff of the Soil Conservation Service.

About 127,000 acres, or 17 percent of Clearfield County, meets the soil requirements for prime farmland. The areas are throughout the county but are mainly in associations 1, 2, and 4 of the general soil map. Most of this prime farmland is in woodland.

A recent trend in land use in some parts of the county has been toward the loss of some prime farmlands to surface mining and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and difficult to cultivate and usually are less productive.

Soil map units that make up prime farmland in Clearfield County are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps in the back of this publication. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units."

Use and Management of the Soils

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

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

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

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

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

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

Crops and Pasture

John C. Spitzer, conservation agronomist, Soil Conservation Service, assisted with this section.

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

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

The 1975 Conservation Needs Inventory lists about 43,000 acres of crops and pasture in Clearfield County. Of that total, 11,000 acres was used for permanent pasture. The 1980 Pennsylvania Crop and Livestock Annual Summary lists 6,800 acres of corn, 3,500 acres of small grain, 18,800 acres of alfalfa and other hay, and the rest in other cropland and pasture. Wheat, oats, and barley are the common close-growing crops.

Erosion is the major soil management concern on most of the cropland and pasture in Clearfield County. Loss of topsoil by erosion causes reduced production, especially on soils that are moderately deep to bedrock, soils with a firm layer, and soils with low available water capacity. For example, Dekalb and Berks soils are moderately deep and have low available water capacity; Ernest, Cookport, and Brinkerton soils have a firm layer. Erosion also results in sedimentation of streams and reservoirs, causing reduced water quality for all uses.

Preparing a good seedbed and tilling are difficult on many sloping, channery soils, such as Hazleton and Clymer soils, because some of the original surface soil has been eroded away, leaving many rock fragments on the surface. Rayne, Allegheny, and Clymer soils are among the most productive in the county but are highly susceptible to erosion. On these and other soils, conservation practices help to reduce the hazard of erosion and increase production.

Conservation and erosion-control practices protect the soils, reduce surface-water runoff and sedimentation, and increase infiltration. A conservation cropping system maintains a plant cover on the soils. On pasture and hayland, deferred grazing and rotational grazing and the use of grasses and legumes help to reduce erosion and improve tilth. Contour farming, terraces, conservation tillage, cover crops, and the use of crop residue help to increase infiltration and reduce erosion. Those practices are suitable for most soils except those with steep and irregular slopes, which are not suited to terraces.

Terraces and diversions, which reduce the length of slopes and result in reducing surface-water runoff and erosion, are practical on deep, well drained soils with moderate, uniform slopes.

Contour farming and stripcropping are common erosion-control practices in the survey area and are best suited to soils with uniform slopes, such as Clymer, Gilpin, and Wharton soils.

Drainage is a major management concern on some of the soils in Clearfield County. Poorly drained Armagh, Brinkerton, and Atkins soils, for example, are so wet that crop production is not practical without artificial drainage.

The somewhat poorly drained soils are so wet that crop damage results in most years unless artificial drainage is used. In this category are Cavode and Tyler soils.

Small, wet areas are in some drainageways and swales in areas of moderately well drained and well drained soils. Artificial drainage can improve the management and productivity of some of those areas.

The design of surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and tile drainage usually is needed for poorly drained soils that are intensively cropped. Drains generally need closer spacing in soils with slow permeability than in soils that are more permeable. In addition, finding adequate outlets for tile drainage systems is often difficult in Atkins, Purdy, and Brinkerton soils.

Fertility is naturally low in many soils in the survey area, and available phosphorus and magnesium levels commonly are naturally low. Many upland soils have naturally strong acidity. They require applications of ground limestone to supply calcium and to raise the pH sufficiently for good growth of alfalfa and other crops.

Tilth is an important factor in seed germination, plant growth, and infiltration of water. Soils with good tilth are granular and porous. Allegheny and Rayne are examples of soils with good tilth. Many soils used for crops in the survey area have a low content of organic matter in the surface layer. Generally, the structure of such soils is weak, and intensive rainfall usually results in crusting of the surface. The crust usually is hard and nearly impervious to water when the soil is dry and usually reduces infiltration and increases runoff. Regular additions of crop residue, manure, and other organic material help to improve soil structure and reduce crust formation.

Generally, fall plowing is not considered to be a good practice on light-colored soils with a surface layer of silt loam. Fall plowing on such soils commonly results in the formation of a crust during the winter and spring, and in many instances the soils are nearly as dense and hard at planting time after fall plowing as they were before they were plowed. In addition, sloping soils are subject to accelerated erosion if they are plowed in the fall.

Surface-mining in Clearfield County disrupts sites to the extent that the original plant community is poorly suited to the new conditions. Much of the refuse from such mining contains no organic matter or micro-organisms. The surface layer of graded refuse consists of rock fragments and soil particles of silt, sand, and clay. The spoil commonly contains levels of iron, aluminum, copper, and manganese that are toxic to plants. Long, steep slopes of the refuse erode rapidly, and compaction of the material restricts root development. The characteristics of the mine refuse are highly variable over short distances, and thus onsite investigation is needed to determine the potential of the area for any use.

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

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

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops (*12*). Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops,

and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

Paxton G. Wolfe, woodland conservationist, Soil Conservation Service, assisted in preparing this section.

Clearfield County has about 578,900 acres of woodland, 98 percent of which is classified as commercial (*10*). Pennsylvania owns about 19 percent of the woodland, but most of the rest is privately owned. In general, the soils in the county are capable of supporting good stands of red oak, sugar maple, yellow-poplar, and eastern white pine.

Stands of second- and third-growth trees make up the woodland. The principal forest cover types in the county and the extent of each, as given by the U.S. Forest Service, are as follows:

Oak-hickory makes up 60 percent of the total woodland in the county. This cover type mainly consists of white oak, red oak, and hickories, although black oak and chestnut oak are dominant in some areas. The principal associates are yellow-poplar, shagbark hickory, white ash, red maple, and beech.

The maple-beech-birch cover type is 12 percent of the woodland in the county. Sugar maple, beech, and yellow birch are the component species in this cover type. The associated species are varying admixtures of basswood, red maple, hemlock, red oak, white ash, eastern white pine, black birch, black cherry, yellow-poplar, and cucumbertree.

Elm-ash-red maple makes up 9 percent of the woodland. The dominant species in this cover type are white ash, American elm, and red maple. The associates are slippery elm, yellow birch, sycamore, and hemlock.

Aspen-birch makes up 9 percent of the woodland. Quaking aspen, bigtooth aspen, and gray birch dominate the mixture. The principal associates are pin cherry, red maple, yellow birch, eastern white pine, ash, and sugar maple.

The white pine cover type makes up 7 percent of the woodland in the county. Eastern white pine is pure or predominant. The principal associates are Virginia and pitch pine; ash; sugar and red maple; hemlock; red and white oak; quaking and bigtooth aspen; and gray, yellow, and black birch.

The Virginia pine-pitch pine cover type is 2 percent of the total woodland in Clearfield County. Virginia pine and pitch pine are dominant. The principal associates are red oak, black oak, scarlet oak, chestnut oak, and hickories.

Chestnut oak completes the primary forest cover types with 1 percent. Chestnut oak grows in pure stands or is predominant. The common associates are red oak, white oak, black oak, scarlet oak, pitch pine, and red maple.

Sawtimber makes up about 36 percent of the commercial woodland in the county, poletimber 31 percent, and seedlings and saplings 31 percent. The

remaining 2 percent is classified as less than 10 percent stocked with commercial growing-stock trees.

A woodland owner can encourage the growth of desirable trees by using woodland management practices on the soils for which potential productivity is rated very high, high, or moderately high in the section "Detailed Soil Map Units." Those soils rated low for potential productivity generally will not economically justify management to increase yields of wood products. Soils that are rated moderate are the most difficult to appraise for management of wood products. An onsite inventory of the quality and quantity of the growing stock is needed. The market potential for the species and whether or not the soils with moderate potential productivity are mixed with larger areas of more productive soils must be determined.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

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

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

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in 50 years. The site index applies to fully stocked, even-aged, unmanaged stands. Some of the commonly grown trees are those that woodland managers generally favor for wood crop production and that are the most important tree species in regard to growth rate, quality, value, and marketability. Other tree species that are common on the soil are also listed, regardless of potential value or growth.

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

Recreation

The undeveloped areas of woodland, adjoining farmland, streams, and the West Branch of the Susquehanna River provide the major source of recreational activities in the county. The common types of recreational activities in these areas are hunting, fishing, camping, hiking, boating, and nature study.

The county contains approximately 110,000 acres of State Forest and State Game Lands and many fishing streams. Within the county are Parker Dam and S. B. Elliott State Parks and a 720-acre recreation lake at Curwensville Dam.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also

important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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

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

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

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

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

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

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

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

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

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

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

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas.

Engineering

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

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

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

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

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

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

performance of existing similar structures on the same or similar soils.

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

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

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

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

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

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

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

Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

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

effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

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

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

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

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

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

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of

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

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

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

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

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

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

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

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

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

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

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

Water Management

Table 14 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 ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a

depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

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

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

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

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

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

Soil Properties

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

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

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

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

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

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

Texture is given in the standard terms used by the U.S. Department of Agriculture (*9*). These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

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

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The

estimates are based on test data from the survey area or from nearby areas and on field examination.

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

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

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

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

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

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt are not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

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

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

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

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of

segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

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

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

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

Laboratory Characterization for Selected Soils

This section was prepared by R. L. Cunningham, G. W. Petersen, E. J. Ciolkosz, R. P. Matelski, R. Pennock, Jr., and R. C. Cronce, Department of Agronomy, Soil Characterization Laboratory, Pennsylvania State University.

Laboratory soil characterization identifies properties useful in studying soil formation processes, in interpreting limitations for land use, in classifying soils, and in understanding genetic concepts of soils. The factors that influence soil formation may vary; consequently, some soils may be different from one another even though their apparent environment is similar. Detailed field and laboratory studies are used to investigate these relationships. Such studies in Clearfield County add to the information previously collected, particularly in central Pennsylvania.

The sampling for this study was done at 12 sites representing a total of five soils, Ernest, Nolo, Hazleton, and Wharton soils and Udorthents. Some of the soils were derived from sandstone and shale colluvium, some from shale bedrock, and some from mine spoil. The descriptions of the soils in the section "Soil Series and Their Morphology" show the properties of the soils.

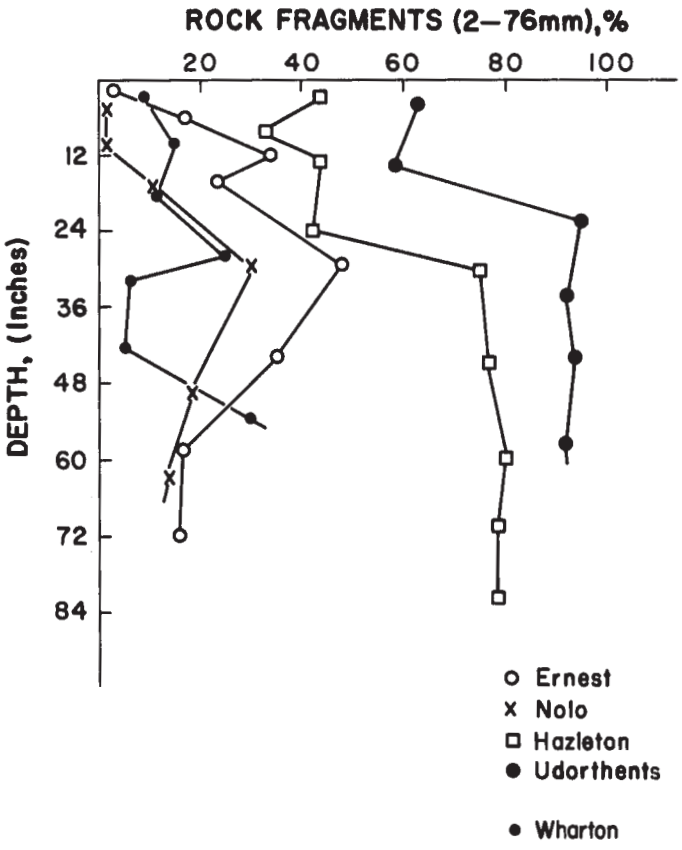


Figure 11.

The detailed laboratory data for all sites sampled have been published and are available from the Agronomy Department of Pennsylvania State University. The analytical methods used are outlined in the Soil Survey Investigations Report (*6*) and the Characterization, Interpretations, and Uses of Pennsylvania Soils (*5*).

Rock Fragments

Particles that are at least 2 millimeters in diameter are called rock fragments, and in this study their size does not exceed 76 millimeters. The percentage of such fragments and their depth are shown in figure 11.

Udorthents formed in the refuse of surface-mining activities, and figure 11 shows that rock fragments are the dominant characteristic of those soils. The low content of fine-earth material implies very low water-holding capacity and very low nutrient-holding capacity. The Hazleton soils, for example, are nearly 80 percent

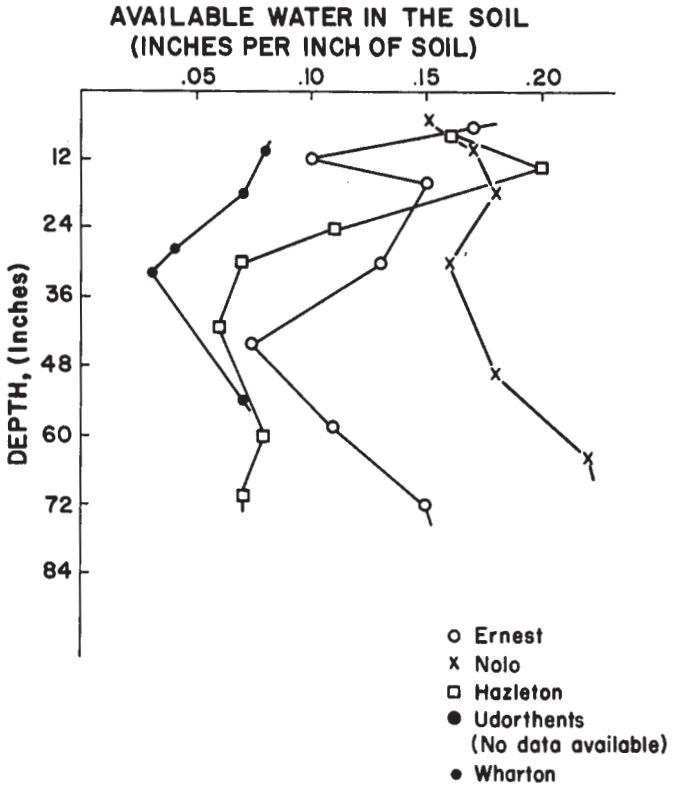


Figure 12.

rock fragments at a depth of 28 inches and thus are droughty for deep-rooted plants. The increase in rock fragments in the lower part of the Wharton soils shows the influence of shale bedrock.

Available Water

The total water available to plant roots is partly dependent on soil depth. Figure 12 presents the available water at different depths for four of the five pedons sampled. The available water for Udorthents is not shown because samples for moisture retention could not be collected in the field. The Nolo soils have a high silt content and a correspondingly high available water capacity, but because those soils are saturated during most of the year, root growth is limited by an oxygen deficiency.

The fine-earth material (less than 2 millimeters in diameter) of the Hazleton soil holds considerable available water, but the total water available in the soils is lessened by the rock fragments. If sampled, Udorthents would show the same relationship between rock fragments and low total available water. Droughts are not frequent in Clearfield County, and most soils, except those with low amounts of fine earth, will store adequate moisture for plant growth.

Clay Content

Figure 13 illustrates the clay content at different depths for one pedon of each of the five soils sampled. The amount of clay in a soil is an indicator of the soil's physical and chemical reactive properties. The more clay the soil contains, the more plastic it is and the higher the shrink-swell potential and cation-exchange capacity. The amount of water that the soil will hold increases as the clay content increases; however, the water available to plants does not necessarily increase.

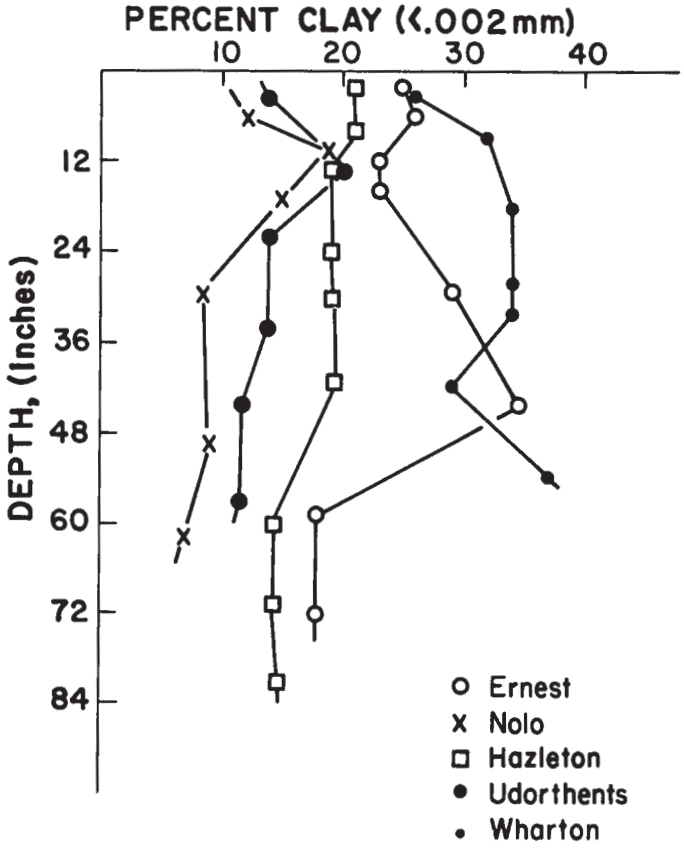


Figure 13.

Clay is a mobile component of soils, so the clay distribution often reveals the state or degree of soil development. The clay content in some soils is greatest between depths of 10 and 30 inches. This clay-enriched zone is called an argillic horizon and is a key feature in the studies of soil information. The sharp increase at a depth of 20 inches in the Wharton soils, for instance, is

an illustration of an argillic horizon formed through leaching processes that moved clay from the A horizon to the B horizon. The argillic horizon of the Ernest soils, and the increase in clay on figure 13, is at a depth of about 40 inches.

The clay content in the fine-earth material of Udorthents is about 15 percent at a depth of 24 inches and more; however, the soil at those depths also is nearly 100 percent rock fragments. Thus, the clay percentage of the total soil is very low because of the rock fragments. Conversely, the Nolo soils have a lower clay content than the Udorthents, according to figure 13, but the Nolo soils are less than 25 percent rock fragments.

Extractable Calcium

Figure 14 shows the amount of extractable calcium in the five soils at different depths, expressed in milliequivalents per 100 grams (me/100g) of material less than 2 millimeters in diameter.

All of the five soils tested are acid, and the amount of extractable calcium generally is low in an acid soil. However, as shown in figure 14, the amount of extractable calcium is high in the surface layer of the Ernest, Hazleton, and Wharton soils and then is lower in the subsoil. The amount of extractable calcium in the Udorthents and Nolo soils is consistently low. Apparently, the amount of extractable calcium in the Ernest, Hazleton, and Wharton soils shows the effects of liming, and the lower amount in the subsoil of those three soils indicates the zone from which plant roots are likely to extract calcium. It also is apparent that the Udorthents and Nolo soils have not been limed.

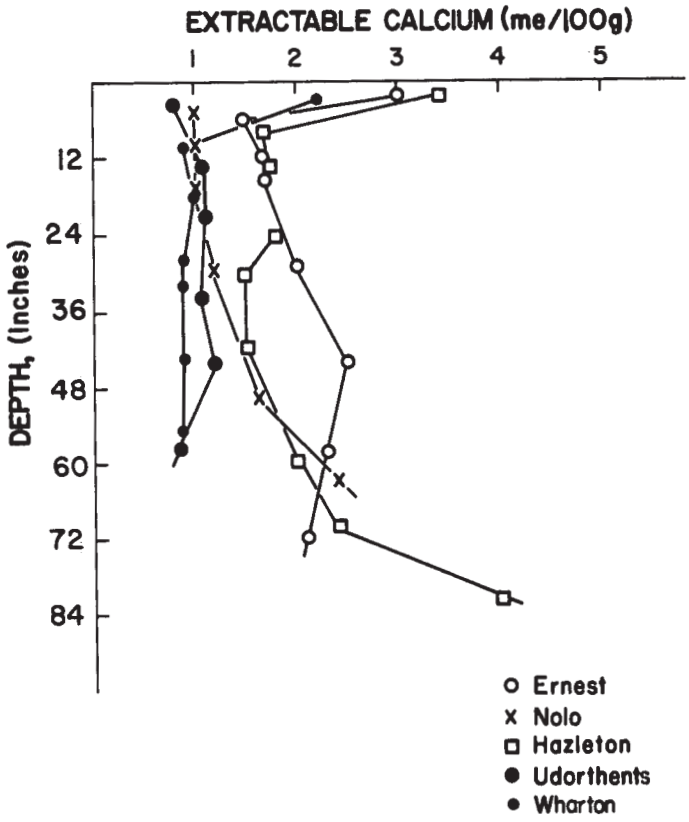


Figure 14.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*11*). 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 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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 Udult (*Ud*, meaning humid, plus *ult*, from Ultisol).

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

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

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

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

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*9*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*11*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Allegheny Series

The soils of the Allegheny series are fine-loamy, mixed, mesic Typic Hapludults. They are deep and well drained and are on stream terraces. These soils formed in loamy, water-worked sediments from mixed brown and gray shale and sandstone. Allegheny soils are along the upper reaches of the West Branch of the Susquehanna River and its larger tributaries. Slopes range from 3 to 8 percent.

Allegheny soils are on the landscape with moderately well drained Monongahela soils, somewhat poorly

drained Tyler soils, and poorly drained and very poorly drained Purdy soils.

Typical pedon of Allegheny silt loam, 3 to 8 percent slopes, in Lawrence Township, 0.75 mile southeast of Clearfield Borough on U.S. Route 322, 0.2 mile northeast of U.S. Route 322, on road to sewage treatment plant, 100 yards north of road, in a field:

Ap—0 to 11 inches, dark grayish brown (10YR 4/2) silt loam; weak very fine granular structure; friable; neutral; abrupt smooth boundary.

B1—11 to 17 inches, yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; medium acid; gradual wavy boundary.

B21t—17 to 27 inches, yellowish brown (10YR 5/6) silt loam; weak fine angular and subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films on ped faces; medium acid; clear wavy boundary.

B22t—27 to 34 inches, yellowish brown (10YR 5/6) silty clay loam; moderate medium and coarse angular blocky structure; friable, slightly sticky, plastic; common thin clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—34 to 47 inches, brown (10YR 5/3) silty clay loam; moderate medium and coarse angular blocky structure; firm, slightly sticky, plastic; many thick clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

C—47 to 66 inches, yellowish brown (10YR 5/4) clay loam; few medium faint pale brown (10YR 6/3) mottles; massive; firm, slightly sticky, plastic; 5 percent coarse fragments; strongly acid.

The thickness of solum ranges from 30 to 60 inches. The depth to bedrock is more than 60 inches. The content of coarse fragments ranges from 0 to 15 percent in the A and B2 horizons and from 0 to 30 percent in the B3 and C horizons. Reaction is strongly acid to very strongly acid throughout.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4. Some pedons have an A1 horizon that has hue of 10YR or 7.5YR, value of 3 through 5, and chroma of 1 through 4. That A1 horizon is less than 5 inches thick.

The B1 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 through 8. The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 through 8. The fine-earth texture of the B horizon is clay loam, loam, silt loam, sandy clay loam, or silty clay loam.

The C horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 4 through 7, and it is mottled. The fine-earth texture ranges from sandy loam to clay loam.

Armagh Series

The soils of the Armagh series are clayey, mixed, mesic Typic Ochraquults. They are deep and poorly drained and are on uplands. The soils formed in clayey residual material weathered from gray and brown clay shales and some interbedded siltstone and thin-bedded sandstone. Slopes range from 0 to 3 percent.

Armagh soils are on the landscape with moderately well drained Wharton soils, somewhat poorly drained Cavode soils, and poorly drained Brinkerton soils that have a fragipan.

Typical pedon of Armagh silt loam, in Union Township, 1/2 mile north of Home Camp, 300 yards east of the intersection of Township Route 408 and road to State Game Lands No. 93, 30 feet north of the road, in a wooded area:

O2—1 inch to 0, decomposed organic matter.

A1—0 to 2 inches, black (10YR 2/1) silt loam; weak very fine granular structure; friable; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

A2g—2 to 4 inches, dark gray (10YR 4/1) silt loam; common fine distinct gray (N 6/0) mottles and few fine faint yellow (10YR 7/8) mottles; weak very fine and fine granular structure; friable, slightly sticky; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B21tg—4 to 10 inches, light gray (10YR 6/1) silty clay loam; common medium distinct strong brown (7.5YR 5/8) and gray (N 6/0) mottles; weak fine subangular blocky structure; friable, sticky, plastic; thin discontinuous clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B22tg—10 to 19 inches, light gray (10YR 7/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable, sticky, plastic; thin discontinuous light gray (10YR 7/2) clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B23tg—19 to 30 inches, light gray (10YR 7/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, plastic; thin discontinuous light gray (10YR 7/2) clay films on ped faces; black (N 2/0) concretions; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B24tg—30 to 42 inches, light gray (10YR 7/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; very coarse prismatic structure parting to moderate medium subangular blocky; firm, sticky, plastic; thin discontinuous light gray (10YR 7/2) clay films on ped faces; black (N 2/0) concretions; 10

percent coarse fragments; strongly acid; clear wavy boundary.
Cg—42 to 60 inches, light gray (10YR 7/1) shaly silty clay loam; many medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; thin discontinuous light gray (10YR 7/2) clay films on ped faces; black (N 2/0) concretions; 34 percent coarse fragments; strongly acid.

The thickness of solum ranges from 30 to 50 inches. The depth to bedrock is 40 to 60 inches. The content of coarse fragments ranges from 0 to 10 percent in the upper part of the solum, from 5 to 20 percent in the lower part of the solum, and from 10 to 70 percent in the C horizon. Reaction in unlimed areas is strongly acid to very strongly acid throughout.

The A horizon is neutral or has hue of 7.5YR through 2.5Y, value of 2 through 7, and chroma of 0 through 2.

The B horizon is neutral or has hue of 10YR or 5Y, value of 4 through 7, and chroma of 0 through 2 and is mottled. The fine-earth texture is silty clay loam, silty clay, or clay.

The C horizon is neutral or has hue of 10YR, 7.5Y, or 2.5Y; value of 5 through 7; and chroma of 0 through 8 and is mottled. The fine-earth texture mainly is silty clay, clay loam, or silty clay loam but ranges to loam.

Atkins Series

The soils of the Atkins series are fine-loamy, mixed, acid, mesic Typic Fluvaquents. They are deep and poorly drained and are on flood plains. The soils formed in loamy alluvial sediments weathered from interbedded gray and brown shale and sandstone. Slopes range from 0 to 3 percent.

Atkins soils are on the landscape with well drained Pope soils and moderately well drained Philo soils.

Typical pedon of Atkins silt loam, in Lawrence Township, 0.75 mile south of Clearfield Borough, 500 feet northeast of the junction of Spruce Street and PA Route 897:

Ap—0 to 8 inches, dark gray (10YR 4/1) silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; very strongly acid; clear smooth boundary.
B21g—8 to 15 inches, gray (10YR 5/1) silt loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; very strongly acid; clear wavy boundary.
B22g—15 to 30 inches, gray (5Y 5/1) silt loam; many medium distinct yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; very few thin clay films in old root channels; very strongly acid; clear wavy boundary.
B23g—30 to 50 inches, light gray (5Y 6/1) silt loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; very few thin clay films in old root channels; very strongly acid; clear wavy boundary.
Cg—50 to 60 inches, olive gray (5Y 5/2) loam; streaks of yellowish red (5YR 5/8); massive; friable, slightly sticky, slightly plastic; very strongly acid.

The thickness of solum ranges from 30 to 50 inches. The depth to bedrock is 60 inches or more. The content of coarse fragments ranges from 0 to 20 percent in the solum and from 0 to 40 percent in the C horizon. Reaction in unlimed areas is strongly acid or very strongly acid.

The A horizon has hue of 10YR, value of 4 through 6, and chroma of 1 or 2.

The B horizon is neutral or has hue of 10YR through 5Y, value of 4 through 6, and chroma of 0 through 2 and is mottled. It dominantly is silt loam but in some areas is silty clay loam, loam, or clay loam.

The C horizon is neutral or has hue of 10YR through 5Y, value of 5 or 6, and chroma of 0 through 6. It is weakly stratified and ranges mainly from sandy loam to silty clay loam. A IIC horizon of stratified sand and gravel is below a depth of 40 inches in some pedons.

Berks Series

The soils of the Berks series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are moderately deep and well drained and are on hilltops and sides of ridges. The soils formed in residual material weathered from gray and brown shale, siltstone, and fine-grained sandstone. Slopes range from 3 to 25 percent.

Berks soils are on the landscape with moderately deep Gilpin soils and deep Rayne soils, both of which have an argillic horizon, and moderately well drained Wharton soils. Berks soils have more coarse fragments than any of those soils.

Typical pedon of Berks shaly silt loam, 3 to 8 percent slopes, in Brady Township, 1.75 miles southwest of Troutville Borough, 1,600 feet northeast of the junction of Township Routes 340 and 349, along the Consolidated Gas Supply Corporation pipeline, in a field:

Ap—0 to 9 inches, dark brown (10YR 3/3) shaly silt loam; weak fine and medium granular structure; very friable; 30 percent coarse fragments; neutral; abrupt smooth boundary.
B2—9 to 18 inches, yellowish brown (10YR 5/6) shaly loam; weak very fine and fine subangular blocky structure; friable; 40 percent coarse fragments; strongly acid; clear wavy boundary.
B3—18 to 23 inches, yellowish brown (10YR 5/6) very shaly loam; weak very fine and fine subangular

blocky structure; very friable; 70 percent coarse fragments; very strongly acid; clear wavy boundary.
C—23 to 30 inches, yellowish brown (10YR 5/6) very shaly loam; massive; friable; 80 percent coarse fragments; very strongly acid; clear wavy boundary.
R—30 inches, light olive brown (2.5Y 5/4) fractured interbedded shale and fine-grained sandstone.

The thickness of solum ranges from 18 to 36 inches. The depth to bedrock is 20 to 40 inches. The content of coarse fragments ranges from 10 to 50 percent in the A horizon, from 15 to 75 percent in the B horizon, and from 40 to 85 percent in the C horizon. Reaction in unlimed areas is very strongly acid or strongly acid in the solum and ranges from very strongly acid to medium acid in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 through 4. Some pedons have an A1 horizon with hue of 10YR, value of 2 through 4, and chroma of 1 through 4.

The B horizon has hue of 7.5YR through 2.5Y, value of 4 through 6, and chroma of 3 through 8. It is silt loam or loam in the fine-earth fraction.

The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 8, and chroma of 2 through 6. It is loam or silt loam in the fine-earth fraction.

Brinkerton Series

The soils of the Brinkerton series are fine-silty, mixed, mesic Typic Fragiaqualfs. They are deep and poorly drained. The soils formed in silty colluvium from upland areas of gray and brown shale, siltstone, and sandstone. Slopes range from 0 to 8 percent.

Brinkerton soils are on the landscape with moderately well drained Ernest soils, somewhat poorly drained Cavode soils, and poorly drained Armagh soils. The Armagh and Cavode soils do not have a fragipan.

Typical pedon of Brinkerton silt loam, 0 to 3 percent slopes, in Brady Township, 1.25 miles north of Luthersburg on Township Route 364, 800 feet west on Township Route 370 to Consolidated Gas Supply Corporation pipeline, 1,200 feet southwest along the pipeline, in a trench:

O1—2 inches to 1 inch, undecomposed hardwood leaf litter.
O2—1 inch to 0, black (10YR 2/2) partially decomposed organic matter.
A1—0 to 2 inches, black (10YR 2/1) silt loam; weak fine and medium granular structure; very friable, slightly sticky, slightly plastic; very strongly acid; abrupt smooth boundary.
A2—2 to 7 inches, light brownish gray (2.5Y 5/2) silt loam; common fine faint gray (2.5Y 6/0) mottles and many fine prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, plastic; very strongly acid; 5 percent coarse fragments; clear wavy boundary.
B21t—7 to 15 inches, grayish brown (10YR 5/2) silt loam; common fine faint gray (N 6/0) mottles and many fine prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable, sticky, plastic; moderately thick continuous clay films on peds; very strongly acid; 5 percent coarse fragments; clear wavy boundary.
B22t—15 to 28 inches, grayish brown (2.5Y 5/2) silty clay loam; many fine and medium faint gray (N 6/0) mottles and common fine prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular and angular blocky structure; friable, sticky, plastic; very strongly acid; common thick clay films on peds; common black (10YR 2/1) concretions on prism faces; 10 percent coarse fragments; gradual wavy boundary.
Bx1t—28 to 42 inches, grayish brown (2.5Y 5/2) silt loam; few fine faint gray (N 6/0) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to weak coarse and very coarse platy; firm, brittle, slightly sticky, plastic; gray (N 5/0) prism faces; common thin clay films in pores and on ped faces; many fine and medium black (10YR 2/1) concretions and ped exteriors; 10 percent coarse fragments; strongly acid; gradual wavy boundary.
Bx2t—42 to 47 inches, grayish brown (10YR 5/2) silt loam; many fine faint gray (N 5/0) mottles and few fine prominent strong brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to weak coarse and very coarse platy; firm, brittle, slightly sticky, plastic; gray (N 5/0) prism faces; common thin clay films in pores and on ped faces; 10 percent coarse fragments; medium acid; clear wavy boundary.
C—47 to 62 inches, dark yellowish brown (10YR 4/4) loam; few fine faint light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; grayish brown (2.5Y 5/2) prism faces; thin patchy clay films in pores; many medium and coarse black (10YR 2/1) concretions; 10 percent coarse fragments; medium acid.

The solum thickness ranges from 40 to 50 inches. The depth to bedrock is more than 60 inches. The depth to the fragipan ranges from 18 to 30 inches. The content of coarse fragments ranges from 0 to 10 percent above the fragipan, from 2 to 20 percent in the fragipan, and from 10 to 90 percent in the C horizon. Reaction in unlimed areas is medium acid to very strongly acid.

Undisturbed pedons have a thin, dark A1 horizon underlain by a gray to light grayish brown A2 horizon 2 to 5 inches thick. Some pedons have an Ap horizon with

hue of 10YR through 2.5Y, value of 2 or 3, and chroma of 1 through 3.

The B horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 1 or 2 and is mottled. The fine-earth texture of the B horizon generally is silty clay loam or silt loam. The Bx horizon is neutral or has hue of 10YR through 2.5Y, value of 5 or 6, and chroma of 1 or 2 and is mottled. The fine-earth texture of the Bx horizon is silt loam, loam, or silty clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 through 4 and has common to many mottles. The fine-earth texture is silt loam, silty clay loam, or loam.

Cavode Series

The soils of the Cavode series are clayey, mixed, mesic Aeric Ochraquults. They are deep and somewhat poorly drained and are on uplands. The soils formed in residuum weathered from shale, siltstone, and sandstone. Slopes range from 3 to 15 percent.

Cavode soils are on the landscape with moderately well drained Wharton and Ernest soils and poorly drained Armagh and Brinkerton soils.

Typical pedon of Cavode silt loam, 3 to 8 percent slopes, Bloom Township, 0.6 mile west of the junction of Township Routes 861 and 461, 2 miles northeast of Grampian Borough, in a wooded area 75 yards west of Bilger Rocks:

O1—2 inches to 1 inch, undecomposed leaf litter.
O2—1 inch to 0, decomposed leaf litter.
A1—0 to 2 inches, very dark grayish brown (10YR 3/2) silt loam; weak very fine granular structure; very friable; very strongly acid; clear smooth boundary.
A2—2 to 7 inches, yellowish brown (10YR 5/4) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak very fine and fine granular structure; friable; strongly acid; clear smooth boundary.
B1—7 to 10 inches, yellowish brown (10YR 5/6) silty clay loam; few fine faint grayish brown (10YR 5/2) and reddish yellow (7.5YR 6/8) mottles; weak very fine subangular blocky structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.
B21t—10 to 16 inches, yellowish brown (10YR 5/4) silty clay loam; few faint reddish yellow (7.5YR 6/8) and light gray (10YR 7/2) mottles; moderate fine subangular blocky structure; friable, slightly sticky, slightly plastic, common thin discontinuous clay films on ped faces; strongly acid; gradual wavy boundary.
B22tg—16 to 29 inches, gray (10YR 6/1) silty clay loam; common fine distinct strong brown (7.5YR 5/8) and light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; common thin and patchy clay films in pores and on ped faces; strongly acid; gradual wavy boundary.
B23tg—29 to 42 inches, gray (10YR 6/1) silty clay loam; common medium distinct strong brown (7.5YR 5/8) and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; common thin patchy clay films in pores and on ped faces; 5 percent coarse fragments; strongly acid; gradual wavy boundary.
C1g—42 to 53 inches, gray (10YR 6/1) shaly silty clay loam; few medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few thin and discontinuous clay films on ped faces; 20 percent coarse fragments; strongly acid; gradual wavy boundary.
C2g—53 to 63 inches, gray (10YR 6/1) very shaly silty clay loam; few medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm, sticky, plastic; few thin and discontinuous clay films on ped faces; 50 percent coarse fragments; strongly acid.

The solum thickness ranges from 30 to 60 inches. The depth to bedrock is 40 to 72 inches. The content of coarse fragments ranges from 0 to 15 percent in the upper part of the solum and from 10 to 70 percent in the lower part of the solum and in the C horizon. Reaction in unlimed areas is strongly acid or very strongly acid throughout.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5, and chroma of 2 through 6, and it is mottled.

The upper part of the B horizon has hue of 10YR through 2.5Y, value of 4 through 5, and chroma of 3 through 6, and it is mottled. The lower part of the B horizon has hue of 10YR through 5Y, value of 5 or 6, and chroma of 1 or 2, and it is mottled. The fine-earth texture is silty clay loam, silty clay, or clay.

The C horizon has hue of 10YR through 5Y, value of 4 through 6, and chroma of 1 through 4. The fine-earth texture ranges from silt loam to clay.

Clymer Series

The soils of the Clymer series are fine-loamy, mixed, mesic Typic Hapludults. They are deep and well drained and are on uplands. The soils formed in residual material weathered from sandstone. Slopes range from 0 to 15 percent.

Clymer soils are on the landscape with moderately deep Dekalb soils, deep Hazleton soils, moderately well drained Cookport soils, and poorly drained Nolo soils. The Clymer soils have fewer coarse fragments throughout than the Dekalb or Hazleton soils.

Typical pedon of Clymer channery loam, in an area of Clymer very stony loam, 8 to 15 percent slopes, in Lawrence Township, 5 miles southeast of Penfield, 0.6

mile northeast of the junction of Laurel Run Road and Laurel Ridge Road, 900 feet north, in a wooded area:

O1—2 inches to 1 inch, mixed hardwood leaf litter.
O2—1 inch to 0, decomposed organic matter.
A1—0 to 1 inch, very dark brown (10YR 2/2) channery loam; weak fine granular structure; very friable; 30 percent coarse fragments; extremely acid; abrupt smooth boundary.
A2—1 to 7 inches, grayish brown (10YR 5/2) channery loam; weak fine granular structure; very friable; 30 percent coarse fragments; extremely acid; abrupt wavy boundary.
B21t—7 to 19 inches, yellowish brown (10YR 5/6) channery loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films in pores and on ped faces; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.
B22t—19 to 38 inches, yellowish brown (10YR 5/4) channery loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; thin patchy clay films in pores and on ped faces; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—38 to 49 inches, yellowish brown (10YR 5/4) very channery loam; massive; very friable; 65 percent coarse fragments; very strongly acid; gradual wavy boundary.
R—49 inches, partly weathered grayish brown (10YR 5/2) sandstone bedrock.

The solum thickness ranges from 24 to 40 inches. The depth to bedrock is 40 to 70 inches. The content of coarse fragments ranges from 10 to 40 percent in the A and B horizons and from 20 to 85 percent in the C horizon. Reaction in unlimed areas is strongly acid to extremely acid throughout.

Some pedons have an Ap horizon that has hue of 10YR, value of 3 through 5, and chroma of 2 through 4. The A1 horizon has hue of 10YR, value of 2, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5, and chroma of 1 through 5. Some pedons do not have an A2 horizon.

The B horizon has hue of 10YR, 2.5YR, or 7.5YR; value of 4 through 6; and chroma of 4 through 8. The fine-earth texture is loam, sandy clay loam, clay loam, or sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 6.

Cookport Series

The soils of the Cookport series are fine-loamy, mixed, mesic Aquic Fragiudults. They are deep and moderately well drained and formed in materials weathered from sandstone and siltstone. Cookport soils are on broad ridgetops. Slopes range from 0 to 25 percent.

Cookport soils are on the landscape with well drained Clymer, Hazleton, and Dekalb soils and poorly drained Nolo soils.

Typical pedon of Cookport channery loam, 3 to 8 percent slopes, in Lawrence Township, 8 miles north of Clearfield Borough, 2,000 feet west on Tyler Road from the junction of McGeorge and Tyler Roads, 30 feet south in a wooded area:

O1—2 inches to 1 inch, leaf litter.
O2—1 inch to 0, decomposed organic matter.
A1—0 to 1 inch, dark brown (7.5YR 3/2) channery loam; weak very fine granular structure; friable; 15 percent coarse fragments; very strongly acid; abrupt wavy boundary.
A2—1 to 3 inches, brown (10YR 4/3) channery loam; weak very fine granular structure; friable; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
B1—3 to 9 inches, yellowish brown (10YR 5/4) clay loam; weak very fine subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B21t—9 to 18 inches, yellowish brown (10YR 5/6) loam, weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few thin discontinuous clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B22t—18 to 22 inches, yellowish brown (10YR 5/6) sandy loam; few fine distinct light gray (10YR 7/2) and reddish yellow (7.5YR 6/8) mottles; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin discontinuous clay films on ped faces; 10 percent coarse fragments; strongly acid; clear wavy boundary.
Bx1—22 to 30 inches, yellowish brown (10YR 5/6) channery sandy loam; few faint distinct reddish yellow (7.5YR 6/8) and yellowish red (5YR 5/8) mottles; weak very coarse prismatic structure parting to moderate medium angular blocky; firm, brittle; 15 percent coarse fragments; strongly acid; clear wavy boundary.
Bx2—30 to 40 inches, strong brown (7.5YR 5/6) channery sandy loam; few fine distinct light gray (10YR 7/2) and yellowish red (5YR 5/8) mottles; many fine black concretions; weak very coarse prismatic structure parting to moderate medium angular blocky; firm, brittle; 20 percent coarse fragments; strongly acid; clear wavy boundary.
C—40 to 49 inches, dark yellowish brown (10YR 4/4) very channery sandy loam; few fine black concretions; massive; firm; 55 percent coarse fragments; strongly acid; clear wavy boundary.
R—49 inches, light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) sandstone bedrock.

The solum thickness ranges from 28 to 40 inches. The depth to bedrock is 40 to 70 inches. The depth to the fragipan ranges from 16 to 27 inches. The content of coarse fragments ranges from 0 to 30 percent in the A and B horizons and from 0 to 60 percent in the C horizon. Reaction in unlimed areas is extremely acid to strongly acid throughout.

The A1 horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 2 or 3; and chroma of 2 or 3. Some pedons have an Ap horizon that has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 3 through 6. The A2 horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 3 or 4. Some pedons do not have an A2 horizon. The fine-earth texture of the A horizon is loam, silt loam, or sandy loam.

The B2 horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 4 through 8. The fine-earth texture is loam, sandy loam, sandy clay loam, or clay loam. The Bx horizon has hue of 10YR, 7.5YR, or 2.5Y; value of 4 or 5; and chroma of 3 through 8. The fine-earth texture is loam, sandy loam, or sandy clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 through 4. The fine-earth texture is loam, sandy loam, or fine sandy loam.

Dekalb Series

The soils of the Dekalb series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are moderately deep and well drained, and are on uplands. The soils formed in residuum weathered from sandstone and shale. Slopes range from 0 to 25 percent.

Dekalb soils are on the landscape with deep Clymer and Hazleton soils and deep, moderately well drained Cookport soils.

Typical pedon of Dekalb channery loam, 15 to 25 percent slopes, in Huston Township, 3/4 mile south of Tyler on Tyler Road to a gas well road, 1/2 mile east on the gas well road, 50 feet north, in a wooded area:

O1—3 to 2 inches, undecomposed leaf litter.
O2—2 inches to 0, decomposed leaf litter.
A1—0 to 1 inch, very dark brown (10YR 2/2) channery loam; weak very fine granular structure; very friable; 20 percent coarse fragments; very strongly acid; clear wavy boundary.
A2—1 to 3 inches, pale brown (10YR 6/3) channery loam; weak very fine granular structure; very friable; 35 percent coarse fragments; very strongly acid; clear wavy boundary.
B21—3 to 12 inches, yellowish brown (10YR 5/4) channery loam; weak very fine and fine subangular blocky structure; friable, slightly sticky, slightly plastic; 45 percent coarse fragments; strongly acid; clear wavy boundary.
B22—12 to 23 inches, yellowish brown (10YR 5/4) very channery loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 60 percent coarse fragments; strongly acid; gradual wavy boundary.
C—23 to 31 inches, yellowish brown (10YR 5/4) very channery sandy loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 90 percent coarse fragments; strongly acid; clear wavy boundary.
R—31 inches, dark gray (10YR 4/1) sandstone bedrock.

The solum thickness and depth to bedrock range from 20 to 40 inches. Coarse fragments make up 20 to 60 percent of the solum and 50 to 90 percent of the C horizon, and their content averages more than 35 percent in the control section. Reaction in unlimed areas is extremely acid to strongly acid throughout.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon that has hue of 10YR, value of 4, and chroma of 2 through 4. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 through 4. The fine-earth texture of the A horizon is loam or sandy loam.

The B horizon has hue of 7.5YR and 10YR, value of 5 through 7, and chroma of 4 through 8. The fine-earth texture is loam or sandy loam.

The C horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 through 6. The fine-earth texture is sandy loam or loamy sand.

Dystrochrepts

Dystrochrepts are deep, well drained and somewhat excessively drained soils formed in colluvium and residuum weathered from sandstone, siltstone, and shale. The soils are on mountainsides and hillsides on uplands. Slopes range from 3 to 75 percent.

Dystrochrepts are on the landscape with Rubble land; moderately deep, well drained Dekalb soils; deep, well drained Hazleton soils; deep, well drained to excessively drained Leetonia soils; and deep, moderately well drained Cookport soils. Dystrochrepts contain fewer stones and boulders than Rubble land, are deeper than Dekalb soils, are better drained than the Hazleton or Cookport soils, and do not contain a spodic horizon as do the Leetonia soils.

Because of the variability of Dystrochrepts, a typical pedon is not given. The solum thickness ranges from 30 to 60 inches. The depth to bedrock is more than 40 inches. Stones and boulders about 1 to 3 feet in diameter cover 0 to 50 percent of the surface and make up 10 to 70 percent of the volume of individual horizons. In unlimed areas reaction ranges from extremely acid to medium acid.

The A horizon has hue of 10YR to 2.5Y, value of 2 through 6, and chroma of 2 through 4. The fine-earth fraction ranges from silt loam to sandy loam.

The B horizon has hue of 10YR to 2.5Y, value of 3 through 6, and chroma of 3 through 8. The fine-earth fraction ranges from sandy clay loam to sandy loam.

The C horizon has hue of 5YR to 2.5Y, value of 3 through 6, and chroma of 2 through 6. The fine-earth fraction ranges from loam to loamy sand.

Ernest Series

The soils of the Ernest series are fine-loamy, mixed, mesic Aquic Fragiudults. They are deep and moderately well drained and formed in loamy colluvial material weathered from the residuum of gray and brown shale, siltstone, and sandstone. Ernest soils are in concave positions on foot slopes and colluvial fans. Slopes range from 0 to 25 percent.

Ernest soils are on the landscape with moderately deep, well drained Gilpin soils, moderately well drained Wharton soils, poorly drained Brinkerton soils, and somewhat poorly drained Cavode soils. All those soils but the Brinkerton soils do not have a fragipan.

Typical pedon of Ernest silt loam, 3 to 8 percent slopes, in Huston Township, 5 miles south of Penfield, 1/4 mile east of the junction of Gordon Road and PA Route 17092, 20 yards north, in a wooded area:

O1—2 inches to 1 inch, leaf litter.
O2—1 inch to 0, decomposed organic matter.
A1—0 to 3 inches, very dark gray (10YR 3/1) silt loam; weak fine granular structure; friable; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B1—3 to 12 inches, yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; 5 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—12 to 17 inches, yellowish brown (10YR 5/6) silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine clay films in pores and on ped faces; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
B22t—17 to 24 inches, yellowish brown (10YR 5/4) channery silt loam; common fine distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable, slightly sticky, slightly plastic; few fine clay films in pores and on ped faces; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
Bx1—24 to 35 inches, yellowish brown (10YR 5/4) silt loam; common fine distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; very coarse prismatic structure parting to very thick and thick platy; firm, brittle, slightly sticky, slightly plastic; few fine clay films in pores and on ped faces; 10 percent coarse fragments; few fine black concretions; strongly acid; clear wavy boundary.
Bx2—35 to 47 inches, dark brown (7.5YR 4/4) silt loam; many medium distinct yellowish brown (10YR 5/4), strong brown (7.5YR 5/8), and pinkish gray (5YR 7/2) mottles; very coarse prismatic structure parting to very thick platy; firm, brittle; 10 percent coarse fragments; many medium black concretions; strongly acid; clear wavy boundary.
C—47 to 60 inches, dark brown (7.5YR 4/4) channery silt loam; many medium faint yellowish brown (10YR 5/4) mottles; massive; friable; 20 percent coarse fragments; strongly acid.

The solum thickness ranges from 36 to 70 inches. The depth to bedrock is more than 60 inches. The depth to the fragipan ranges from 20 to 36 inches. The content of coarse fragments ranges from 0 to 25 percent in the A horizon and from 5 to 20 percent in the Bx and C horizons. Reaction in unlimed areas is strongly acid or very strongly acid throughout.

The A1 horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon that has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 through 4. Some pedons have an A2 horizon that has hue of 10YR, value of 4 or 5, and chroma of 2 through 4.

The B1 and B2t horizons have hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 3 through 8. The B22t horizon is mottled. The fine-earth texture is silt loam or silty clay loam.

The Bx horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 2 through 8. The fine-earth texture is silt loam, silty clay loam, or clay loam.

The C horizon has hue of 7.5YR through 2.5Y, value of 4 through 7, and chroma of 2 through 6. The fine-earth texture is loam, silt loam, clay loam, or silty clay loam.

Gilpin Series

The soils of the Gilpin series are fine-loamy, mixed, mesic Typic Hapludults. They are moderately deep and well drained and formed in residuum weathered from gray and brown shale, siltstone, and sandstone. Gilpin soils are on hilltops and sides of ridges. Slopes range from 2 to 25 percent.

Gilpin soils are on the landscape with well drained Rayne soils, moderately well drained Wharton soils, somewhat poorly drained Cavode soils, and poorly drained Armagh soils, all of which are deep.

Typical pedon of Gilpin channery silt loam, 8 to 15 percent slopes, in Bradford Township, 1.1 miles north of Needful on PA Route 970, 80 feet east of PA Route 970, in a field:

Ap—0 to 9 inches, dark grayish brown (10YR 4/2) channery silt loam; weak fine and medium granular structure; friable, slightly sticky, slightly plastic; 15

percent coarse fragments; slightly acid; abrupt smooth boundary.
B21t—9 to 19 inches, yellowish brown (10YR 5/4) channery silt loam; moderate medium and coarse subangular blocky structure; friable, sticky, slightly plastic; few thin clay films on ped faces; 15 percent coarse fragments; very strongly acid; clear smooth boundary.
B22t—19 to 26 inches, yellowish brown (10YR 5/4) very channery silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films on ped faces; 40 percent coarse fragments; extremely acid; gradual wavy boundary.
C—26 to 31 inches, yellowish brown (10YR 5/4) very channery loam; massive; friable; few thin clay films on coarse fragments; 90 percent coarse fragments; very strongly acid; gradual wavy boundary.
R—31 inches, very dark gray (10YR 3/1) shattered shale bedrock.

The solum thickness ranges from 18 to 36 inches. The depth to bedrock is 20 to 40 inches. Coarse fragments comprise 10 to 40 percent of individual horizons of the solum and 30 to 90 percent of the C horizon, and their content averages less than 35 percent in the control section. Reaction in unlimed areas ranges from strongly acid to extremely acid throughout.

The A horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 7.5YR through 2.5Y, value of 5, and chroma of 4 through 8. The fine-earth texture is silt loam, loam, or silty clay loam.

The C horizon has hue of 7.5YR through 2.5Y, value of 3 through 5, and chroma of 3 through 8. The fine-earth texture is silt loam or loam.

Hazleton Series

The soils of the Hazleton series are loamy-skeletal, mixed, mesic Typic Dystrochrepts. They are deep and well drained and are on uplands. The soils formed in residual material weathered from gray and brown sandstone. Hazleton soils are on ridgetops and hillsides. Slopes range from 0 to 80 percent.

Hazleton soils are on the landscape with moderately well drained Cookport soils and poorly drained Nolo soils and Clymer soils, which contain less sand than Hazleton soils. None of those soils is loamy-skeletal throughout.

Typical pedon of Hazleton channery loam, in an area of Hazleton-Clymer channery loams, 3 to 8 percent slopes, in Girard Township, 6.75 miles north of Le Contes Mills, 1/4 mile west on Caledonia Pike from the junction of Caledonia Pike and Ames Road, 25 feet south, in a wooded area:

O1—3 inches to 1 inch, undecomposed leaf litter.
O2—1 inch to 0, decomposed organic matter.
A1—0 to 2 inches, black (10YR 2/1) channery loam; weak very fine granular structure; very friable; 15 percent coarse fragments; extremely acid; abrupt smooth boundary.
A2—2 to 4 inches, grayish brown (10YR 5/2) channery sandy loam; weak very fine granular structure; very friable; 20 percent coarse fragments; extremely acid; abrupt smooth boundary.
B21hir—4 to 7 inches, dark reddish brown (5YR 3/3) channery loam; weak very fine subangular blocky structure; friable; 15 percent coarse fragments; extremely acid; clear irregular boundary.
B22—7 to 15 inches, brownish yellow (10YR 6/6) channery loam; weak very fine subangular blocky structure; friable; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
B23—15 to 20 inches, brownish yellow (10YR 6/6) channery loam; weak very fine and fine subangular blocky structure; friable; 30 percent coarse fragments; very strongly acid; clear wavy boundary.
B24—20 to 29 inches, brownish yellow (10YR 6/6) very channery loam; moderate fine subangular and angular blocky structure; friable; 40 percent coarse fragments; very strongly acid; clear wavy boundary.
B25—29 to 40 inches, strong brown (7.5YR 5/6) very channery loam; moderate fine and medium subangular and angular blocky structure; friable; 50 percent coarse fragments; very strongly acid; clear wavy boundary.
B3—40 to 46 inches, strong brown (7.5YR 5/6) very channery sandy loam; weak fine subangular blocky structure; friable; 60 percent coarse fragments; very strongly acid; clear wavy boundary.
C—46 to 55 inches, strong brown (7.5YR 5/6) very channery sandy loam; massive; very friable; 80 percent coarse fragments; very strongly acid; clear wavy boundary.
R—55 inches, light gray (10YR 7/2) sandstone bedrock.

The solum thickness ranges from 25 to 50 inches. The depth to bedrock is 40 inches or more. The content of coarse fragments ranges from 5 to 40 percent in the A horizon, 15 to 70 percent in the B horizon, and 35 to 80 percent in the C horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid throughout.

The A1 horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 1 through 4. The fine-earth texture of the A2 horizon is sandy loam or loam. Some pedons do not have an A2 horizon.

The B horizon has hue of 10YR or 7.5YR, value of 3 through 6, and chroma of 3 through 8. The fine-earth texture is sandy loam or loam. The Bhir horizon has hue of 5YR, value of 3 through 6, and chroma of 3 through 8. Some pedons have a Bir horizon instead of a Bhir

horizon, and some pedons have neither. The fine-earth texture of the B horizon is loam or sandy loam.

The C horizon has hue of 5YR to 2.5Y, value of 4 through 6, and chroma of 4 through 6. The fine-earth texture is sandy loam, loam, or loamy sand.

Leetonia Series

The soils of the Leetonia series are sandy-skeletal, siliceous, mesic Entic Haplorthods. They are deep and well drained to excessively drained and are on uplands. The soils formed in sandy residual material weathered from coarse-grained, gray acid sandstone and conglomerate. Slopes range from 0 to 12 percent.

Leetonia soils are on the landscape with deep, well drained Hazleton and Clymer soils; deep, moderately well drained Cookport soils; and moderately deep, well drained Dekalb soils.

Typical pedon of Leetonia very gravelly loamy fine sand, in an area of Leetonia very stony loamy fine sand, 0 to 12 percent slopes, in Pike Township, 2 miles south on Greenwood Road from the junction of Greenwood Road and U.S. Route 322, 1,000 feet west on a dirt road, in a wooded area:

O1—5 to 3 inches, undecomposed leaf litter.
O2—3 inches to 0, black (N 2/0) decomposed organic matter.
A1—0 to 3 inches, gray (10YR 4/1) very gravelly loamy fine sand; fine granular structure; friable; 50 percent coarse fragments; very strongly acid; clear wavy boundary.
A2—3 to 7 inches, light gray (10YR 6/1) very gravelly loamy sand; moderate very fine granular structure; very friable; 50 percent coarse fragments; very strongly acid; abrupt wavy boundary.
Bh—7 to 8 inches, dark reddish gray (5YR 4/2) gravelly loamy fine sand; weak very fine subangular blocky structure; friable, slightly sticky; 45 percent coarse fragments; very strongly acid; clear wavy boundary.
Bir—8 to 9 inches, red (2.5YR 4/6) gravelly loamy fine sand; weak very fine subangular blocky structure; friable; 45 percent coarse fragments; very strongly acid; clear wavy boundary.
B21—9 to 15 inches, brown (7.5YR 5/4) gravelly loamy sand; moderate fine and medium subangular blocky structure; friable; 35 percent coarse fragments; very strongly acid; clear wavy boundary.
B22—15 to 24 inches, brown (7.5YR 5/4) very gravelly loamy sand; moderate fine and medium subangular blocky structure; friable; 50 percent coarse fragments; very strongly acid; clear wavy boundary.
B23—24 to 28 inches, strong brown (7.5YR 5/6) very gravelly loamy sand; weak fine granular structure; friable; 60 percent coarse fragments; very strongly acid; clear wavy boundary.
C—28 to 41 inches, yellowish brown (10YR 5/6) very stony loamy sand; single grain; loose; 80 percent coarse fragments; very strongly acid.
R—41 inches, light gray (10YR 7/2) and light brownish gray (10YR 6/2) sandstone bedrock.

The solum thickness ranges from 20 to 34 inches, and the depth to bedrock is 40 to 60 inches. Coarse fragments make up 35 to 50 percent of the A horizon, 35 to 60 percent of the B horizon, and 35 to 80 percent of the C horizon. Reaction ranges from very strongly acid to extremely acid.

The A1 horizon has hue of 10YR, value of 2 through 4, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The fine-earth texture of the A horizon is loamy fine sand or loamy sand.

The Bh and Bir horizons have hue of 10YR through 2.5YR, value of 2 through 4, and chroma of 2 through 6.

The B2 and B3 horizons have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 6.

The C horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 4 through 6.

Monongahela Series

The soils of the Monongahela series are fine-loamy, mixed, mesic Typic Fragiudults. They are deep and moderately well drained and are on high stream terraces mainly along the upper reaches of the West Branch of the Susquehanna River and its larger tributaries. The soils formed in old alluvium weathered from acid shale and sandstone on uplands. Slopes range from 3 to 8 percent.

Monongahela soils are on the landscape with well drained Allegheny soils, somewhat poorly drained Tyler soils, and poorly drained to very poorly drained Purdy soils.

Typical pedon of Monongahela silt loam, 3 to 8 percent slopes, in Lawrence Township, 1.5 miles southeast of Clearfield Borough on U.S. Route 322, 200 feet southwest of the Army Reserve Armory, in a field:

Ap—0 to 8 inches, dark brown (10YR 4/3) silt loam; weak medium granular structure; friable, slightly sticky, slightly plastic; neutral; abrupt smooth boundary.
B1—8 to 11 inches, dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; neutral; clear wavy boundary.
B21t—11 to 21 inches, yellowish brown (10YR 5/6) silt loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; few thin patchy clay films on ped faces; 5 percent coarse fragments; neutral; clear wavy boundary.

B22t—21 to 25 inches, yellowish brown (10YR 5/6) silt loam; few fine and medium distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; firm, slightly sticky, slightly plastic; thin continuous clay films and black coatings on ped faces; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx1—25 to 44 inches, strong brown (7.5YR 5/6) silt loam; common fine distinct light brownish gray (10YR 6/8) and yellowish brown (10YR 5/8) mottles; moderate very coarse prismatic structure parting to medium platy; very firm and brittle, slightly sticky, slightly plastic; moderate thick continuous clay films in pores and pockets; 5 percent coarse fragments; black (10YR 2/1) coatings on ped faces; very strongly acid; clear wavy boundary.

Bx2—44 to 64 inches, strong brown (7.5YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium platy; firm and brittle, slightly sticky, slightly plastic; 10 percent coarse fragments; strongly acid.

The solum thickness ranges from 40 to 72 inches. The depth to bedrock is more than 60 inches. The depth to the fragipan is 18 to 30 inches. Coarse fragments make up 0 to 15 percent of the soil above the fragipan, 0 to 25 percent of the fragipan, and 10 to 40 percent of the C horizon. Reaction in unlimed areas is very strongly acid or strongly acid throughout.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Undisturbed areas have an A1 horizon with hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Some pedons have an A2 horizon.

The B2 horizon has hue of 7.5YR or 10YR, value of 4 through 6, and chroma of 4 through 8. It is silt loam, loam, silty clay loam, clay loam, or sandy clay loam. The Bx horizon has hue of 7.5YR through 2.5Y, value of 5 or 6, and chroma of 2 through 8. The fine-earth texture ranges from silt loam to sandy clay loam or is silty clay loam.

Some pedons have a C horizon that has hue of 7.5YR through 2.5Y, value of 5 through 7, and chroma of 2 through 8. The fine-earth texture ranges from sandy loam to clay loam.

Nolo Series

The soils of the Nolo series are fine-loamy, mixed, mesic Typic Fragiaquults. They are deep and poorly drained and are in depressions on broad sandstone uplands. The soils formed in residuum weathered from sandstone and siltstone. Slopes range from 0 to 8 percent.

Nolo soils are on the landscape with moderately well drained Cookport soils, poorly drained Brinkerton soils, well drained Clymer and Hazleton soils, and moderately deep, well drained Dekalb soils.

Typical pedon of Nolo loam, in an area of Nolo very stony loam, 0 to 8 percent slopes, in Pine Township, 1/2 mile south of the junction of Interstate Route 80 and PA Route 153, 25 yards east, in a wooded area:

O2—2 inches to 0, decomposed leaf litter.

A1—0 to 5 inches, very dark grayish brown (10YR 3/2) loam; weak fine subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

B21tg—5 to 10 inches, light brownish gray (2.5Y 6/2) loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; some ped faces coated with brown (10YR 5/3) organic matter; few thin clay films in pores and on ped faces; very strongly acid; clear irregular boundary.

B22tg—10 to 17 inches, gray (10YR 6/1) loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; few thin patches of clay films on ped faces and in pores; very strongly acid; clear irregular boundary.

Bx1g—17 to 30 inches, grayish brown (2.5Y 5/2) channery loam; many coarse distinct brown (7.5YR 5/4) and strong brown (7.5YR 5/6) mottles; few fine black (N 2/0) coatings; moderate very coarse prismatic structure parting to weak thick platy; firm, brittle, slightly sticky, slightly plastic; few clay films in pores; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx2g—30 to 49 inches, grayish brown (2.5Y 5/2) loam; many coarse distinct strong brown (7.5YR 5/6) and brown (7.5YR 5/4) mottles; few fine black coatings; strong very coarse prismatic structure; firm, brittle, slightly sticky, slightly plastic; 10 percent coarse fragments; few thin clay films in pores; strongly acid; gradual wavy boundary.

Bx3g—49 to 55 inches, grayish brown (2.5Y 5/2) loam; few medium distinct strong brown (7.5YR 5/6) and brown (7.5YR 5/4) mottles; moderate very coarse prismatic structure; firm, brittle, slightly sticky, slightly plastic; 10 percent coarse fragments; few thin clay films in pores; very strongly acid; clear wavy boundary.

R—55 inches, partially weathered sandstone.

The solum thickness ranges from 40 to 55 inches. The depth to bedrock is 40 to 60 inches. The depth to the fragipan ranges from 16 to 30 inches. Coarse fragments make up 5 to 20 percent of the soil above the fragipan and 10 to 35 percent of the fragipan. Reaction in unlimed areas ranges from very strongly acid to extremely acid.

The A1 horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. Some pedons have an Ap horizon that has hue of 10YR or 2.5Y, value of 3 through 5, and chroma of 2 or 3. Some pedons have an A2 horizon that has hue of 10YR or 2.5Y, value of 6, and chroma of 1 or 2.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 1 or 2 and is mottled. The fine-earth texture is loam, silt loam, clay loam, or sandy clay loam. The Bx horizon has hue of 7.5YR through 2.5Y or is neutral, has value of 5 or 6, and has chroma of 0 through 2. It is mottled. The fine-earth texture is loam, sandy clay loam, or clay loam.

Some pedons have a C horizon that has hue of 10YR or 7.5YR, value of 5, and chroma of 2 through 4. The fine-earth texture is loam or sandy clay loam.

Philo Series

The soils of the Philo series are coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts. They are deep and moderately well drained. They formed in recent loamy alluvial sediments weathered mainly from sandstone and shale. Slopes range from 0 to 3 percent.

Philo soils are on the landscape with well drained Pope soils and poorly drained Atkins soils.

Typical pedon of Philo silt loam, in Pike Township, 1.25 miles east of Curwensville Borough on PA Route 879, 600 feet east, in a field:

Ap—0 to 9 inches, very dark grayish brown (10YR 3/2) silt loam; moderate fine and medium granular structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; neutral; abrupt smooth boundary.

B21—9 to 19 inches, dark yellowish brown (10YR 4/4) silt loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22—19 to 31 inches, dark yellowish brown (10YR 4/4) silt loam; few fine faint light brownish gray (2.5Y 6/2) mottles and fine distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; very few thin clay films in pores; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B23—31 to 43 inches, dark yellowish brown (10YR 4/4) silt loam; common fine and medium distinct gray (10YR 5/1) and strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; very few thin clay films in pores; 5 percent coarse fragments; very strongly acid; abrupt wavy boundary.

IIC—43 to 62 inches, grayish brown (10YR 5/2) gravelly sandy loam; common fine medium faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; massive; friable, slightly sticky, slightly plastic; 25 percent coarse fragments; very strongly acid.

The solum thickness ranges from 20 to 48 inches. The depth to low-chroma mottles ranges from 12 to 24 inches. The depth to bedrock is 40 inches or greater. The content of coarse fragments in the solum ranges from 0 to 20 percent. Reaction in unlimed areas ranges from very strongly acid to medium acid.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 or 3.

The B horizon has hue of 10YR and 7.5YR, value of 4 through 6, and chroma of 4 through 6. The fine-earth texture ranges from silt loam to sandy loam.

The C horizon is neutral or has hue of 7.5YR to 2.5Y, value of 4 through 6, and chroma of 0 through 4. The fine-earth texture ranges from sand to silt loam.

Pope Series

The soils of the Pope series are coarse-loamy, mixed, mesic Fluventic Dystrochrepts. They are deep and well drained and are on flood plains. The soils formed in alluvium weathered from sandstone and shale. Slopes range from 0 to 3 percent.

Pope soils are on the landscape with moderately well drained Philo soils and poorly drained Atkins soils.

Typical pedon of Pope loam, in Clearfield Borough, 250 feet southwest of the junction of West First Street and Patterson Street, in a wooded area:

Ap—0 to 6 inches, dark yellowish brown (10YR 4/4); loam; weak medium and coarse granular structure; friable, slightly sticky, slightly plastic; strongly acid; clear wavy boundary.

B21—6 to 15 inches, dark brown (7.5YR 4/4); loam; weak fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; very strongly acid; gradual wavy boundary.

B22—15 to 30 inches, dark brown (7.5YR 4/4) sandy loam; weak medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; very strongly acid; gradual wavy boundary.

B23—30 to 40 inches, dark yellowish brown (10YR 4/4); sandy loam; weak medium and coarse subangular blocky structure; very friable; very strongly acid; gradual wavy boundary.

C—40 to 68 inches, dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 50 inches. The depth to bedrock is more than 60 inches. Coarse fragments make up 0 to 30 percent of the A and B horizons and 0 to 40 percent of the C horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid throughout.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 through 4.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. The fine-earth texture is sandy loam or loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 3 through 6. The fine-earth texture is loamy sand or sandy loam.

Purdy Series

The soils of the Purdy series are clayey, mixed, mesic Typic Ochraquults. They are deep and poorly drained and very poorly drained and are on alluvial terraces. The soils formed in old silty alluvial terrace sediments weathered from upland areas dominantly of shale and siltstone. Slopes range from 0 to 3 percent.

Purdy soils are on the landscape with moderately well drained Monongahela soils, somewhat poorly drained Tyler soils, and well drained Allegheny soils.

Typical pedon of Purdy silt loam, in Lawrence Township, 1/4 mile north of Clearfield Borough and 900 feet northwest of the junction of PA Route 17052 and PA Route 17134 (High Level Road):

O2—3 inches to 0, black (10YR 2/1) decomposed leaf litter.

A1—0 to 6 inches, very dark gray (10YR 3/1) silt loam; moderate very fine granular structure; friable, slightly sticky, slightly plastic; very strongly acid; clear wavy boundary.

B21tg—6 to 12 inches, gray (10YR 4/1) silty clay loam; many medium and coarse distinct strong brown (7.5YR 5/6) and brownish yellow (10YR 6/6) mottles; weak fine angular blocky structure; firm, sticky, plastic; thin discontinuous clay films in pores; extremely acid; clear wavy boundary.

B22tg—12 to 30 inches, gray (N 5/0) silty clay; many coarse distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate fine angular blocky; firm, sticky, plastic; thin continuous clay films on ped faces; extremely acid; clear wavy boundary.

B3g—30 to 44 inches, gray (10YR 5/1) silty clay; many medium distinct gray (N 6/0) and dark gray (2.5YR 4/1) mottles; weak coarse prismatic structure parting to moderate fine angular blocky; firm, sticky, plastic; thin continuous clay films on ped faces; very strongly acid; clear wavy boundary.

Cg—44 to 60 inches, dark gray (N 4/0) silty clay; massive; firm, sticky, plastic; very strongly acid.

The solum thickness ranges from 28 to 50 inches. The depth to bedrock is more than 60 inches. Reaction in unlimed areas is strongly acid to extremely acid throughout.

The A1 horizon is neutral or has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0 through 2.

Some pedons have an Ap horizon that is neutral or has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 0 through 2.

The B horizon is neutral or has hue of 10YR through 5Y, value of 4 or 5, and chroma of 0 through 2. It is mottled. The fine-earth texture is silty clay, silty clay loam, or clay loam.

The C horizon is neutral or has hue of 10YR through 5Y, value of 4 through 6, and chroma of 0 through 3. The fine-earth texture is silty clay, clay loam, or clay.

Rayne Series

The soils of the Rayne series are fine-loamy, mixed, mesic Typic Hapludults. They are deep and well drained and are on hilltops and sides of ridges. The soils formed in residuum weathered from shale, siltstone, and sandstone. Slopes range from 3 to 65 percent.

Rayne soils are on the landscape with moderately deep Gilpin soils, moderately well drained Wharton soils, somewhat poorly drained Cavode soils, and poorly drained Armagh soils.

Typical pedon of Rayne silt loam, 8 to 15 percent slopes, in Pike Township, 2.5 miles north of Curwensville Borough, 200 feet southeast of the junction of Township Route 504 and Township Route 517:

Ap—0 to 9 inches, dark brown (10YR 4/3) silt loam; weak medium granular structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B21—9 to 15 inches, dark yellowish brown (10YR 4/4) silt loam; weak very fine and fine angular blocky structure; friable, slightly sticky, slightly plastic; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—15 to 27 inches, yellowish brown (10YR 5/6) channery silt loam; weak fine and medium angular blocky structure; friable, sticky, plastic; thin discontinuous clay films on ped faces and in pores; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

B23t—27 to 35 inches, yellowish brown (10YR 5/6) channery silt loam; weak fine and medium angular blocky structure; friable, sticky, plastic; thin clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B24t—35 to 38 inches, dark brown (7.5YR 4/4) channery silt loam; weak very fine and fine angular and subangular blocky structure; friable, slightly sticky, slightly plastic; thin discontinuous clay films on ped faces; 30 percent coarse fragments; strongly acid; clear wavy boundary.

B3—38 to 50 inches, dark brown (7.5YR 4/4) channery silt loam; weak fine and medium platy structure parting to weak very fine angular and subangular

blocky; firm; 45 percent coarse fragments; strongly acid; clear wavy boundary.
C—50 to 60 inches, dark brown (7.5YR 4/2) very channery silt loam; weak medium platy structure parting to weak very fine angular and subangular blocky; firm; 70 percent coarse fragments; very strongly acid; abrupt smooth boundary.
R—60 inches, dark grayish brown (10YR 4/2) shale bedrock.

The solum thickness ranges from 40 to 60 inches. The depth to bedrock is at least 40 inches. Coarse fragments make up 0 to 40 percent of the A and B2 horizons and 15 to 90 percent of the B3 and C horizons. Reaction in unlimed areas is very strongly acid or strongly acid throughout.

The Ap horizon has hue of 10YR, value of 3 through 5, and chroma of 2 through 4.

The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 through 8. The fine-earth texture is silt loam, loam, or silty clay loam.

The C horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 through 6. The fine-earth texture ranges from sandy loam to silty clay loam.

Tyler Series

The soils of the Tyler series are fine-silty, mixed, mesic Aeric Fragiaquults. They are deep and somewhat poorly drained and are on terraces along major stream valleys in the upper reaches of the West Branch of the Susquehanna River and its larger tributaries. The soils formed in silty alluvium weathered from areas dominantly of shale and siltstone. Slopes range from 0 to 6 percent.

Tyler soils are on the landscape with well drained Allegheny soils, moderately well drained Monongahela soils, and poorly drained and very poorly drained Purdy soils.

Typical pedon of Tyler silt loam, 3 to 6 percent slopes, in Pike Township, Curwensville State Park, 400 feet west-southwest of the maintenance shed, in a field:

Ap—0 to 7 inches, dark grayish brown (10YR 4/2) silt loam; dark reddish brown (5YR 3/4) stains on ped faces; weak medium and coarse granular structure; friable, slightly sticky, slightly plastic; 5 percent coarse fragments; medium acid; abrupt smooth boundary.
B21t—7 to 15 inches, yellowish brown (10YR 5/4) silt loam; common medium faint light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.
B22t—15 to 20 inches, grayish brown (10YR 5/2) silt loam; few fine and medium distinct yellowish brown (10YR 5/6) mottles and many medium faint olive gray (5Y 5/2) mottles; moderate medium and coarse subangular blocky structure; friable, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear wavy boundary.
Bx1—20 to 38 inches, olive (5Y 5/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles and common fine and medium faint grayish brown (2.5Y 5/2) mottles; moderate very coarse prismatic structure parting to weak coarse and very coarse platy; firm and brittle, slightly sticky, slightly plastic; few thin clay films on ped faces and in pores; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.
Bx2—38 to 61 inches, olive (5Y 5/4) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles and common fine and medium faint grayish brown (2.5Y 5/2) mottles; moderate very coarse platy structure; very firm, brittle, slightly sticky, slightly plastic; common fine and medium distinct black (10YR 2/1) concretions; common moderate thick clay films on ped faces and in pores; 15 percent coarse fragments; very strongly acid.

The solum thickness ranges from 40 to 80 inches. The depth to bedrock is more than 60 inches. The depth to the fragipan ranges from 15 to 24 inches. Coarse fragments make up 0 to 10 percent of the A and Bt horizons and 0 to 15 percent of the Bx horizon. Reaction in unlimed areas ranges from strongly acid to extremely acid.

The Ap horizon has hue of 10YR or 5Y, value of 4 through 6, and chroma of 1 through 3. Some pedons have an A1 horizon that has value of 3 or 4 and chroma of 1 or 2.

The Bt horizon has hue of 10YR, 5Y, or 2.5Y; value of 5 or 6; and chroma of 2 through 6. It is mottled. The fine-earth texture is silt loam or silty clay loam. The Bx horizon has hue of 10YR, 5Y, or 2.5Y; value of 5 or 6; and chroma mainly of 2 through 6. It has common or many mottles with chroma of 2 or less. The fine-earth texture of the Bx horizon ranges from clay loam to silty clay loam.

The C horizon has hue of 10YR, 5Y, or 2.5Y; value of 5 or 6; and chroma of 2 through 8. The fine-earth texture is stratified silt loam, loam, and silty clay loam and a few strata of loamy sand or silty clay in some pedons.

Udifluvents

Udifluvents are deep, moderately well drained to well drained soils on narrow flood plains. The soils formed in alluvial sediments of stratified sand, silt, and clay and consist of unconsolidated alluvium. Slopes range from 0 to 3 percent.

Udifluvents are on the landscape with well drained Pope soils, moderately well drained Philo soils, and poorly drained Atkins soils.

Because of the variability of Udifluvents, a typical pedon is not given.

The solum thickness ranges from 0 to 40 inches. The depth to bedrock is at least 40 inches. The content of coarse fragments ranges from 0 to 85 percent throughout. Reaction is strongly acid to extremely acid.

The A horizon has hue of 7.5YR through 2.5Y and value and chroma of 0 through 7. The fine-earth texture is silt loam to sandy loam. Some pedons do not have an A horizon.

The B horizon has hue of 7.5YR through 5Y, value of 2 through 6, and chroma of 3 through 6. It is mottled in some pedons. The fine-earth texture ranges from sandy loam to silty clay loam. Some pedons do not have a B horizon.

The C horizon has hue of 7.5YR through 5Y, value of 2 through 6, and chroma of 3 through 6. It is mottled in some pedons. The fine-earth texture ranges from loamy sand to silty clay loam, but the loamy sand is only at a depth of 40 inches or more.

Udorthents

Udorthents are shallow to deep, well drained to moderately well drained soils on uplands. Some of these soils consist of the overburden that was stripped from beds of coal and clay, and some of that material has been used for backfilling and reclamation of the stripped areas. Udorthents also consist of the material that was excavated or used for fill at sites for highways, sand and gravel pits, and quarries. Slopes range from 0 to 80 percent.

Udorthents are on the landscape with all other soils in the survey area but are more commonly on the landscape with well drained Gilpin soils and moderately well drained Ernest and Wharton soils.

Because of the variability of Udorthents, a typical pedon is not given.

The solum thickness ranges from 0 to 20 inches. Bedrock is between the surface and a depth of more than 60 inches. The coarse-fragment content ranges from 0 to 95 percent throughout. Reaction is strongly acid to extremely acid throughout.

The A horizon is neutral or has hue of 5YR through 2.5Y, value of 2 through 8, and chroma of 0 through 8. The fine-earth texture ranges from sandy loam to clay. Some pedons do not have an A horizon.

The C horizon is neutral or has hue of 7.5YR through 5Y, value of 2 through 8, and chroma of 0 through 8. The fine-earth texture ranges from sandy loam to clay.

Wharton Series

The soils of the Wharton series are fine-loamy, mixed, mesic Aquic Hapludults. They are deep and moderately well drained, and are on uplands. The soils formed in residuum weathered from gray and brown clay shale. Slopes range from 3 to 25 percent.

Wharton soils are on the landscape with well drained Rayne soils; moderately deep, well drained Gilpin soils; moderately well drained Ernest soils, which have a fragipan and which formed in colluvium; and somewhat poorly drained Cavode soils.

Typical pedon of Wharton silt loam, 8 to 15 percent slopes, in Lawrence Township, in Moshannon State Forest, 2.3 miles northeast on Blackwell Road from the intersection of Tyler Road and Blackwell Road, 20 feet north, in a wooded area:

O1—2 inches to 1 inch, undecomposed leaf litter.
O2—1 inch to 0, decomposed leaf litter.
A1—0 to 2 inches, dark brown (10YR 3/3) silt loam; weak very fine granular structure; friable; very strongly acid; clear wavy boundary.
A2—2 to 8 inches, light yellowish brown (10YR 6/4) silt loam; weak very fine granular structure; friable; very strongly acid; clear wavy boundary.
B1—8 to 11 inches, yellowish brown (10YR 5/6) silt loam; weak very fine and fine subangular blocky structure; friable, slightly sticky, slightly plastic; very strongly acid; clear wavy boundary.
B21t—11 to 21 inches, yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky, slightly plastic; thin continuous clay films in pores; very strongly acid; clear wavy boundary.
B22t—21 to 40 inches, light yellowish brown (10YR 6/4) silty clay loam; many distinct strong brown (7.5YR 5/8) and light gray (10YR 7/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; friable, slightly sticky, slightly plastic; yellowish brown (10YR 5/4) thick continuous clay films on faces of peds and in pores; very strongly acid; clear wavy boundary.
B23t—40 to 50 inches, yellowish brown (10YR 6/4) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and light gray (10YR 7/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm, slightly sticky, slightly plastic; few thick light yellowish brown clay films in pores and on peds; many medium distinct black (N 2/0) concretions; 10 percent coarse fragments; very strongly acid; clear wavy boundary.
C—50 to 60 inches, dark grayish brown (2.5Y 4/2) shaly silty clay loam; many fine distinct light olive gray (5Y 6/2) and strong brown (7.5YR 5/6) mottles; massive; firm, slightly sticky, slightly plastic; 40 percent coarse fragments; very strongly acid.

The solum thickness ranges from 30 to 60 inches. The depth to bedrock is more than 40 inches. The content of coarse fragments ranges from 0 to 20 percent in the A,

B1, and B2 horizons; from 5 to 50 percent in the B3 horizon; and from 20 to 90 percent in the C horizon. In unlimed areas the soil is strongly acid or very strongly acid throughout.

The A1 horizon is neutral or has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 0 through 3. Some pedons have an Ap horizon that has hue of 10YR or 7.5YR, value of 3 through 6, and chroma of 2 through 4. The A2 horizon has hue of 10YR or 7.5YR, value of 6 through 8, and chroma of 1 through 4. The fine-earth texture of the A horizon is silt loam or silty clay loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 through 6, and chroma of 4 through 8. It is mottled in the lower part. The fine-earth texture is silt loam or silty clay loam.

The C horizon has hue of 10YR or 2.5Y, value of 4 through 6, and chroma of 2 through 8. It is mottled. The fine-earth texture ranges from silt loam to clay.

Formation of the Soils

This section describes the factors and processes of soil formation, the processes of horizon differentiation, and the major soil horizons.

Factors of Soil Formation

The characteristics of the soil at any given place are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time the forces of soil development have acted on the soil material.

Climate and vegetation are the active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and bring about the development of soil horizons. The effects of climate and vegetation are conditioned by relief. The parent material also affects the kind of profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is needed to change the parent material into a soil. Generally, a long time is required for distinct horizons to develop.

Parent Material

Parent material is the unconsolidated mass from which soils formed. The soils of Clearfield County formed in material derived from horizontal and gently folded sedimentary rocks of sandstone, shale, and siltstone.

Some soils formed in place in residuum directly over the original bedrock. Hazleton, Dekalb, and Clymer soils formed in material derived from sandstone; Gilpin, Berks, and Rayne soils formed in material derived dominantly from shale.

Some soils formed in material that slipped or otherwise moved downhill to lower positions on the landscape. Ernest and Brinkerton soils, for example, formed in material derived from shale and sandstone.

Some soils formed in stream-deposited material. These deposits may be either very old or of recent origin. The Allegheny and Monongahela soils on terraces formed in old stream deposits. Soils on flood plains, such as Pope, Philo, and Atkins soils, formed in deposits of recent origin.

Plant and Animal Life

All living organisms, including vegetation, animals, and bacteria, fungi, and other micro-organisms, affect soil formation. The vegetation strongly affects the organic-matter content and the amount of plant nutrients in the soil. Earthworms, cicadas, and burrowing animals help mix partly decomposed organic matter with the mineral soil material, helping to keep it porous for water and air movement. This mixing action also improves the environmental conditions for certain micro-organisms to further digest these organic materials, which in turn releases the nutrients needed for plant growth.

Most of the soils in Clearfield County formed under stands mainly of oak, chestnut, maple, and eastern white pine. Under these conditions, the soil surface had a covering of leaf litter. The upper part of the surface layer was dark colored, and the lower part was light colored. The organic matter and plant nutrients were concentrated in the top 4 inches of the soil. When the land was cleared and farmed, the organic matter and plant nutrients were mixed to the plow depth.

Climate

The climate of Clearfield County is a humid-temperate, continental type characteristic of the Middle Atlantic States. Some characteristics of the soil profiles indicate that this kind of climate prevailed when the soils were forming and that it influenced soil development.

The effect of climate on the formation of soils has been nearly uniform throughout the county. The development of some soils, however, may have been influenced by a microclimate caused by differences in relief.

Relief

The northern and eastern parts of the county are characterized by broad, gently rolling areas cut by steep-sided stream valleys. Hazleton, Clymer, and Dekalb soils are on the broad areas and steep sides. Cookport and Nolo soils are on the flats and lower slopes. The central part of the county is a highly dissected hilly area dominated by Gilpin, Rayne, Wharton, and Ernest soils that formed over shale and sandstone bedrock. The southern and western parts of the county are a rolling to hilly plateau of soils developed in materials weathered from interbedded shale and sandstone.

Time

The length of time the other factors of soil formation have operated is indicated, to some extent, by the degree of development of the soil profile. Some soils, especially those that formed in alluvium, show little profile development because the soil material has not been in place long enough for distinct horizons to form. Examples of soils that formed in alluvium are Pope, Philo, and Atkins soils. These soils show little horizon development because they are continually receiving fresh material that is deposited on the surface. They are called young, or recent, soils.

The profile development of Gilpin, Berks, and Dekalb soils shows that some changes have taken place in the parent material. These changes, however, do not represent the effects of advanced weathering. Weathering and the profile development of those soils have been slowed by the effects of relief and by the kind of parent material.

Hazleton, Clymer, and Wharton soils have a well developed profile. In these soils, the parent material has been in place long enough for distinct horizons to develop.

Processes of Horizon Differentiation

Several apparent processes cause layers, or horizons, to develop in the soil. For example, soils gain material when leaves and plant remains accumulate on the surface. This accumulation is easily seen in areas of Dekalb, Clymer, and Hazleton soils and other soils that formed in woodland and that have not been plowed. Organic matter, chemicals, and mineral material are deposited on or in the soil by animals, floodwaters, and wind or by gravity.

The soils lose minerals when primary minerals decompose, and some of the products of weathering are leached from the soils in solution. This process is apparent in Hazleton and Clymer soils, where calcium carbonate has been leached out of the soil. Losses of minerals also occur when plant nutrients are removed in harvested plants. In addition, fine particles of soil material are removed by erosion, and gases escape as organic matter decomposes.

The transfer or translocation of material from one part of the soil to another is common in most soils. Small amounts of organic matter are moved from the upper part of the profile to the lower part in suspension or solution. Calcium is leached from the surface layer and is held by the clay in the subsoil. The results of this process can be seen in Rayne and Wharton soils, where clay has been transferred from the upper horizons and has accumulated in the B horizon.

Bases and plant nutrients move upward in the soil when they are absorbed by the roots of plants, and they rise in the stem and are stored in the leaves and twigs. When the plant dies and decays, the plant nutrients are returned to the soil.

Elements in the soil undergo transformation as chemical weathering takes place. During the process of chemical weathering, iron, aluminum, calcium, and other elements are released from the primary and secondary minerals in the soil. The gray and white of the parent material of a well drained Hazleton soil, for example, gradually are replaced by the red, brown, and yellow of oxidized iron compounds as the parent material weathers. This change in color indicates that iron has been released or that ferrous oxide has been oxidized to ferric oxide in the presence of an adequate supply of oxygen.

Major Soil Horizons

The results of the soil-forming processes are reflected in the different horizons in a soil profile. The soil profile extends from the surface downward to materials that are little altered by the soil-forming processes.

Most soils contain three major horizons: A, B, and C. These horizons can be subdivided by the use of numbers and letters to indicate changes within one horizon. An example is the B2t horizon, a layer within the B horizon that contains an accumulation of clay.

The A horizon is the surface layer. It contains the A1 horizon, which has the largest accumulation of organic matter. It also contains the A2 horizon, which is the horizon of maximum leaching, or eluviation, of clay and iron.

The B horizon is underneath the A horizon and is commonly called the subsoil. It is the horizon of maximum accumulation, or illuviation, of clay, iron, aluminum, or other compounds leached from the A horizon. In some soils, the B horizon forms through alteration in place rather than from illuviation. The alteration may be caused by oxidation and reduction of iron or by the weathering of clay minerals. The B horizon commonly has blocky structure and is generally firmer and lighter in color than the A1 horizon and darker than the C horizon.

The C horizon is below the A and B horizons. It consists of material that may have been modified by weathering, but it is relatively unaffected by the biological, physical, or chemical processes involved in the formation of the A and B horizons.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	>5.2

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. These include no-tillage, strip tillage, stubble mulching, and other types of noninversion tillage.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:
O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.
A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
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 O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.
R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly

deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

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.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

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.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Data recorded in the period 1951-78 at Madera, Pennsylvania]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	31.8	12.6	22.3	58	-15	13	2.37	1.40	3.23	7	10.2
February---	34.3	12.8	23.6	62	-16	12	2.24	1.16	3.17	6	12.5
March------	43.6	21.3	32.5	74	-1	48	3.22	1.83	4.45	8	10.5
April------	57.9	31.2	44.6	85	13	171	3.49	2.12	4.71	9	1.7
May--------	69.0	39.9	54.5	88	23	450	3.99	2.02	5.70	9	.0
June-------	77.1	49.1	63.1	90	32	693	4.00	2.01	5.73	8	.0
July-------	80.8	53.2	67.0	92	38	837	4.44	2.75	5.96	9	.0
August-----	78.8	5.10	65.6	91	37	791	3.73	2.28	5.03	8	.0
September--	72.0	45.2	58.6	89	27	558	3.39	2.07	4.56	7	.0
October----	60.5	33.9	47.2	81	15	251	2.55	1.12	3.77	6	.2
November---	47.3	27.2	37.3	70	5	48	2.55	1.52	3.46	7	3.3
December---	35.4	17.4	26.4	62	-11	22	2.43	1.31	3.40	7	10.3
Yearly:											
Average--	57.4	33.0	45.2	---	---	---	---	---	---	---	---
Extreme--	---	---	---	93	-20	---	---	---	---	---	---
Total----	---	---	---	---	---	3,894	38.40	33.99	42.68	91	48.7

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data recorded in the period 1951-78 at Madera, Pennsylvania]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	May 14	May 27	June 11
2 years in 10 later than--	May 8	May 21	June 6
5 years in 10 later than--	April 27	May 11	May 26
First freezing temperature in fall:			
1 year in 10 earlier than--	September 29	September 18	September 12
2 years in 10 earlier than--	October 5	September 24	September 16
5 years in 10 earlier than--	October 16	October 4	September 25

TABLE 3.--GROWING SEASON

[Data recorded in the period 1951-78 at Madera, Pennsylvania]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	144	124	99
8 years in 10	153	132	107
5 years in 10	188	160	136
2 years in 10	197	168	144
1 year in 10	254	225	210

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AlB	Allegheny silt loam, 3 to 8 percent slopes	625	0.1
Ar	Armagh silt loam	358	*
At	Atkins silt loam	12,774	1.7
BeB	Berks shaly silt loam, 3 to 8 percent slopes	1,616	0.2
BeC	Berks shaly silt loam, 8 to 15 percent slopes	1,600	0.2
BeD	Berks shaly silt loam, 15 to 25 percent slopes	1,235	0.2
BrA	Brinkerton silt loam, 0 to 3 percent slopes	2,295	0.3
BrB	Brinkerton silt loam, 3 to 8 percent slopes	12,367	1.7
BxB	Brinkerton very stony silt loam, 0 to 8 percent slopes	1,445	0.2
CaB	Cavode silt loam, 3 to 8 percent slopes	8,115	1.1
CaC	Cavode silt loam, 8 to 15 percent slopes	2,312	0.3
ClB	Clymer channery loam, 3 to 8 percent slopes	14,413	2.0
ClC	Clymer channery loam, 8 to 15 percent slopes	4,351	0.6
CmB	Clymer very stony loam, 0 to 8 percent slopes	7,724	1.1
CmC	Clymer very stony loam, 8 to 15 percent slopes	2,724	0.4
CoB	Cookport channery loam, 3 to 8 percent slopes	31,489	4.3
CoC	Cookport channery loam, 8 to 15 percent slopes	9,501	1.3
CxB	Cookport very stony loam, 0 to 8 percent slopes	19,955	2.7
CxD	Cookport very stony loam, 8 to 25 percent slopes	10,134	1.4
DeB	Dekalb channery loam, 3 to 8 percent slopes	1,435	0.2
DeC	Dekalb channery loam, 8 to 15 percent slopes	1,218	0.2
DeD	Dekalb channery loam, 15 to 25 percent slopes	1,137	0.2
DxB	Dekalb very stony loam, 0 to 8 percent slopes	2,151	0.3
DxD	Dekalb very stony loam, 8 to 25 percent slopes	3,124	0.4
ErB	Ernest silt loam, 3 to 8 percent slopes	22,966	3.1
ErC	Ernest silt loam, 8 to 15 percent slopes	39,081	5.3
ErD	Ernest silt loam, 15 to 25 percent slopes	7,512	1.0
ExB	Ernest very stony silt loam, 0 to 8 percent slopes	3,532	0.5
ExD	Ernest very stony silt loam, 8 to 25 percent slopes	8,388	1.1
GlB	Gilpin channery silt loam, 3 to 8 percent slopes	29,195	4.0
GlC	Gilpin channery silt loam, 8 to 15 percent slopes	43,628	6.0
GmB	Gilpin very stony silt loam, 2 to 8 percent slopes	982	0.1
GmD	Gilpin very stony silt loam, 8 to 25 percent slopes	2,978	0.4
HaD	Hazleton channery loam, 15 to 25 percent slopes	3,891	0.5
HbD	Hazleton very stony loam, 8 to 25 percent slopes	23,110	3.2
HbF	Hazleton very stony loam, 25 to 80 percent slopes	50,388	6.9
HcB	Hazleton-Clymer channery loams, 3 to 8 percent slopes	9,335	1.3
HcC	Hazleton-Clymer channery loams, 8 to 15 percent slopes	6,710	0.9
HdB	Hazleton-Clymer very stony loams, 0 to 8 percent slopes	24,178	3.3
LeB	Leetonia very stony loamy fine sand, 0 to 12 percent slopes	251	*
MoB	Monongahela silt loam, 3 to 8 percent slopes	4,144	0.6
NoA	Nolo loam, 0 to 3 percent slopes	678	0.1
NoB	Nolo loam, 3 to 8 percent slopes	1,278	0.2
NxB	Nolo very stony loam, 0 to 8 percent slopes	1,699	0.2
Ph	Philo silt loam	8,745	1.2
Po	Pope loam	1,606	0.2
Pu	Purdy silt loam	479	0.1
RaB	Rayne silt loam, 3 to 8 percent slopes	4,782	0.7
RaC	Rayne silt loam, 8 to 15 percent slopes	2,608	0.4
RbF	Rayne channery silt loam, 25 to 65 percent slopes	67,697	9.2
RcD	Rayne-Gilpin complex, 15 to 25 percent slopes	50,692	6.9
Ru	Rubble land-Dystrochrepts complex	1,131	0.2
TyA	Tyler silt loam, 0 to 3 percent slopes	456	0.1
TyB	Tyler silt loam, 3 to 6 percent slopes	1,184	0.2
Ud	Udifluvents, sandy	1,310	0.2
Uo	Udorthents, shale	91,040	12.4
Up	Udorthents, smoothed	2,486	0.3
Ur	Urban land	904	0.1
WhB	Wharton silt loam, 3 to 8 percent slopes	27,173	3.7
WhC	Wharton silt loam, 8 to 15 percent slopes	24,099	3.3
WhD	Wharton silt loam, 15 to 25 percent slopes	4,746	0.6
	Water	3,000	0.4
	Total	732,160	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland]

Map symbol	Soil name
AlB	Allegheny silt loam, 3 to 8 percent slopes
ClB	Clymer channery loam, 3 to 8 percent slopes
CoB	Cookport channery loam, 3 to 8 percent slopes
GlB	Gilpin channery silt loam, 3 to 8 percent slopes
HcB	Hazleton-Clymer channery loams, 3 to 8 percent slopes
Ph	Philo silt loam
Po	Pope loam
RaB	Rayne silt loam, 3 to 8 percent slopes
WhB	Wharton silt loam, 3 to 8 percent slopes

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
AlB---------- Allegheny	115	23	75	45	4.5	3.5	7.0
Ar---------- Armagh	80	16	60	---	---	2.5	5.0
At---------- Atkins	100	20	60	30	---	3.0	5.5
BeB---------- Berks	80	16	60	35	3.5	3.0	6.5
BeC---------- Berks	75	15	55	35	3.0	2.5	5.0
BeD---------- Berks	70	14	50	30	3.0	2.5	5.0
BrA---------- Brinkerton	90	18	60	---	---	2.5	5.0
BrB---------- Brinkerton	90	18	60	---	---	2.5	5.0
BxB---------- Brinkerton	---	---	---	---	---	---	---
CaB---------- Cavode	85	17	65	35	---	3.0	5.5
CaC---------- Cavode	80	16	60	30	---	3.0	5.5
ClB---------- Clymer	120	24	75	45	4.5	3.5	7.0
ClC---------- Clymer	110	22	70	40	4.0	3.0	7.0
CmB, CmC---------- Clymer	---	---	---	---	---	---	---
CoB---------- Cookport	100	20	65	40	3.5	3.0	---
CoC---------- Cookport	90	18	60	35	3.5	3.0	---
CxB---------- Cookport	---	---	---	---	---	---	---
CxD---------- Cookport	---	---	---	---	---	---	---
DeB---------- Dekalb	80	16	60	35	3.5	3.0	6.0
DeC---------- Dekalb	75	15	55	35	3.0	2.5	5.0
DeD---------- Dekalb	70	14	50	30	3.0	2.0	5.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
DxB, DxD---- Dekalb	---	---	---	---	---	---	---
ErB---- Ernest	100	20	65	40	3.5	3.0	6.0
ErC---- Ernest	95	19	60	35	3.5	3.0	6.0
ErD---- Ernest	90	18	55	35	3.0	2.5	5.5
ExB---- Ernest	---	---	---	---	---	---	---
ExD---- Ernest	---	---	---	---	---	---	---
GlB---- Gilpin	90	18	65	40	3.5	3.0	6.0
GlC---- Gilpin	85	17	60	35	3.5	3.0	6.0
GmB---- Gilpin	---	---	---	---	---	---	---
GmD---- Gilpin	---	---	---	---	---	---	---
HaD---- Hazleton	95	19	60	35	4.0	3.0	6.0
HbD---- Hazleton	---	---	---	---	---	---	---
HbF---- Hazleton	---	---	---	---	---	---	---
HcB---- Hazleton-Clymer	120	24	75	45	4.5	3.5	7.0
HcC---- Hazleton-Clymer	110	20	71	40	4.4	3.4	7.0
HdB---- Hazleton-Clymer	---	---	---	---	---	---	---
LeB---- Leetonia	---	---	---	---	---	---	---
MoB---- Monongahela	110	22	65	40	3.5	3.0	---
NoA---- Nolo	80	16	60	---	---	2.5	5.0
NoB---- Nolo	80	16	60	---	---	2.5	5.0
NxB---- Nolo	---	---	---	---	---	---	---
Ph---- Philo	130	27	80	45	4.5	3.5	7.0
Po---- Pope	130	27	80	45	4.5	4.0	8.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Corn silage	Oats	Wheat	Alfalfa hay	Grass-legume hay	Pasture
	Bu	Ton	Bu	Bu	Ton	Ton	AUM*
Pu---------- Purdy	80	16	55	---	---	2.5	---
RaB---------- Rayne	110	22	75	45	4.5	3.5	7.0
RaC---------- Rayne	100	20	70	40	4.5	3.5	7.0
RbF---------- Rayne	---	---	---	---	---	---	---
RcD---------- Rayne-Gilpin	90	18	62	37	3.7	2.8	7
Ru**---------- Rubble land-Dystrochrepts	---	---	---	---	---	---	---
TyA---------- Tyler	95	19	60	---	---	3.0	6.0
TyB---------- Tyler	85	17	60	---	---	3.0	6.0
Ud**. Udifluvents							
Uo, Up**. Udorthents							
Ur**. Urban land							
WhB---------- Wharton	90	18	65	40	3.5	3.0	6.0
WhC---------- Wharton	80	16	60	35	3.5	3.0	6.0
WhD---------- Wharton	70	14	55	30	3.0	2.5	5.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	1,606	---	---	---	---
II	132,952	124,207	8,745	---	---
III	180,961	158,074	22,887	---	---
IV	86,310	69,213	17,097	---	---
V	---	---	---	---	---
VI	110,676	---	---	110,676	---
VII	119,784	67,697	---	52,087	---
VIII	1,131	---	---	1,131	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AlB---------- Allegheny	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Austrian pine, yellow-poplar, black walnut, Japanese larch, red pine, Norway spruce.
						Yellow-poplar-------	90	
						Virginia pine-------	75	
						Eastern white pine--	90	
						Shortleaf pine------	75	
Ar---------- Armagh	3w	Slight	Severe	Severe	Severe	Northern red oak----	75	Eastern white pine, Norway spruce.
At---------- Atkins	1w	Slight	Severe	Severe	Moderate	Pin oak------------	100	Eastern white pine, white spruce.
						Sweetgum-----------	95	
						Eastern cottonwood--	105	
						Red maple----------	---	
						American sycamore---	---	
BeB, BeC---------- Berks	3f	Slight	Slight	Moderate	Slight	Northern red oak----	70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
						Black oak----------	70	
						Virginia pine-------	70	
BeD---------- Berks	3f	Slight	Moderate	Moderate	Slight	Northern red oak----	70	Virginia pine, eastern white pine, Japanese larch, Norway spruce, red pine.
						Black oak----------	70	
						Virginia pine-------	70	
BrA, BrB, BxB------ Brinkerton	2w	Slight	Severe	Severe	Moderate	Northern red oak----	77	Eastern white pine, white spruce, red maple, yellow-poplar.
CaB---------- Cavode	2w	Slight	Moderate	Moderate	Moderate	Northern red oak----	83	Eastern white pine, yellow-poplar, black cherry, Norway spruce, white spruce.
						Yellow-poplar-------	95	
CaC---------- Cavode	2w	Moderate	Moderate	Moderate	Moderate	Northern red oak----	83	Eastern white pine, yellow-poplar, black cherry, Norway spruce, white spruce.
						Yellow-poplar-------	95	
ClB, ClC, CmB, CmC- Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak----	77	Eastern white pine, Virginia pine, black cherry, yellow-poplar.
						Yellow-poplar-------	90	
						Eastern white pine--	90	
CoB, CoC---------- Cookport	2w	Slight	Moderate	Slight	Slight	Northern red oak----	76	Yellow-poplar, eastern white pine, black cherry, Japanese larch, Norway spruce.
						Black cherry--------	86	
						Yellow-poplar-------	90	
						White ash----------	86	
						Sugar maple---------	80	
CxB---------- Cookport	2w	Slight	Moderate	Slight	Slight	Northern red oak----	76	Yellow-poplar, eastern white pine, Japanese larch, Norway spruce.
						Black cherry--------	86	
						Yellow-poplar-------	90	
						White ash----------	86	
						Sugar maple---------	80	
CxD---------- Cookport	2w	Moderate	Moderate	Slight	Slight	Northern red oak----	76	Yellow-poplar, eastern white pine, Japanese larch, Norway spruce.
						Black cherry--------	86	
						Yellow-poplar-------	90	
						White ash----------	86	
						Sugar maple---------	80	
DeB, DeC---------- Dekalb	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Norway spruce, yellow-poplar, black cherry.
						Black cherry--------	88	
						White ash----------	80	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
DeD--- Dekalb	2r	Slight	Moderate	Slight	Slight	Northern red oak----	76	Norway spruce, yellow-poplar, black cherry.
						Black cherry--------	95	
						Yellow-poplar-------	93	
DxB--- Dekalb	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Norway spruce, yellow-poplar, black cherry.
						Black cherry--------	88	
						White ash-----------	80	
DxD--- Dekalb	2r	Slight	Moderate	Slight	Slight	Northern red oak----	76	Norway spruce, yellow-poplar, black cherry.
						Black cherry--------	95	
						Yellow-poplar-------	93	
ErB--- Ernest	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Japanese larch.
						Yellow-poplar-------	89	
						White ash-----------	80	
						Black walnut--------	---	
						Sugar maple---------	80	
						Black cherry--------	80	
ErC--- Ernest	2r	Moderate	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Japanese larch.
						Yellow-poplar-------	89	
						White ash-----------	80	
						Black walnut--------	---	
						Sugar maple---------	80	
						Black cherry--------	80	
ErD--- Ernest	2r	Severe	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Japanese larch.
						Yellow-poplar-------	89	
						White ash-----------	80	
						Black walnut--------	---	
						Sugar maple---------	80	
						Black cherry--------	80	
ExB--- Ernest	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Japanese larch.
						Yellow-poplar-------	89	
						White ash-----------	80	
						Black walnut--------	---	
						Sugar maple---------	80	
						Black cherry--------	80	
ExD--- Ernest	2w	Severe	Moderate	Slight	Slight	Northern red oak----	80	Eastern white pine, Norway spruce, Japanese larch.
						Yellow-poplar-------	89	
						White ash-----------	80	
						Black walnut--------	---	
						Sugar maple---------	80	
						Black cherry--------	80	
GlB, GlC, GmB--- Gilpin	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
GmD--- Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
						Yellow-poplar-------	95	
HaD, HbD--- Hazleton	3f	Moderate	Moderate	Slight	Slight	Northern red oak----	70	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow-poplar-------	80	
HbF--- Hazleton	3r	Moderate	Severe	Slight	Slight	Northern red oak----	70	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
						Yellow-poplar-------	80	

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
HcB*, HcC*, HdB*: Hazleton	3f	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	70 80	Japanese larch, eastern white pine, Norway spruce, Austrian pine, black cherry.
Clymer	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine	77 90 90	Eastern white pine, Virginia pine, black cherry, yellow-poplar.
LeB Leetonia	5f	Slight	Slight	Severe	Slight	Northern red oak Virginia pine	50 50	Virginia pine, pitch pine.
MoB Monongahela	3o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine White ash Black walnut	70 85 72 66 --- ---	Eastern white pine.
NoA, NoB, NxB Nolo	3w	Slight	Severe	Severe	Moderate	Northern red oak Black cherry	70 70	Eastern white pine, Norway spruce, red maple.
Ph Philo	1w	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Virginia pine Black oak White oak White ash	86 102 74 85 85 85	Eastern white pine, yellow-poplar.
Po Pope	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine	80 102 89 74	Eastern white pine, yellow-poplar, loblolly pine, black walnut, black cherry, Norway spruce, Japanese larch.
Pu Purdy	1w	Slight	Severe	Severe	Severe	Pin oak Shortleaf pine Virginia pine Yellow-poplar Sweetgum	85 75 75 90 85	Virginia pine, eastern white pine, loblolly pine.
RaB, RaC Rayne	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 75 75	Eastern white pine, yellow-poplar, black cherry, Virginia pine, Norway spruce.
RbF Rayne	2r	Moderate	Severe	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 75 75	Eastern white pine, yellow-poplar, black cherry, Virginia pine, Norway spruce.
RcD*: Rayne	2r	Slight	Moderate	Slight	Slight	Northern red oak Yellow-poplar Eastern white pine Virginia pine Shortleaf pine	80 90 90 75 75	Eastern white pine, yellow-poplar, black cherry, Virginia pine, Norway spruce.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
RcD*:								
Gilpin	2r	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
TyA, TyB Tyler	2d	Slight	Slight	Moderate	Moderate	Northern red oak White oak Slippery elm American beech White ash Sugar maple American sycamore	80 --- --- --- --- --- ---	Green ash, yellow-poplar, red pine, Virginia pine.
WhB Wharton	2o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
WhC Wharton	2r	Moderate	Slight	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.
WhD Wharton	2r	Severe	Moderate	Slight	Slight	Northern red oak Yellow-poplar	76 90	Eastern white pine, yellow-poplar.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AlB---------- Allegheny	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
Ar---------- Armagh	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
At---------- Atkins	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
BeB---------- Berks	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: small stones.
BeC---------- Berks	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight----------	Severe: small stones.
BeD---------- Berks	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope, small stones.
BrA, BrB---------- Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
BxB---------- Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness, large stones.	Severe: wetness.	Severe: wetness.
CaB---------- Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
CaC---------- Cavode	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.
ClB---------- Clymer	Slight----------	Slight----------	Severe: small stones.	Slight----------	Moderate: large stones.
ClC---------- Clymer	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight----------	Moderate: slope, large stones.
CmB---------- Clymer	Moderate: large stones.	Moderate: large stones.	Severe: large stones, small stones.	Moderate: large stones.	Moderate: droughty, large stones.
CmC---------- Clymer	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: large stones, slope, small stones.	Moderate: large stones.	Moderate: large stones, slope.
CoB---------- Cookport	Moderate: small stones, wetness.	Moderate: small stones, wetness.	Severe: small stones.	Slight----------	Moderate: small stones, wetness.
CoC---------- Cookport	Moderate: slope, small stones, wetness.	Moderate: slope, small stones, wetness.	Severe: slope.	Slight----------	Moderate: slope, small stones, wetness.
CxB---------- Cookport	Moderate: wetness, large stones.	Moderate: large stones, wetness.	Severe: large stones.	Slight----------	Moderate: large stones, wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CxD--- Cookport	Severe: slope.	Severe: slope.	Severe: slope, large stones.	Moderate: slope.	Severe: slope.
DeB--- Dekalb	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: large stones.	Severe: small stones.
DeC--- Dekalb	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.	Severe: small stones.
DeD--- Dekalb	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, large stones.	Severe: slope, small stones.
DxB--- Dekalb	Severe: small stones.	Severe: small stones.	Severe: small stones, large stones.	Moderate: large stones.	Severe: small stones.
DxD--- Dekalb	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones, large stones.	Moderate: slope, large stones.	Severe: slope, small stones.
ErB--- Ernest	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: large stones, small stones.
ErC--- Ernest	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: slope.	Severe: erodes easily.	Moderate: large stones, small stones, slope.
ErD--- Ernest	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
ExB--- Ernest	Moderate: large stones, wetness.	Moderate: large stones, wetness.	Severe: large stones, small stones.	Moderate: wetness.	Moderate: small stones, large stones.
ExD--- Ernest	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Moderate: wetness, slope.	Severe: slope.
GlB--- Gilpin	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: large stones.	Moderate: thin layer, small stones.
GlC--- Gilpin	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Moderate: large stones.	Moderate: slope, small stones.
GmB--- Gilpin	Moderate: large stones.	Moderate: large stones.	Severe: small stones, large stones.	Moderate: large stones.	Moderate: small stones, thin layer.
GmD--- Gilpin	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Moderate: large stones, slope.	Severe: slope.
HaD--- Hazleton	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope.
HbD--- Hazleton	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Moderate: slope.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HbF---------- Hazleton	Severe: slope.	Severe: slope.	Severe: slope, small stones, large stones.	Severe: slope.	Severe: slope.
HcB*: Hazleton----------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones, droughty.
Clymer----------	Slight----------	Slight----------	Severe: small stones.	Slight----------	Moderate: large stones.
HcC*: Hazleton----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight----------	Moderate: slope, small stones.
Clymer----------	Moderate: slope.	Moderate: slope.	Severe: slope, small stones.	Slight----------	Moderate: slope, large stones.
HdB*: Hazleton----------	Moderate: large stones.	Moderate: large stones.	Severe: small stones, large stones.	Slight----------	Moderate: large stones.
Clymer----------	Moderate: large stones.	Moderate: large stones.	Severe: large stones, small stones.	Moderate: large stones.	Moderate: droughty, large stones.
LeB---------- Leetonia	Severe: small stones.	Severe: small stones.	Severe: large stones, small stones.	Slight----------	Severe: small stones, large stones, droughty.
MoB---------- Monongahela	Moderate: wetness.	Moderate: wetness.	Moderate: slope, small stones.	Severe: erodes easily.	Slight.
NoA, NoB---------- Nolo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
NxB---------- Nolo	Severe: wetness.	Severe: wetness.	Severe: large stones.	Severe: wetness.	Severe: wetness.
Ph---------- Philo	Severe: flooding.	Moderate: wetness.	Moderate: flooding, wetness.	Slight----------	Moderate: flooding.
Po---------- Pope	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
Pu---------- Purdy	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
RaB---------- Rayne	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
RaC---------- Rayne	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
RbF---------- Rayne	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
RcD*:					
Rayne	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope, large stones.	Severe: slope.
Ru*:					
Rubble land.					
Dystrochrepts.					
TyA, TyB	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness.
Tyler					
Ud*.					
Udifluvents					
Uo, Up*.					
Udorthents					
Ur*.					
Urban land					
WhB	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, percs slowly, wetness.	Slight	Moderate: wetness.
Wharton					
WhC	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, small stones.	Slight	Moderate: slope, wetness.
Wharton					
WhD	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Wharton					

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AlB---- Allegheny	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ar---- Armagh	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
At---- Atkins	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
BeB---- Berks	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
BeC---- Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
BeD---- Berks	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
BrA---- Brinkerton	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
BrB---- Brinkerton	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
BxB---- Brinkerton	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
CaB---- Cavode	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaC---- Cavode	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ClB---- Clymer	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ClC---- Clymer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CmB---- Clymer	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
CmC---- Clymer	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
CoB---- Cookport	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoC---- Cookport	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CxB---- Cookport	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
CxD---- Cookport	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
DeB---- Dekalb	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
DeC---- Dekalb	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.

TABLE 10.--WILDLIFE HABITAT

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
DeD---- Dekalb	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
DxB---- Dekalb	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
DxD---- Dekalb	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
ErB---- Ernest	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ErC---- Ernest	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ErD---- Ernest	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ExB---- Ernest	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
ExD---- Ernest	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
GlB---- Gilpin	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
GlC---- Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
GmB---- Gilpin	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
GmD---- Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
HaD---- Hazleton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HbD, HbF---- Hazleton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
HcB*:										
Hazleton----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Clymer----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
HcC*:										
Hazleton----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Clymer----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HdB*:										
Hazleton----	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Clymer----	Very poor.	Poor	Good	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
LeB---- Leetonia	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MoB---- Monongahela	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
NoA---- Nolo	Poor	Fair	Good	Fair	Fair	Good	Good	Fair	Fair	Good.
NoB---- Nolo	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
NxB---- Nolo	Very poor.	Poor	Good	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Ph---- Philo	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Po---- Pope	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pu---- Purdy	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
RaB---- Rayne	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RaC---- Rayne	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RbF---- Rayne	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
RcD*: Rayne----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin----	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Ru*: Rubble land.										
Dystrochrepts.										
TyA---- Tyler	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
TyB---- Tyler	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud. Udifluvents										
Uo, Up. Udorthents										
Ur*. Urban land										
WhB---- Wharton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WhC---- Wharton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WhD---- Wharton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AlB---- Allegheny	Slight	Slight	Slight	Moderate: slope.	Slight	Slight.
Ar---- Armagh	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Severe: wetness.
At---- Atkins	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, frost action.	Severe: wetness, flooding.
BeB---- Berks	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Slight	Severe: small stones.
BeC---- Berks	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope.	Severe: small stones.
BeD---- Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
BrA, BrB, BvB---- Brinkerton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Severe: wetness.
CaB---- Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
CaC---- Cavode	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: frost action, low strength, wetness.	Severe: wetness.
ClB---- Clymer	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
ClC---- Clymer	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, large stones.
CmB---- Clymer	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: droughty, large stones.
CmC---- Clymer	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: large stones, slope.
CoB---- Cookport	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, low strength.	Moderate: small stones, wetness.
CoC---- Cookport	Severe: wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Moderate: slope, wetness, low strength.	Moderate: slope, small stones, wetness.
CxB---- Cookport	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: wetness, low strength.	Moderate: large stones, wetness.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
CxD---------- Cookport	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Severe: slope.
DeB---------- Dekalb	Severe: depth to rock.	Moderate: depth to rock, large stones.	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Moderate: depth to rock, large stones.	Severe: small stones.
DeC---------- Dekalb	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: slope, depth to rock, large stones.	Severe: small stones.
DeD---------- Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
DtB---------- Dekalb	Severe: depth to rock.	Moderate: depth to rock, large stones.	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Moderate: depth to rock, large stones.	Severe: small stones.
DxD---------- Dekalb	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
ErB---------- Ernest	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: large stones, small stones.
ErC---------- Ernest	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: large stones, small stones, slope.
ErD---------- Ernest	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
ExB---------- Ernest	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength.	Moderate: small stones, large stones.
ExD---------- Ernest	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
GlB---------- Gilpin	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: thin layer, small stones.
GlC---------- Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, small stones.
GmB---------- Gilpin	Moderate: depth to rock.	Slight---------	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: small stones, thin layer.
GmD---------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HaD, HbD, HbF----- Hazleton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
HcB*:						
Hazleton	Moderate: depth to rock, large stones.	Moderate: large stones.	Moderate: large stones, depth to rock.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: small stones, droughty.
Clymer	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: large stones.
HcC*:						
Hazleton	Moderate: depth to rock, slope, large stones.	Moderate: slope, large stones.	Moderate: slope, large stones, depth to rock.	Severe: slope.	Moderate: slope, frost action, large stones.	Moderate: slope, small stones.
Clymer	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, large stones.
HdB*:						
Hazleton	Moderate: depth to rock, large stones.	Moderate: large stones.	Moderate: large stones, depth to rock.	Moderate: slope, large stones.	Moderate: frost action, large stones.	Moderate: large stones.
Clymer	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Moderate: droughty, large stones.
LeB---- Leetonia	Severe: cutbanks cave.	Moderate: large stones.	Moderate: depth to rock, large stones.	Moderate: slope, large stones.	Moderate: large stones.	Severe: small stones, large stones, droughty.
MoB---- Monongahela	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: low strength, wetness.	Slight.
NoA, NoB, NxB---- Nolo	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
Ph---- Philo	Severe: cutbanks cave, wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Po---- Pope	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
Pu---- Purdy	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, low strength, frost action.	Severe: wetness.
RaB---- Rayne	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
RaC---- Rayne	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
RbF---- Rayne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
RcD*:						
Rayne	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ru*: Rubble land. Dystrochrepts.						
TyA, TyB---------- Tyler	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
Ud. Udifluvents						
Uo, Up. Udorthents						
Ur*. Urban land						
WhB---------- Wharton	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: frost action, low strength.	Moderate: wetness.
WhC---------- Wharton	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope, wetness.
WhD---------- Wharton	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AlB Allegheny	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Ar Armagh	Severe: percs slowly, wetness.	Moderate: depth to rock.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
At Atkins	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Poor: wetness.
BeB Berks	Severe: depth to rock.	Severe: seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
BeC Berks	Severe: depth to rock.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
BeD Berks	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
BrA Brinkerton	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BrB, BxB Brinkerton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CaB Cavode	Severe: percs slowly, wetness.	Moderate: slope, depth to rock.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
CaC Cavode	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness, depth to rock, too clayey.	Severe: wetness.	Poor: too clayey, wetness.
ClB Clymer	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
ClC Clymer	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.
CmB Clymer	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
CmC Clymer	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CoB---------- Cookport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, depth to rock.	Moderate: wetness, depth to rock.	Fair: small stones, wetness.
CoC---------- Cookport	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness, depth to rock.	Moderate: slope, wetness, depth to rock.	Fair: small stones, wetness, slope.
CxB---------- Cookport	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, depth to rock.	Moderate: wetness, depth to rock.	Fair: area reclaim, too clayey, wetness.
CxD---------- Cookport	Severe: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: slope, wetness, depth to rock.	Severe: slope.	Poor: slope.
DeB---------- Dekalb	Severe: depth to rock, poor filter.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
DeC---------- Dekalb	Severe: depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: seepage, depth to rock.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
DeD---------- Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
DxB---------- Dekalb	Severe: depth to rock, poor filter.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage, depth to rock.	Poor: small stones, area reclaim.
DxD---------- Dekalb	Severe: slope, depth to rock, poor filter.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
ErB---------- Ernest	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
ErC---------- Ernest	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: slope, wetness.	Moderate: slope, wetness.	Poor: small stones.
ErD---------- Ernest	Severe: slope, percs slowly, wetness.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
ExB---------- Ernest	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Poor: small stones.
ExD---------- Ernest	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
GlB---------- Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
GlC---------- Gilpin	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
GmB---------- Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: thin layer, large stones, area reclaim.
GmD---------- Gilpin	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Poor: slope, area reclaim, large stones.
HaD, HbD, HbF------- Hazleton	Severe: poor filter, slope.	Severe: slope, seepage.	Severe: slope, seepage, depth to rock.	Severe: slope, seepage.	Poor: slope, small stones.
HcB*: Hazleton----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
Clymer----------	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
HcC*: Hazleton----------	Severe: poor filter.	Severe: slope, seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
Clymer----------	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Poor: small stones.
HdB*: Hazleton----------	Severe: poor filter.	Severe: seepage.	Severe: seepage, depth to rock.	Severe: seepage.	Poor: small stones.
Clymer----------	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: small stones.
LeB---------- Leetonia	Severe: poor filter.	Severe: seepage, large stones.	Severe: depth to rock, seepage, large stones.	Severe: seepage.	Poor: seepage, too sandy, small stones.
MoB---------- Monongahela	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: small stones, wetness.
NoA, NoB, NxB------- Nolo	Severe: wetness, percs slowly.	Severe: wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness, thin layer.
Ph---------- Philo	Severe: flooding, wetness, poor filter.	Severe: flooding, wetness, seepage.	Severe: flooding, depth to rock, seepage.	Severe: flooding, wetness.	Fair: area reclaim, wetness, thin layer.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Po---------- Pope	Moderate: flooding.	Severe: seepage, flooding.	Severe: seepage.	Severe: seepage.	Good.
Pu---------- Purdy	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
RaB---------- Rayne	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: small stones, thin layer.
RaC---------- Rayne	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: small stones, thin layer, slope.
RbF---------- Rayne	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
RcD*: Rayne----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Gilpin----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Ru*: Rubble land. Dystrochrepts.					
TyA---------- Tyler	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: wetness.
TyB---------- Tyler	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ud. Udifluvents					
Uo, Up. Udorthents					
Ur*. Urban land					
WhB---------- Wharton	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
WhC---------- Wharton	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: slope, too clayey.
WhD---------- Wharton	Severe: slope, percs slowly, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AlB---------- Allegheny	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ar---------- Armagh	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
At---------- Atkins	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BeB, BeC---------- Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
BeD---------- Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
BrA, BrB, BxB--------- Brinkerton	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CaB, CaC---------- Cavode	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
ClB, ClC, CmB, CmC---- Clymer	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
CoB, CoC---------- Cookport	Fair: low strength, wetness, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
CxB---------- Cookport	Fair: area reclaim, wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
CxD---------- Cookport	Fair: area reclaim, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
DeB, DeC---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
DeD---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
DxB---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
DxD---------- Dekalb	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
ErB, ErC---------- Ernest	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ErD---------- Ernest	Fair: low strength, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
ExB---------- Ernest	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
ExD---------- Ernest	Fair: low strength, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
GlB, GlC---------- Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
GmB---------- Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, small stones.
GmD---------- Gilpin	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, large stones, small stones.
HaD---------- Hazleton	Fair: slope, area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HbD---------- Hazleton	Fair: slope, area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HbF---------- Hazleton	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HcB*, HcC*, HdB*: Hazleton----------	Fair: area reclaim, thin layer, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Clymer----------	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
LeB---------- Leetonia	Fair: area reclaim, large stones.	Probable----------	Probable----------	Poor: small stones, area reclaim.
MoB---------- Monongahela	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
NoA, NoB, NxB--------- Nolo	Poor: wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, wetness.
Ph---------- Philo	Fair: area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Po---------- Pope	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
Pu---------- Purdy	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, too clayey.
RaB, RaC---------- Rayne	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
RbF---------- Rayne	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
RcD*: Rayne----------	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Gilpin----------	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Ru*: Rubble land.				
Dystrochrepts.				
TyA, TyB---------- Tyler	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
Ud. Udifluvents				
Uo, Up. Udorthents				
Ur*. Urban land				
WhB, WhC---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WhD---------- Wharton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones, area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AlB---- Allegheny	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Ar---- Armagh	Moderate: depth to rock.	Severe: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
At---- Atkins	Severe: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
BeB---- Berks	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, large stones.	Droughty, depth to rock, large stones.
BeC, BeD---- Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
BrA---- Brinkerton	Slight---------	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Percs slowly, wetness, rooting depth.	Percs slowly, wetness, rooting depth.
BrB---- Brinkerton	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, rooting depth.	Percs slowly, wetness, rooting depth.
BxB---- Brinkerton	Moderate: slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, large stones.	Wetness, large stones, rooting depth.
CaB---- Cavode	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly.	Wetness, percs slowly.
CaC---- Cavode	Severe: slope.	Severe: piping, wetness.	Severe: no water.	Slope, percs slowly, frost action.	Wetness, percs slowly, slope.	Wetness, percs slowly, slope.
ClB---- Clymer	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Large stones---	Large stones.
ClC---- Clymer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
CmB---- Clymer	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Large stones---	Large stones.
CmC---- Clymer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
CoB---- Cookport	Moderate: depth to rock, slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth.	Rooting depth, percs slowly.
CoC---- Cookport	Severe: slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Slope, wetness, rooting depth.	Slope, rooting depth, percs slowly.
CxB---- Cookport	Moderate: depth to rock, slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, percs slowly, rooting depth.	Rooting depth, percs slowly.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
CxD---------- Cookport	Severe: slope.	Severe: piping.	Severe: no water.	Slope, percs slowly.	Wetness, rooting depth, slope.	Slope, rooting depth, percs slowly.
DeB---------- Dekalb	Severe: seepage.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, droughty, depth to rock.
DeC, DeD---------- Dekalb	Severe: seepage, slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Slope, large stones, droughty.
DxB---------- Dekalb	Severe: seepage.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Depth to rock, large stones.	Large stones, droughty, depth to rock.
DxD---------- Dekalb	Severe: seepage, slope.	Severe: piping, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, large stones, droughty.
ErB---------- Ernest	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, rooting depth, percs slowly.	Erodes easily, rooting depth.
ErC, ErD---------- Ernest	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, rooting depth.	Rooting depth, slope, erodes easily.
ExB---------- Ernest	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Large stones, wetness.	Large stones, rooting depth.
ExD---------- Ernest	Severe: slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, large stones, wetness.	Large stones, slope, rooting depth.
GlB---------- Gilpin	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, large stones.	Depth to rock, large stones.
GlC---------- Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
GmB---------- Gilpin	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Large stones, depth to rock.	Large stones, depth to rock.
GmD---------- Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
HaD---------- Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
HbD, HbF---------- Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, slope, too sandy.	Large stones, slope, droughty.
HcB*: Hazleton----------	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
Clymer----------	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Large stones---	Large stones.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
HcC*: Hazleton	Severe: seepage, slope.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Slope, large stones, too sandy.	Large stones, slope, droughty.
Clymer	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones.	Large stones, slope.
HdB*: Hazleton	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
Clymer	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Large stones---	Large stones.
LeB Leetonia	Severe: seepage.	Severe: seepage, large stones.	Severe: no water.	Deep to water	Large stones, too sandy.	Large stones, droughty.
MoB Monongahela	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
NoA Nolo	Moderate: depth to rock.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Percs slowly, wetness, rooting depth.	Wetness, percs slowly, rooting depth.
NoB Nolo	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Percs slowly, wetness, rooting depth.	Wetness, percs slowly, rooting depth.
NxB Nolo	Moderate: depth to rock, slope.	Severe: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, rooting depth, percs slowly.	Wetness, percs slowly, rooting depth.
Ph Philo	Severe: seepage.	Severe: piping.	Moderate: deep to water.	Flooding-------	Wetness--------	Favorable.
Po Pope	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
Pu Purdy	Slight---------	Severe: piping, hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
RaB Rayne	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
RaC, RbF Rayne	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
RcD*: Rayne	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Ru*: Rubble land. Dystrochrepts.						

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
TyA---------- Tyler	Slight---------	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
TyB---------- Tyler	Moderate: slope.	Severe: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Ud. Udifluvents						
Uo, Up. Udorthents						
Ur*. Urban land						
WhB---------- Wharton	Moderate: depth to rock, slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly.	Percs slowly.
WhC, WhD---------- Wharton	Severe: slope.	Moderate: thin layer, piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, slope, percs slowly.	Slope, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AlB---------- Allegheny	0-11	Silt loam--------	ML, CL, CL-ML	A-4	0	90-100	80-100	65-100	55-95	<35	NP-10
	11-47	Clay loam, loam, sandy clay loam.	ML, CL, SM, SC	A-4, A-6	0	90-100	80-100	65-95	35-80	<35	NP-15
	47-66	Clay loam, sandy loam, gravelly sandy loam.	SM, GC, ML, CL	A-4, A-6, A-2, A-1	0-5	65-100	55-100	35-95	20-75	<35	NP-15
Ar---------- Armagh	0-4	Silt loam--------	ML	A-4, A-6	0-5	95-100	90-100	80-95	75-85	---	---
	4-42	Silty clay loam, silty clay, shaly clay.	ML, CL, MH	A-4, A-6, A-7	0-5	80-95	65-90	60-85	55-85	35-55	9-25
	42-60	Silty clay, shaly clay loam, very shaly loam.	GC, SM, GM, SC	A-4, A-6, A-2, A-7	0-40	55-90	20-85	15-60	15-45	30-45	9-18
At---------- Atkins	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-95	20-40	3-20
	8-50	Silty clay loam, silt loam, sandy loam.	SM, SC, ML, CL	A-4, A-6	0-5	90-100	85-100	65-100	45-85	20-40	3-20
	50-60	Stratified silty clay loam to gravelly sandy loam.	SM, CL, GM, ML	A-2, A-4, A-6	0-15	60-100	60-100	50-95	30-85	20-40	1-15
BeB, BeC, BeD---- Berks	0-9	Shaly silt loam	GM, ML, GC, SC	A-2, A-4	0-20	50-80	45-70	40-60	30-55	25-36	5-10
	9-23	Shaly loam, very shaly loam, shaly silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	23-30	Shaly loam, very shaly loam, shaly silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
BrA, BrB---------- Brinkerton	0-7	Silt loam--------	ML	A-4, A-6	0-10	90-100	85-100	85-100	75-100	---	---
	7-28	Silty clay loam, silt loam.	ML	A-4, A-6, A-7	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	28-47	Silt loam, shaly loam, channery silty clay loam.	ML	A-4, A-6, A-7	0-10	75-100	70-100	65-100	55-100	30-45	5-15
	47-62	Silt loam, shaly loam, channery silt loam.	ML, SM, SC, CL	A-4, A-6, A-2	0-50	70-90	35-85	30-85	25-75	30-40	5-15
BxB---------- Brinkerton	0-7	Very stony silt loam.	ML	A-4, A-6	3-20	90-100	85-100	85-100	75-100	---	---
	7-28	Silty clay loam, silt loam.	ML	A-4, A-6, A-7	0-10	90-100	85-100	85-100	65-100	30-45	5-15
	28-47	Silt loam, shaly loam, channery silty clay loam.	ML	A-4, A-6, A-7	0-10	75-100	70-100	65-100	55-100	30-45	5-15
	47-62	Silt loam, shaly loam, channery silt loam.	ML, SM, SC, CL	A-4, A-6, A-2	0-50	70-90	35-85	30-85	25-75	30-40	5-15
CaB, CaC---------- Cavode	0-7	Silt loam--------	ML, CL	A-4	0-5	90-100	80-100	80-95	75-95	---	---
	7-42	Silty clay loam, silty clay, clay.	ML, CL, CL-ML	A-4, A-7, A-6	0-5	85-100	80-100	80-95	70-95	25-50	4-20
	42-63	Shaly silty clay loam, silty clay, clay.	ML, CL, GC, GM	A-2, A-4, A-6	0-45	50-100	35-100	30-80	25-75	25-45	2-15

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ClB, ClC--------- Clymer	0-7	Channery loam----	ML, SM, GM	A-2, A-4	0-15	60-80	50-70	45-65	30-60	<30	NP-9
	7-38	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	<32	NP-9
	38-49	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	<32	NP-9
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
CmB, CmC--------- Clymer	0-7	Very stony loam	ML, SM, GM	A-4, A-2	3-30	60-100	50-95	45-90	30-85	<30	NP-9
	7-38	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	<32	NP-9
	38-49	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	<32	NP-9
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
CoB, CoC--------- Cookport	0-9	Channery loam----	ML, CL, SM, SC	A-2, A-4, A-6	0-15	75-100	60-70	50-60	30-55	20-40	1-15
	9-22	Sandy clay loam, clay loam, channery loam.	CL, SC, ML-CL, SL-SM	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	22-40	Sandy clay loam, clay loam, channery loam.	CL, SC, ML-CL, SC-SM	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	40-49	Very channery sandy loam, channery loam.	ML, CL, SM-SC, GM-GC	A-2, A-4, A-6	0-15	60-100	50-95	40-95	30-75	20-40	1-15
	49	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CxB, CxD--------- Cookport	0-9	Very stony loam	ML, CL, SM, SC	A-2, A-4, A-6	2-40	75-95	60-70	50-60	30-55	20-40	1-15
	9-22	Sandy clay loam, clay loam, channery loam.	CL, SC, ML-CL, SC-SM	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	22-40	Sandy clay loam, clay loam, channery loam.	CL, SC, ML-CL, SC-SM	A-4, A-6	0-15	85-100	65-100	55-95	40-75	20-40	4-20
	40-49	Very channery sandy loam, channery loam.	ML, CL, SM-SC, GM-GC	A-2, A-4, A-6	0-15	60-100	50-95	40-95	30-75	20-40	1-15
	49	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
DeB, DeC, DeD---- Dekalb	0-3	Channery loam----	SM, GM, ML, CL-ML	A-2, A-4, A-1	0-30	50-90	45-80	40-75	20-55	<32	NP-9
	3-23	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	<32	NP-9
	23-31	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	<32	NP-9
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DxB, DxD--------- Dekalb	0-3	Very stony loam	SM, GM, ML, CL-ML	A-2, A-4, A-1	10-30	50-90	45-80	40-75	20-55	<32	NP-9
	3-23	Channery sandy loam, channery loam, very channery sandy loam.	SM, GM, ML, GM-GC	A-2, A-4, A-1	5-40	50-85	40-80	40-75	20-55	<32	NP-9
	23-31	Channery sandy loam, flaggy sandy loam, very flaggy loamy sand.	SM, GM, SC, GC	A-2, A-4, A-1	10-50	45-85	25-75	20-65	15-40	<32	NP-9
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ErB, ErC, ErD---- Ernest	0-3	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-10	85-100	80-100	70-95	60-95	20-40	4-15
	3-24	Silty clay loam, silt loam, channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-15	75-95	70-95	65-90	55-90	25-50	6-22
	24-47	Channery silt loam, channery loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	55-95	55-90	45-90	20-45	4-18
	47-60	Channery silt loam, silt loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	45-95	45-90	40-90	25-50	6-22
ExB, ExD--------- Ernest	0-3	Very stony silt loam.	ML, CL, CL-ML	A-4, A-6	3-15	65-80	60-80	55-75	55-70	20-40	4-15
	3-24	Silty clay loam, silt loam, channery silt loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-15	75-95	70-95	65-90	55-90	25-50	6-22
	24-47	Channery silt loam, channery loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	55-95	55-90	45-90	20-45	4-18
	47-60	Channery silt loam, silt loam, silty clay loam.	ML, CL, GM, SC	A-4, A-6, A-7	0-20	70-95	45-95	45-90	40-90	25-50	6-22
GlB, GlC--------- Gilpin	0-9	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	9-26	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	26-31	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GmB, GmD--------- Gilpin	0-9	Very stony silt loam.	GC, CL, SC, CL-ML	A-2, A-4, A-6	10-40	50-90	45-85	35-75	30-70	20-40	4-15
	9-26	Shaly silt loam, channery loam, silty clay loam.	GM-GC, CL, CL-ML, SC	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	26-31	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HaD---------- Hazleton	0-4	Channery loam----	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	---	---
	4-46	Channery sandy loam, loam, very channery loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	46-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	0-60	55-80	35-75	25-65	15-50	<30	NP-8
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HbD, HbF---------- Hazleton	0-4	Very stony loam	ML, GM, SM	A-4, A-2	5-15	60-85	50-80	50-70	35-55	---	---
	4-46	Channery sandy loam, channery loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	46-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-60	55-80	35-75	25-65	15-50	<30	NP-8
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
HcB*, HcC*: Hazleton--------	0-4	Channery loam----	ML, GM, SM	A-2, A-4	0-15	60-85	60-80	60-75	35-55	---	---
	4-46	Channery sandy loam, loam, very channery loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	46-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	0-60	55-80	35-75	25-65	15-50	<30	NP-8
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Clymer----------	0-7	Channery loam----	ML, SM, GM	A-2, A-4	0-15	60-80	50-70	45-65	30-60	<30	NP-9
	7-38	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	<32	NP-9
	38-49	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	<32	NP-9
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
HdB*: Hazleton--------	0-4	Very stony loam	ML, GM, SM	A-4, A-2	5-15	60-85	50-80	50-70	35-55	---	---
	4-46	Channery sandy loam, channery loam, loam.	GM, SM, ML, SC	A-2, A-4, A-1	0-50	60-95	45-90	35-70	20-55	<30	NP-8
	46-55	Channery loam, very channery sandy loam, very channery loamy sand.	GM, SM, SC, GC	A-2, A-1, A-4	5-60	55-80	35-75	25-65	15-50	<30	NP-8
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HdB*:											
Clymer----------	0-7	Very stony loam	ML, SM, GM	A-4, A-2	3-30	60-100	50-95	45-90	30-85	<30	NP-9
	7-38	Sandy loam, channery loam, channery clay loam.	GM, SM, GC, ML	A-2, A-4	0-20	60-95	50-95	45-85	30-60	<32	NP-9
	38-49	Channery loam, very channery loam, channery sandy loam.	GM, GP-GM, GC, SM	A-1, A-2, A-3, A-4	10-30	30-75	25-70	20-60	5-40	<32	NP-9
	49	Weathered bedrock	---	---	---	---	---	---	---	---	---
LeB---------- Leetonia	0-7	Very stony loamy fine sand.	GW, GM, SW, SM	A-1, A-2, A-3	5-20	45-85	35-70	20-55	2-20	---	NP
	7-15	Gravelly loamy sand, very gravelly loam.	GW, GM, SW, SM	A-1, A-2, A-3	15-50	45-85	25-70	20-55	2-20	---	NP
	15-41	Very gravelly sand, very gravelly loamy sand.	GW, GM, SW, SM	A-1	20-40	45-70	35-65	20-35	2-15	---	NP
	41	Unweathered bedrock.	GW, GM, SW, SM	---	---	---	---	---	---	---	---
MoB---------- Monongahela	0-8	Silt loam--------	ML, SM, CL-ML, SM-SC	A-4	0-5	90-100	85-100	75-100	45-90	20-35	1-10
	8-25	Silt loam, clay loam, gravelly loam.	ML, CL, CL-ML	A-4, A-6	0-15	90-100	80-100	75-100	70-90	20-40	5-15
	25-64	Silt loam, sandy clay loam, gravelly loam.	ML, CL, SM, SC	A-4, A-6	0-10	80-100	60-100	55-95	45-95	20-40	3-15
NoA, NoB---------	0-5	Loam----------	ML	A-4	0-5	90-100	90-100	80-100	55-90	---	---
Nolo	5-17	Silt loam, channery clay loam, channery sandy clay loam.	ML, CL-ML	A-4, A-6	0-15	80-100	80-100	80-95	55-85	25-40	4-11
	17-55	Loam, channery sandy clay loam, channery clay loam.	CL-ML, GC, SC, CL	A-4, A-6	0-15	60-100	60-90	55-85	35-70	25-35	4-11
	55	Weathered bedrock	---	---	---	---	---	---	---	---	---
NxB----------	0-5	Very stony loam	ML	A-4	3-15	75-100	75-100	70-100	60-90	---	---
Nolo	5-17	Silt loam, channery clay loam, channery sandy clay loam.	ML, CL-ML	A-6, A-4	0-15	80-100	80-100	80-95	55-85	25-40	4-11
	17-55	Loam, channery sandy clay loam, channery clay loam.	CL-ML, GC, SC, CL	A-4, A-6	0-15	60-100	60-90	55-85	35-70	25-35	4-11
	55	Weathered bedrock	---	---	---	---	---	---	---	---	---
Ph---------- Philo	0-9	Silt loam--------	ML, SM, CL-ML	A-4	0-5	95-100	80-100	85-90	60-80	20-35	1-10
	9-43	Silt loam, loam, sandy loam.	ML, SM, CL-ML	A-4	0-5	95-100	75-100	70-90	45-80	20-35	1-10
	43-62	Stratified sand to silt loam.	GM, SM, ML, CL-ML	A-2, A-4	0-5	60-95	50-90	40-85	30-80	15-30	1-10
Po---------- Pope	0-6	Loam----------	ML, CL, SM, CL-ML	A-4	0	85-100	75-100	70-100	45-90	<30	NP-10
	6-40	Fine sandy loam, sandy loam, loam.	SM, SM-SC, ML, CL-ML	A-2, A-4	0	95-100	80-100	51-95	25-75	<30	NP-7
	40-68	Sandy loam, loamy sand.	SM, SM-SC, ML, GM	A-2, A-1, A-4	0-20	45-100	35-100	30-95	15-70	<30	NP-7

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pu---------- Purdy	0-6	Silt loam--------	ML, CL	A-4, A-6, A-7	0	95-100	90-100	90-100	90-100	25-50	4-20
	6-44	Silty clay, clay, clay loam.	CL, CH, MH	A-6, A-7	0	95-100	90-100	85-100	75-85	30-65	11-30
	44-60	Silty clay, clay loam, clay.	CL, CH, MH	A-6, A-7	0	95-100	90-100	85-100	70-95	30-65	11-30
RaB, RaC---------- Rayne	0-9	Silt loam--------	ML, CL	A-4	0-5	85-100	80-100	70-85	60-80	---	---
	9-38	Loam, shaly silty clay loam, channery clay loam.	GM, ML, GC, CL	A-4, A-6, A-2	0-15	60-95	55-85	40-85	30-60	20-40	2-15
	38-60	Channery sandy loam, shaly silt loam, very shaly silty clay loam.	SM, ML, GM, GP-GM	A-4, A-2, A-1	0-35	40-90	15-80	15-75	10-60	20-35	NP-10
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RbF---------- Rayne	0-9	Channery silt loam.	GM, ML, SM, CL	A-4	0-10	60-85	55-80	50-80	45-65	---	---
	9-38	Loam, shaly silty clay loam, channery clay loam.	GM, ML, GC, CL	A-4, A-6, A-2	0-15	60-95	55-85	40-85	30-60	20-40	2-15
	38-60	Channery sandy loam, shaly silt loam, very shaly silty clay loam.	SM, ML, GM, GP-GM	A-4, A-2, A-1	0-35	40-90	15-80	15-75	10-60	20-35	NP-10
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RcD*:											
Rayne----------	0-9	Silt loam--------	ML, CL	A-4	0-5	85-100	80-100	70-85	60-80	---	---
	9-38	Loam, shaly silty clay loam, channery clay loam.	GM, ML, GC, CL	A-4, A-6, A-2	0-15	60-95	55-85	40-85	30-60	20-40	2-15
	38-60	Channery sandy loam, shaly silt loam, very shaly silty clay loam.	SM, ML, GM, GP-GM	A-4, A-2, A-1	0-35	40-90	15-80	15-75	10-60	20-35	NP-10
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Gilpin----------	0-9	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	9-26	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	26-31	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ru*:											
Rubble land.											
Dystrochrepts.											
TyA, TyB---------- Tyler	0-7	Silt loam--------	ML	A-4	0	100	100	95-100	80-95	30-40	4-10
	7-20	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	100	95-100	85-100	25-45	8-20
	20-61	Silty clay loam, silt loam, clay loam.	CL	A-6, A-7, A-4	0	100	100	80-100	70-95	25-45	8-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ud. Udifluvents											
Uo, Up. Udorthents											
Ur*. Urban land											
WhB, WhC, WhD---- Wharton	0-8	Silt loam--------	ML, CL	A-4, A-6	0-5	95-100	90-100	80-95	70-90	---	---
	8-50	Clay loam, shaly silty clay loam, shaly silt loam.	ML, CL	A-7, A-6	0-25	75-100	70-100	65-95	60-90	35-45	10-25
	50-60	Silt loam, shaly clay, very shaly silt loam.	ML, GM, SM	A-4, A-6, A-7, A-2	0-50	45-100	30-100	25-95	25-90	30-45	5-15
	69	Weathered bedrock	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm^3	In/hr	In/in	pH				Pct
AlB----------	0-11	15-27	1.20-1.40	0.6-2.0	0.12-0.22	3.6-5.5	Low----------	0.32	4	1-4
Allegheny	11-47	18-35	1.20-1.50	0.6-2.0	0.13-0.18	3.6-5.5	Low----------	0.28		
	47-66	10-35	1.20-1.40	0.6-2.0	0.08-0.17	3.6-5.5	Low----------	0.28		
Ar----------	0-4	15-32	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.24	3	1-4
Armagh	4-42	35-55	1.30-1.60	0.06-0.2	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	42-60	15-55	1.20-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.24		
At----------	0-8	18-30	1.20-1.40	0.6-2.0	0.14-0.22	4.5-5.5	Low----------	0.32	4	2-4
Atkins	8-50	18-35	1.20-1.50	0.06-2.0	0.14-0.18	4.5-5.5	Low----------	0.32		
	50-60	10-35	1.20-1.50	0.2-6.0	0.08-0.18	4.5-5.5	Low----------	0.28		
BeB, BeC, BeD----	0-9	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	.5-3
Berks	9-23	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	23-30	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low----------	0.17		
	30	---	---	---	---	---	----------	----		
BrA, BrB---------	0-7	15-30	1.20-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.32	3	1-4
Brinkerton	7-28	15-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37		
	28-47	15-35	1.40-1.70	0.06-0.2	0.08-0.12	4.5-6.0	Moderate-----	0.32		
	47-62	15-25	1.20-1.60	0.06-0.6	0.14-0.18	5.1-6.5	Low----------	0.20		
BxB----------	0-7	15-35	1.20-1.40	0.6-2.0	0.18-0.24	4.5-6.0	Low----------	0.24	3-2	---
Brinkerton	7-28	15-35	1.20-1.50	0.6-2.0	0.14-0.18	4.5-6.0	Moderate-----	0.37		
	28-47	15-35	1.40-1.70	0.06-0.2	0.08-0.12	4.5-6.0	Moderate-----	0.32		
	47-62	15-25	1.20-1.60	0.06-0.6	0.14-0.18	5.1-6.5	Low----------	0.20		
CaB, CaC---------	0-7	15-35	1.20-1.40	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37	3	2-4
Cavode	7-42	35-45	1.20-1.50	0.06-0.2	0.10-0.14	4.5-5.5	Moderate-----	0.24		
	42-63	35-45	1.20-1.50	0.06-0.2	0.08-0.12	4.5-5.5	Moderate-----	0.24		
ClB, ClC---------	0-7	15-27	1.20-1.40	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.20	3	1-4
Clymer	7-38	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	38-49	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low----------	0.15		
	49	---	---	---	---	---	----------	----		
CmB, CmC---------	0-7	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.17	3	---
Clymer	7-38	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	38-49	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low----------	0.15		
	49	---	---	---	---	---	----------	----		
CoB, CoC---------	0-9	10-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.24	3	1-4
Cookport	9-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	22-40	18-35	1.40-1.70	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.24		
	40-49	10-27	1.20-1.50	0.2-0.6	0.08-0.12	3.6-5.5	Low----------	0.24		
	49	---	---	---	---	---	----------	----		
CxB, CxD---------	0-9	10-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.24	3	---
Cookport	9-22	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24		
	22-40	18-35	1.40-1.70	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.24		
	40-49	10-27	1.20-1.50	0.2-0.6	0.08-0.12	3.6-5.5	Low----------	0.24		
	49	---	---	---	---	---	----------	----		
DeB, DeC, DeD,										
DxB, DxD---------	0-3	10-20	1.20-1.50	2.0-20	0.08-0.12	3.6-6.5	Low----------	0.17	2	2-4
Dekalb	3-23	7-18	1.20-1.50	2.0-20	0.06-0.12	3.6-5.5	Low----------	0.17		
	23-31	5-15	1.20-1.50	>6.0	0.05-0.10	3.6-5.5	Low----------	0.17		
	31	---	---	---	---	---	----------	----		
ErB, ErC, ErD----	0-3	15-20	1.20-1.40	0.6-2.0	0.14-0.20	4.5-5.5	Low----------	0.43	3	2-4
Ernest	3-24	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.32		
	24-47	18-30	1.40-1.70	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.32		
	47-60	20-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.32		

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
ExB, ExD----------	0-3	15-20	1.20-1.40	0.6-2.0	0.12-0.18	4.5-5.5	Low----------	0.32	3	---
Ernest	3-24	20-35	1.30-1.50	0.6-2.0	0.12-0.16	4.5-5.5	Moderate-----	0.32		
	24-47	18-30	1.40-1.70	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.32		
	47-60	20-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.32		
GlB, GlC----------	0-9	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24	3	1-4
Gilpin	9-26	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24		
	26-31	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low----------	0.24		
	31	---	---	---	---	---	----------	----		
GmB, GmD----------	0-9	15-27	1.20-1.40	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.24	3	---
Gilpin	9-26	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24		
	26-31	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low----------	0.24		
	31	---	---	---	---	---	----------	----		
HaD----------	0-4	7-18	1.20-1.40	2.0-6.0	0.10-0.14	3.6-5.5	Low----------	0.17	3	2-4
Hazleton	4-46	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.15		
	46-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low----------	0.15		
	55	---	---	---	---	---	----------	----		
HbD, HbF----------	0-4	7-18	1.20-1.40	2.0-6.0	0.10-0.16	3.6-5.5	Low----------	0.15	3	2-4
Hazleton	4-46	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.15		
	46-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low----------	0.15		
	55	---	---	---	---	---	----------	----		
HcB*, HcC*:										
Hazleton--------	0-4	7-18	1.20-1.40	2.0-6.0	0.10-0.14	3.6-5.5	Low----------	0.17	3	2-4
	4-46	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.15		
	46-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low----------	0.15		
	55	---	---	---	---	---	----------	----		
Clymer----------	0-7	15-27	1.20-1.40	0.6-2.0	0.10-0.14	3.6-5.5	Low----------	0.20	3	1-4
	7-38	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	38-49	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low----------	0.15		
	49	---	---	---	---	---	----------	----		
HdB*:										
Hazleton--------	0-4	7-18	1.20-1.40	2.0-6.0	0.10-0.16	3.6-5.5	Low----------	0.15	3	2-4
	4-46	7-18	1.20-1.40	2.0-20	0.08-0.12	3.6-5.5	Low----------	0.15		
	46-55	5-15	1.20-1.40	2.0-20	0.04-0.10	3.6-5.5	Low----------	0.15		
	55	---	---	---	---	---	----------	----		
Clymer----------	0-7	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.17	3	---
	7-38	18-30	1.20-1.50	0.6-2.0	0.08-0.14	3.6-5.5	Low----------	0.15		
	38-49	15-27	1.20-1.40	0.6-2.0	0.04-0.08	3.6-5.5	Low----------	0.15		
	49	---	---	---	---	---	----------	----		
LeB----------	0-7	3-10	1.10-1.30	2.0-6.0	0.03-0.05	3.6-5.0	Low----------	0.17	3	---
Leetonia	7-15	3-15	1.10-1.30	2.0-6.0	0.03-0.05	3.6-5.0	Low----------	0.17		
	15-41	3-10	1.10-1.30	6.0-20	0.02-0.03	3.6-5.0	Low----------	0.17		
	41	---	---	---	---	---	----------	----		
MoB----------	0-8	10-27	1.20-1.40	0.6-2.0	0.18-0.24	4.5-5.5	Low----------	0.43	3	2-4
Monongahela	8-25	18-35	1.30-1.50	0.6-2.0	0.14-0.18	4.5-5.5	Low----------	0.43		
	25-64	18-35	1.30-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.43		
NoA, NoB----------	0-5	10-20	1.20-1.40	0.6-2.0	0.16-0.20	3.6-5.0	Low----------	0.32	3	1-3
Nolo	5-17	18-35	1.30-1.40	0.6-2.0	0.12-0.16	3.6-5.0	Low----------	0.32		
	17-55	18-35	1.30-1.60	0.06-0.2	0.06-0.10	3.6-5.0	Low----------	0.17		
	55	---	---	---	---	---	----------	----		
NxB----------	0-5	10-20	1.20-1.40	0.6-2.0	0.14-0.20	3.6-5.0	Low----------	0.24	3	---
Nolo	5-17	18-35	1.30-1.50	0.6-2.0	0.12-0.16	3.6-5.0	Low----------	0.28		
	17-55	18-35	1.30-1.60	0.06-0.2	0.06-0.10	3.6-5.0	Low----------	0.17		
	55	---	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
								K	T	
	In	Pct	G/cm³	In/hr	In/in	pH				Pct
Ph----------	0-9	10-18	1.20-1.40	0.6-2.0	0.14-0.20	4.5-6.0	Low----------	0.37	5	2-4
Philo	9-43	10-18	1.20-1.40	0.6-2.0	0.10-0.20	4.5-6.0	Low----------	0.32		
	43-62	5-18	1.20-1.40	2.0-6.0	0.06-0.10	4.5-6.0	Low----------	0.24		
Po----------	0-6	5-15	1.20-1.40	0.6-2.0	0.14-0.23	3.6-5.5	Low----------	0.37	5	1-4
Pope	6-40	5-18	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low----------	0.28		
	40-68	5-20	1.30-1.60	0.6-6.0	0.10-0.18	3.6-5.5	Low----------	0.28		
Pu----------	0-6	18-35	1.30-1.50	0.2-0.6	0.18-0.24	3.6-5.5	Moderate-----	0.43	3	2-4
Purdy	6-44	35-50	1.30-1.60	<0.2	0.12-0.18	3.6-5.5	Moderate-----	0.32		
	44-60	35-50	1.30-1.60	<0.2	0.10-0.16	3.6-5.5	Moderate-----	0.32		
RaB, RaC----------	0-9	10-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-5.5	Low----------	0.28	3	1-3
Rayne	9-38	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.20		
	38-60	10-30	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.20		
	60	---	---	---	---	---	----------	----		
RbF----------	0-9	10-27	1.20-1.40	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.20	3	1-3
Rayne	9-38	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.20		
	38-60	10-30	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.20		
	60	---	---	---	---	---	----------	----		
RcD*:										
Rayne----------	0-9	10-27	1.20-1.40	0.6-2.0	0.14-0.18	4.5-5.5	Low----------	0.28	3	1-3
	9-38	18-35	1.40-1.60	0.6-2.0	0.12-0.16	4.5-5.5	Low----------	0.20		
	38-60	10-30	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	Low----------	0.20		
	60	---	---	---	---	---	----------	----		
Gilpin----------	0-9	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24	3	1-4
	9-26	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24		
	26-31	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low----------	0.24		
	31	---	---	---	---	---	----------	----		
Ru*:										
Rubble land.										
Dystrochrepts.										
TyA, TyB----------	0-7	14-26	1.30-1.50	0.6-2.0	0.18-0.22	3.6-6.5	Low----------	0.43	3	2-4
Tyler	7-20	20-33	1.40-1.60	0.2-0.6	0.16-0.20	3.6-5.5	Moderate-----	0.43		
	20-61	18-33	1.60-1.85	<0.2	0.04-0.12	3.6-5.5	Low----------	0.43		
Ud.										
Udifluvents										
Uo, Up.										
Udorthents										
Ur*.										
Urban land										
WhB, WhC, WhD----	0-8	15-25	1.10-1.30	0.6-2.0	0.16-0.20	4.5-5.5	Low----------	0.37	3	1-4
Wharton	8-50	15-35	1.20-1.50	0.06-0.6	0.12-0.16	4.5-5.5	Moderate-----	0.24		
	50-60	20-45	1.20-1.60	0.06-0.6	0.08-0.12	4.5-5.5	Moderate-----	0.17		
	69	---	---	---	---	---	----------	----		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AlB---------- Allegheny	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Ar---------- Armagh	D	None--------	---	---	0-0.5	Apparent	Oct-Jun	40-60	Soft	High-----	High-----	High.
At---------- Atkins	D	Frequent----	Very brief	Sep-Jul	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	Moderate.
BeB, BeC, BeD----- Berks	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	Low------	High.
BrA, BrB, BxB----- Brinkerton	D	None--------	---	---	0-0.5	Perched	Oct-May	>60	---	High-----	High-----	High.
CaB, CaC---------- Cavode	C	None--------	---	---	0.5-1.5	Perched	Oct-May	40-72	Soft	High-----	High-----	High.
ClB, ClC, CmB, CmC---------- Clymer	B	None--------	---	---	>6.0	---	---	40-70	Hard	Moderate	Low------	High.
CoB, CoC, CxB, CxD---------- Cookport	C	None--------	---	---	1.5-2.5	Perched	Dec-Apr	40-70	Hard	Moderate	Moderate	Moderate.
DeB, DeC, DeD, DxB, DxD--------- Dekalb	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
ErB, ErC, ErD, ExB, ExD--------- Ernest	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	Moderate	Moderate.
GlB, GlC, GmB, GmD---------- Gilpin	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
HaD, HbD, HbF----- Hazleton	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
HcB*, HcC*, HdB*: Hazleton---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
Clymer----------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Low------	High.
LeB---------- Leetonia	C	None--------	---	---	>6.0	---	---	40-60	Hard	Low------	Low------	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MoB---------- Monongahela	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High-----	High.
NoA, NoB, NxB----- Nolo	D	None--------	---	---	0-0.5	Perched	Sep-Jun	40-60	Soft	High-----	High-----	High.
Ph---------- Philo	B	Occasional	Very brief	Dec-May	1.5-3.0	Apparent	Dec-Apr	>40	Hard	Moderate	Low------	High.
Po---------- Pope	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Pu---------- Purdy	D	None--------	---	---	0-1.0	Apparent	Nov-Jun	>60	---	High-----	High-----	High.
RaB, RaC, RbF----- Rayne	B	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Low------	High.
RcD*:												
Rayne----------	B	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Low------	High.
Gilpin----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Ru*: Rubble land.												
Dystrochrepts.												
TyA, TyB---------- Tyler	D	None--------	---	---	0.5-2.0	Perched	Nov-May	>60	---	High-----	High-----	High.
Ud. Udifluvents												
Uo, Up. Udorthents												
Ur*. Urban land												
WhB, WhC, WhD----- Wharton	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>40	Soft	High-----	High-----	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Allegheny	Fine-loamy, mixed, mesic Typic Hapludults
Armagh	Clayey, mixed, mesic Typic Ochraquults
Atkins	Fine-loamy, mixed, acid, mesic Typic Fluvaquents
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Brinkerton	Fine-silty, mixed, mesic Typic Fragiaqualfs
Cavode	Clayey, mixed, mesic Aeric Ochraquults
Clymer	Fine-loamy, mixed, mesic Typic Hapludults
Cookport	Fine-loamy, mixed, mesic Aquic Fragiudults
Dekalb	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Dystrochrepts	Dystrochrepts
Ernest	Fine-loamy, mixed, mesic Aquic Fragiudults
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hazleton	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Leetonia	Sandy-skeletal, siliceous, mesic Entic Haplorthods
Monongahela	Fine-loamy, mixed, mesic Typic Fragiudults
Nolo	Fine-loamy, mixed, mesic Typic Fragiaquults
Philo	Coarse-loamy, mixed, mesic Fluvaquentic Dystrochrepts
Pope	Coarse-loamy, mixed, mesic Fluventic Dystrochrepts
Purdy	Clayey, mixed, mesic Typic Ochraquults
Rayne	Fine-loamy, mixed, mesic Typic Hapludults
Tyler	Fine-silty, mixed, mesic Aeric Fragiaquults
Udifluvents	Udifluvents
Udorthents	Udorthents
Wharton	Fine-loamy, mixed, mesic Aquic Hapludults

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