SOIL SURVEY OF

Huntingdon County, Pennsylvania

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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. 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 who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1964-73. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1974. 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. It is part of the technical assistance furnished to the Huntingdon County Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, and recreation.

Locating Soils

All the soils of Huntingdon County are shown on the detailed map at the back of this publication. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Index to Mapping Units" on page ii lists all the soils in Huntingdon County in alphabetic order by map symbol and shows the page where each soil is described. The capability subclass to which each soil has been assigned is indicated at the end of the soil description.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay on the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussions of the capability units and the woodland interpretations.

Foresters and others can refer to the section "Woodland," where the soils of the county are rated according to their suitability for trees.

Game managers, sportsmen, and others can find information about soils and wildlife in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for dwellings, industrial buildings, and recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Newcomers in Huntingdon County may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the information about the county given in the section "General Nature of the County."

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Issued November 1978

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Summary of Tables

SOIL SURVEY OF HUNTINGDON COUNTY, PENNSYLVANIA

By Edward J. Merkel, Soil Conservation Service

Field survey by Edward J. Merkel, Thomas J. Craft, and Gerald D. Yoder, Soil Conservation Service

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

HUNTINGDON COUNTY is in the south-central part of Pennsylvania (fig. 1). It has a total area of 895 square miles, or 572,480 acres. The county is in the Ridge and Valley Province. Mountains and steep hills that have narrow ridgetops dominate the landscape, but some moderately broad, level areas are on river terraces and flood plains along the Juniata River. Approximately 74 percent of the county is wooded.

The county is in the Susquehanna River basin. The Juniata River, which flows through the county in a southeasterly direction, divides the county into two major drainage basins. North of the river, Spruce Creek, Shaver Creek, and Standing Stone Creek flow in a southerly direction. South of the main river, the Aughwick Creek and Raystown Branch of the Juniata River flow in a northerly direction. All of these streams drain into the Juniata River within the county. Lake Raystown has an 8,300-acre recreational pool 27 miles long. It is impounded by an earth-filled dam constructed by the U.S. Army Corps of Engineers. It is on the Raystown Branch of the Juniata River south of the borough of Huntingdon.

The population of Huntingdon County, according to the 1970 census, was 39,108, and it has been relatively stable for the past 50 years. The borough of Huntingdon, the county seat, is on the Juniata River in about the center of the county. It had a population of 6,987 in 1970. Mount Union, which is located a few miles east of Huntingdon and is also along the Juniata River, had a population of 3,662 in 1970. The rest of the population in the county lives on farms, in smaller towns, or in new subdivision developments surrounding Huntingdon and Mount Union.

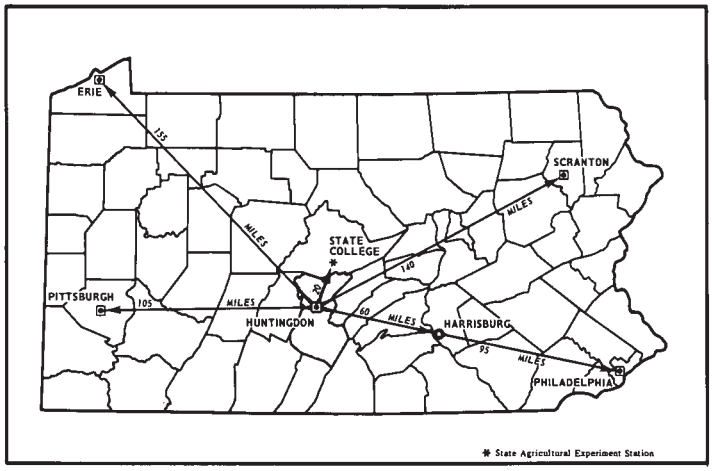

Figure 1.—Location of Huntingdon County in Pennsylvania.

Farming is an important industry in the county. Dairy farms predominate, but beef cattle, poultry, and fruit are also produced. Although farms are operated throughout the county, the major areas of farm production are in the limestone valley in the northwestern part of the county around Spruce Creek, along Shaver Creek, and to a lesser extent in Woodcock Valley. Others areas of the county, particularly those of soils derived from brown and red shale, were intensively cultivated in the past; but because these areas have steep slopes, are inaccessible to farm machinery, and have relatively low productivity, many that were farmed have reverted to woodland. The average size of farms in the county is 221.7 acres. According to the 1969 census, three farms were 1,000 acres or more.

Other important enterprises in the county are the harvesting of wood and the manufacturing of related products, quarrying operations, and some small to moderately large manufacturing industries. Because much of the county is wooded, forestry operations are conducted with farming or as a separate operation. Wood is cut for pulpwood and shipped to various papermaking plants outside the county. Some timber is used for construction, for making shipping pallets, for railroad ties, and, to some extent, for veneer furniture and tool handles. Several large limestone quarries are in the county. Road construction materials and agricultural lime are the main products. Sand suitable for construction uses, for bricks, and for glass is another natural resource in the county. Coal was once a major product of the Broad Top area in the southwestern part of the county. However, most of the coal supply that could be economically obtained is exhausted.

Tourist, recreational, and natural areas are abundant in the county. Two limestone caves, several State parks, and many acres of State forest and game lands are open to the public.

The transportation and access needs of the county are provided by one major U.S. Highway, Route 22, which parallels the Juniata River from east to west, and several State highways running north to south. The Pennsylvania Turnpike crosses the southwest

corner of the county. A major railroad line bisects the county, generally following the Juniata River.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Huntingdon County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose 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 that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. Hagerstown and Berks, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Hagerstown silt loam, 2 to 8 percent slopes, is one of several phases within the Hagerstown series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of other soils that have been seen within an area that is dominantly of a recognized soil phase.

Some mapping units are made up of soils of different series, or of different phases within one series. Three such kinds of mapping units are shown on the soil map of Huntingdon County: soil associations, soil complexes, and undifferentiated groups.

A soil complex consists of areas of two or more soils, so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Edom-Weikert complex, 3 to 8 percent slopes, is an example.

A soil association is made up of adjacent soils that are in areas large enough to be shown individually on the soil map but are shown as one unit because the time and effort of delineating them separately cannot be justified. There is a considerable degree of uniformity in pattern and relative extent of the dominant soils, but the soils may differ greatly from each other. The name of an association consists of the names of the dominant soils, joined by a hyphen. Hazleton-Dekalb association, steep, is an example.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. If there are two or more dominant series represented in the group, the name of the group ordinarily consists of the names of the dominant soils, joined by "and." Philo and Basher silt loams is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Urban land and Rubble land are examples.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or its high water table. They see that streets, road pavements, and foundations for houses are cracked on a named kind of soil and they relate this failure to the high shrink-swell potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by

further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Huntingdon County. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning on a watershed, a wooded tract, or a wildlife area or for broad planning of recreational facilities, community developments and such engineering works as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils within an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management. Some of the soil names and boundaries of the general soil map of Huntingdon County do not match those in earlier surveys. This is caused by differing patterns and distribution of soils between adjacent survey areas, by changes in legend design, and by changes in the concept of some series.

The soil associations in this survey area have been grouped into general kinds of landscapes for broad interpretative purposes. Each of the broad groups and the soil associations in it are described on the following pages.

Areas Dominated By Soils Formed In Material Weathered From Sandstone and Colluvium

The soils that make up these associations are mostly deep and well drained. Some of the soils, however, are moderately well drained, and some are somewhat poorly drained. All the soils in these associations formed on gently sloping to steep mountainsides and in intermountain valleys. The soil associations in this group are mostly in woodland.

1. Hazleton-Laidig-Buchanan association

Sloping to steep, deep, well drained to somewhat poorly drained soils that have a loamy subsoil; on mountain ridges and foot slopes

This association consists of soils that formed in material weathered from sandstone and some shale (fig. 2). It is on mountain ridges and foot slopes throughout the county. Most areas of the association are very stony or extremely stony.

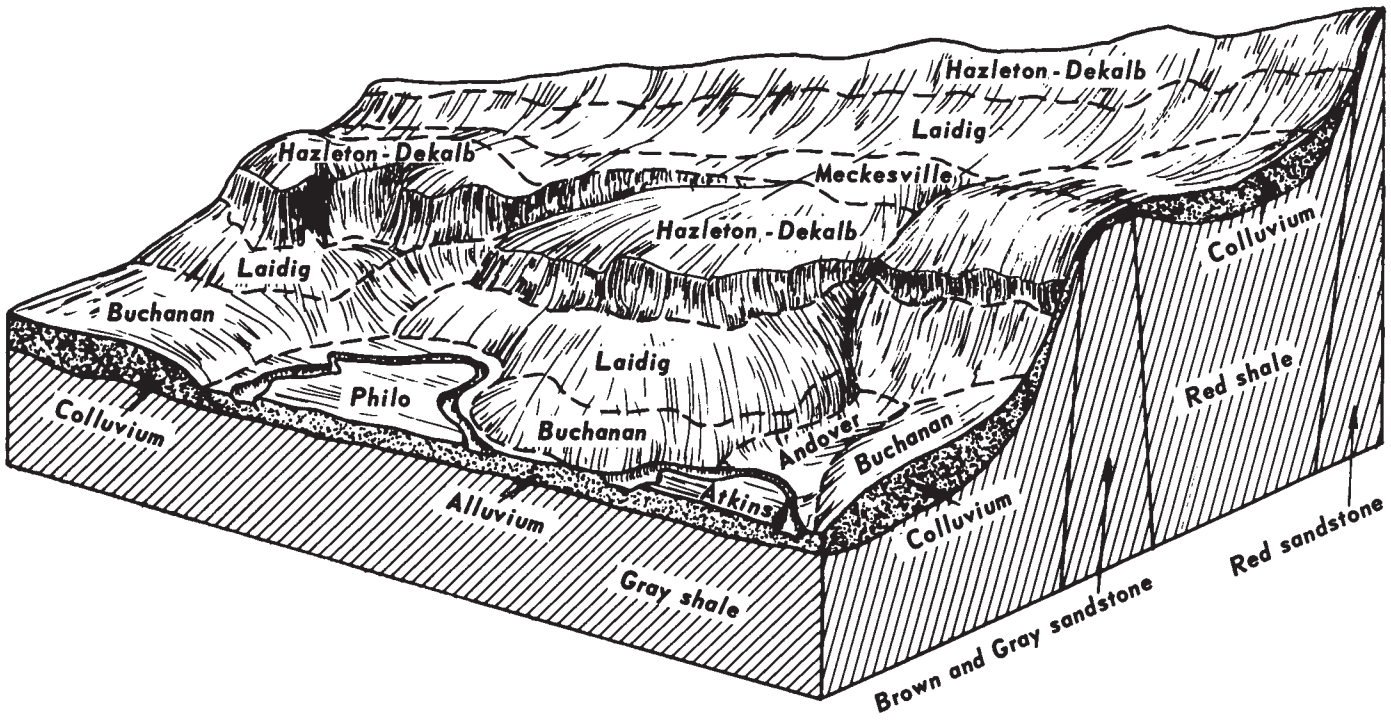

Figure 2.—**Pattern of soils and underlying material in association 1.**

This association makes up 33 percent of the county. It is about 29 percent Hazleton soils, 17 percent Laidig soils, 16 percent Buchanan soils, and 38 percent soils of minor extent.

The nearly level to steep Hazleton soils formed on mountain ridges and plateaus. The soils are deep and well drained. They have a moderately coarse textured and medium textured subsoil. In most areas of this association these soils are mapped in complexes with Dekalb soils.

The gently sloping to steep Laidig soils formed in colluvium that accumulated on upper foot slopes and lower mountain slopes. The soils are deep and well drained. They have a moderately coarse textured and moderately fine textured subsoil that has a fragipan.

The gently sloping to moderately steep Buchanan soils formed in colluvium that accumulated on lower foot slopes and mountain plateaus. The soils are deep and are moderately well drained and somewhat poorly drained. They have a medium textured and moderately fine textured subsoil that has a fragipan.

Minor in this association are Dekalb, Berks, Leetonia, Meckesville, Murrill, Albrights, and Andover soils on mountain ridges, plateaus, and lower foot slopes of mountains and Philo and Atkins soils along streams. Rubble land is also in this association.

This association is mainly wooded. Large areas are in game lands and State forests. A few small areas on the foot slopes have been cleared and are used mainly for pasture and hay. Stones and steep slopes limit the suitability of the soils for farming. The main limitations for town and country uses are slope, stones, depth to bedrock, and a seasonal high water table.

2. *Hazleton-Morrison-Vanderlip association*

Sloping to steep, deep, well drained soils that have a sandy and loamy subsoil; in intermountain valleys

This association consists of soils that formed in material weathered from fine grained sandstone (fig. 3). It is on relatively wide ridgetops within intermountain valleys in the central part of the county. The valleys in these areas are slightly below and between mountain crests.

This association makes up 9 percent of the county. It is about 30 percent Hazleton soils, 21 percent Morrison soils, 15 percent Vanderlip soils, and 34 percent soils of minor extent.

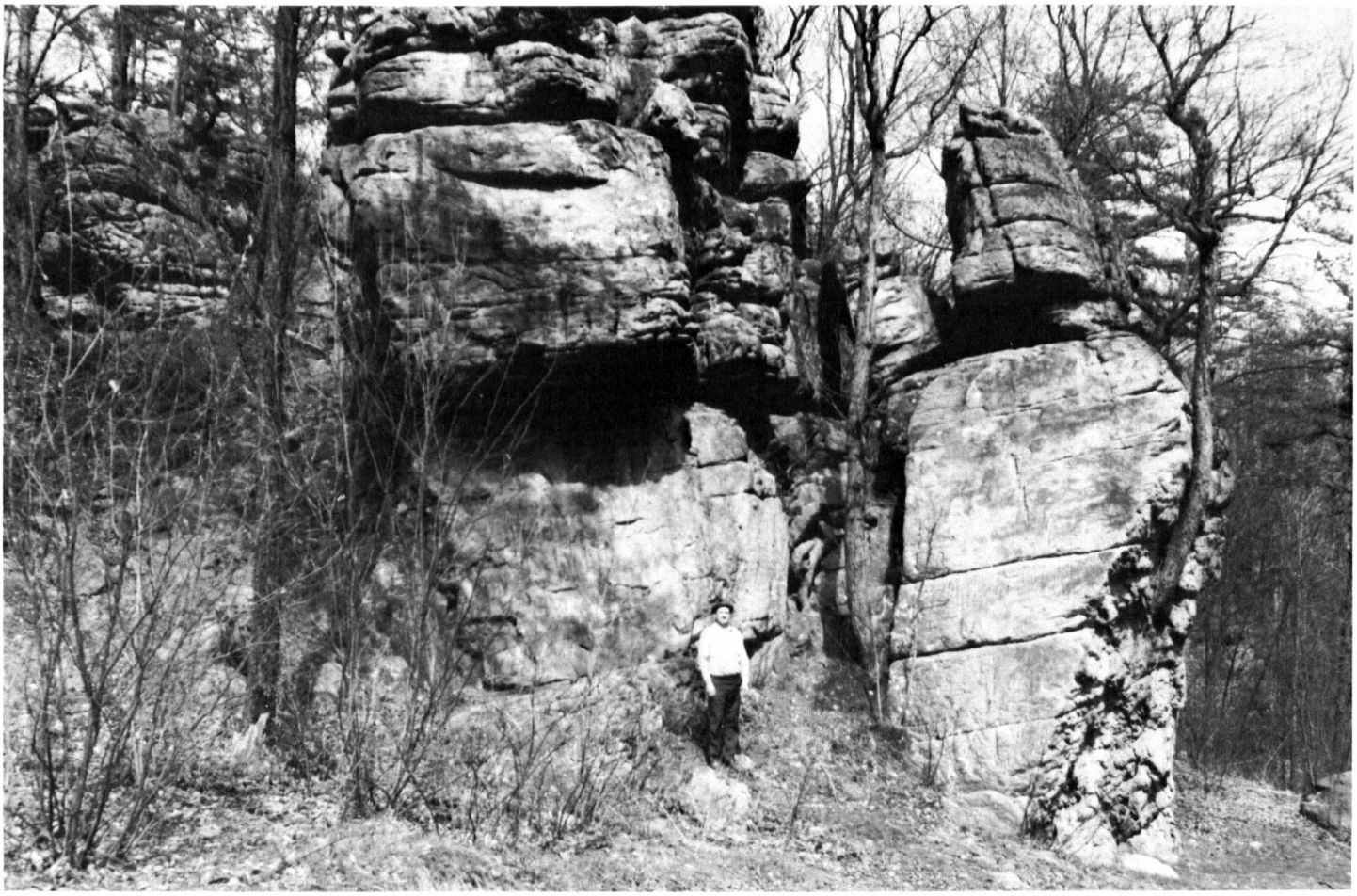

***Figure 3.*—Sandstone outcrop in area of Vanderlip soils in the Hazleton-Morrison-Vanderlip association. Rounded rock corners due to weathering of exposed bedrock is characteristic of this sandstone formation.**

The nearly level to steep Hazleton soils formed on ridges. The soils are deep and well drained. They have a moderately coarse textured and medium textured subsoil. Most areas of these soils are extremely stony. In most areas of this association, the Hazleton soils are mapped in complexes with Dekalb soils.

The gently sloping to moderately steep Morrison soils formed on upper sides of valleys. The soils are deep and well drained. They have a moderately fine textured subsoil. Some of these soils are very stony, and others are channery.

The gently sloping to steep Vanderlip soils are on tops and sides of ridges. The soils are deep and well drained. They have a coarse textured subsoil. Some areas of these soils have bedrock outcrops that have been rounded by weathering.

Minor in this association are Dekalb, Laidig, Buchanan, and Andover soils on ridges and in valleys. Rubble land is also in this association.

Most areas of this association remain wooded because the soils are too stony and steep for other uses. Farming is generally limited to the Morrison soils, and corn, hay, and other crops associated with dairy farming are grown. A few areas of Vanderlip soils are used for fruit orchards and as a source of sand. The major limitations for town and country use are slope, depth to bedrock, hazard of ground water contamination, and a moderately rapidly permeable to rapidly permeable subsoil.

3. *Hazleton-Clymer-Buchanan association*

Gently sloping to moderately steep, deep, well drained to somewhat poorly drained soils that have a loamy subsoil; mostly on broad mountaintops

This association consists of soils that formed in material weathered from fine grained sandstone and some shale (fig. 4). It is on relatively broad mountaintops in the southern part of the county.

This association makes up 5 percent of the county. It is about 29 percent Hazleton soils, 29 percent Clymer soils, 10 percent Buchanan soils, and 32 percent soils of minor extent.

The nearly level to steep Hazleton soils formed in place on mountaintops and mountainsides. These soils are deep and well drained. They have a moderately coarse textured and medium textured subsoil. In most areas of this association, the Hazleton soils are mapped in complexes with Dekalb soils. They are generally at a slightly higher elevation than Clymer soils. Most areas of Hazleton soils are extremely stony.

The mostly gently sloping to moderately steep Clymer soils are on broad mountaintops. These soils are deep and well drained. They have a medium textured and moderately fine textured subsoil. Some areas of these soils are very stony, and others are relatively free of stones.

The gently sloping to moderately steep Buchanan soils are in broad to relatively narrow, concave drainage areas. These soils are deep and somewhat poorly drained and moderately well drained. They have a moderately fine textured subsoil and a fragipan. Most areas of these soils are extremely stony.

Minor in this association are Dekalb, Berks, Laidig, and Andover soils on ridges and in valleys and Atkins soils along streams. Rubble land and strip mines on ridges are also in this association. Strip mines are areas of excavations and soil material produced during coal mining operations. These areas are indicated on the detailed soil map by name.

This association is mainly wooded. The stony and steep areas are better suited to trees, wildlife habitat, recreation, and watersheds than to other uses. Farming is generally limited to the Clymer soils, which are suitable for most general farm crops. The strip mining operations in the county are in this association. The major limitations for most town and country uses are slope, a seasonal high water table, and stones.

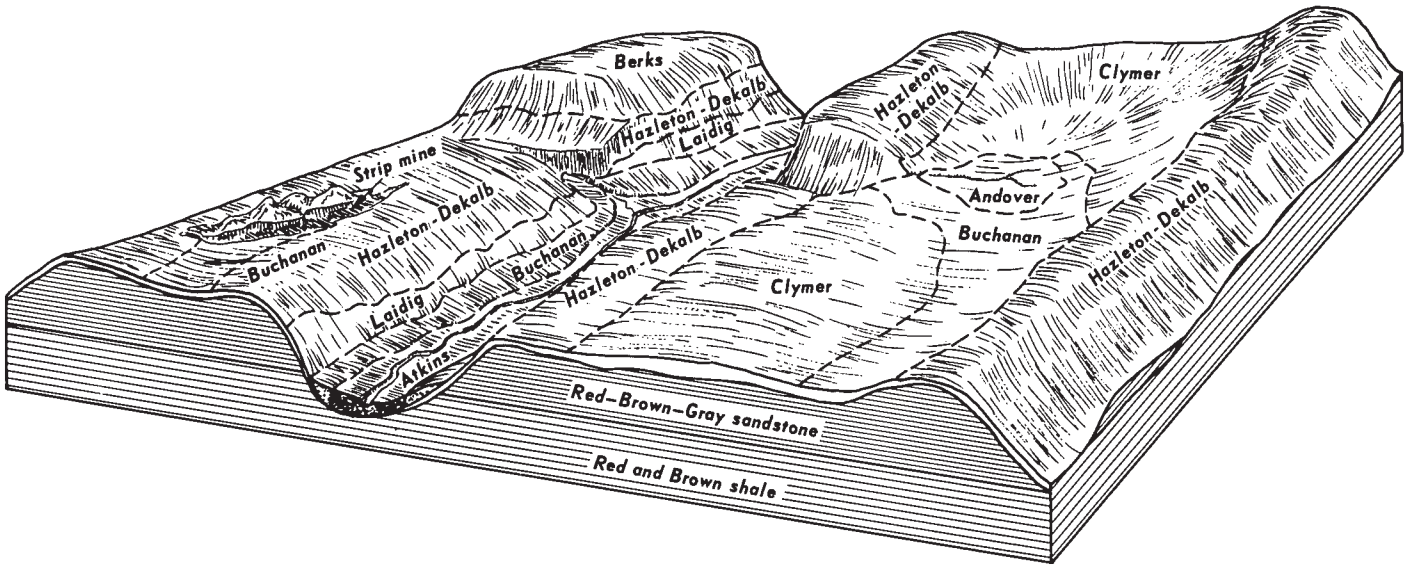

Figure 4.—**Pattern of soils and underlying material in association 3.**

4. Morrison-Vanderlip association

Gently sloping to moderately steep, deep, well drained soils that have a loamy and sandy subsoil; in intermountain valleys

This association consists of soils that formed in material weathered from fine grained sandstone and dolomitic limestone (fig. 5). It is on moderately broad and undulating hills and is in a few steep areas that are part of the low mountains that are in the center of the limestone valleys in the northern part of the county.

This association makes up 2 percent of the county. It is about 69 percent Morrison soils, 10 percent Vanderlip soils, and 21 percent soils of minor extent. The Morrison and Vanderlip soils are intermingled and are not in any pattern. The gently sloping to moderately steep Morrison soils are on hills, ridges, and narrow low mountains. These soils are deep and well drained. They have a moderately fine textured subsoil. Most areas of these soils are very stony.

The gently sloping to steep Vanderlip soils are on ridges, low mountains, and hills. These soils are deep and well drained. They have a coarse textured subsoil.

Minor in this association are Hazleton, Murrill, and Hublersburg soils on uplands and Buchanan soils along drainageways. Abandoned iron ore pits, sandpits, and sinkholes are common on ridges in this association. Iron ore pits are old excavations and overburden soil material remaining after iron ore was taken from these areas. These areas are indicated on the detailed soil map by name or by special symbol.

This association is mainly in woodlands. Most of the wooded areas are stony or have steep slopes. Vanderlip soils and abandoned iron ore pits and spoil areas are also wooded. Other areas are used for crops associated with dairy operations or are used for pasture. Vanderlip soils are too droughty for shallow rooted plants. Some areas of these soils are used as a source of masonry sand. The major limitations for most town and country uses are the moderately rapidly to rapidly permeable subsoil, the steep slopes, and the hazard of ground water contamination.

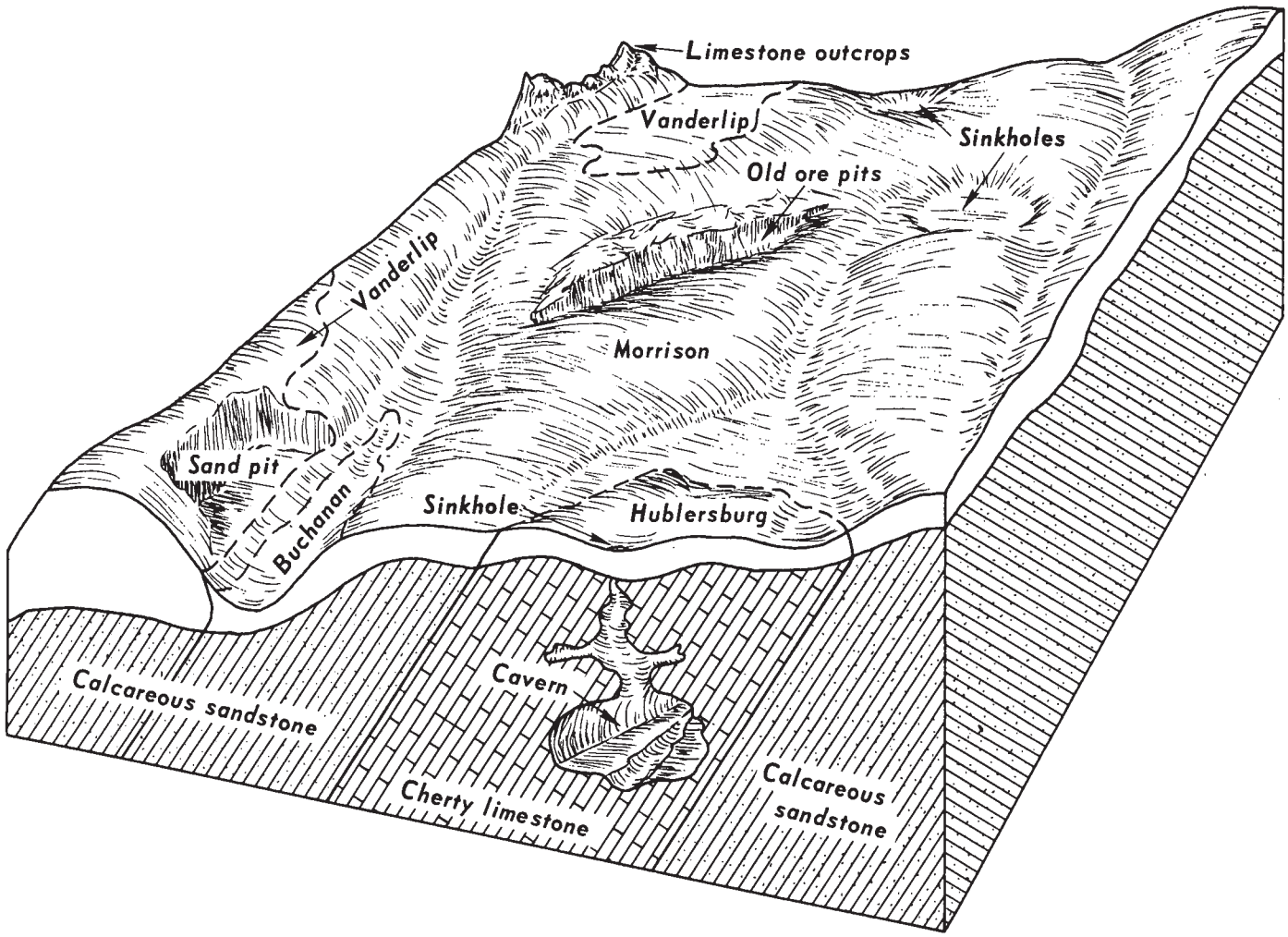

Figure 5.—**Pattern of soils and underlying material in association 4.**

Areas Dominated By Soils Formed In Material Weathered From Shale and Some Colluvium

The soils that make up these associations are mostly shallow to moderately deep and well drained. Some of the soils, however, are moderately well drained or somewhat poorly drained. All the soils in these associations formed in sloping to steep areas on ridges and in valleys. The soil associations in this group are mostly in woodland.

5. Berks-Weikert-Ernest association

Sloping to steep, shallow to deep, well drained to moderately well drained soils that have a loamy subsoil; on intermountain ridges and foot slopes

This association consists of soils that formed in material weathered from acid brown, yellow, and olive shale (fig. 6). It is on rolling hills that have steep-sided, narrow valleys and ridges in intermountain valley areas throughout the county.

This association makes up 25 percent of the county. It is about 52 percent Berks soils, 20 percent Weikert soils, 6 percent Ernest soils, and 22 percent soils of minor extent.

The Berks soils are gently sloping to steep and are on ridges. These soils are moderately deep and well drained. They have a shaly, medium textured subsoil.

The Weikert soils are gently sloping to steep and are on hills and valley sides. These soils are shallow and well drained. They have a shaly, medium textured subsoil.

The gently sloping to sloping Ernest soils formed in colluvium that accumulated at the base of steep slopes. These soils are deep and moderately well drained. They have a moderately fine textured subsoil and a fragipan.

Minor in this association are Bedington, Blairton, and Brinkerton soils on foot slopes and in valleys and Atkins, Philo, and Basher soils along streams.

This association is mainly wooded or idle. A few scattered areas are used for dairy and beef operations, and some areas are in Christmas tree plantations. Many of the areas were cleared and cultivated at one time, but small fields, steep slopes, and droughtiness of the soils made most farming operations uneconomical. The main limitations for town and country uses are depth to bedrock, slope, a seasonal high water table, and moderately rapid permeability.

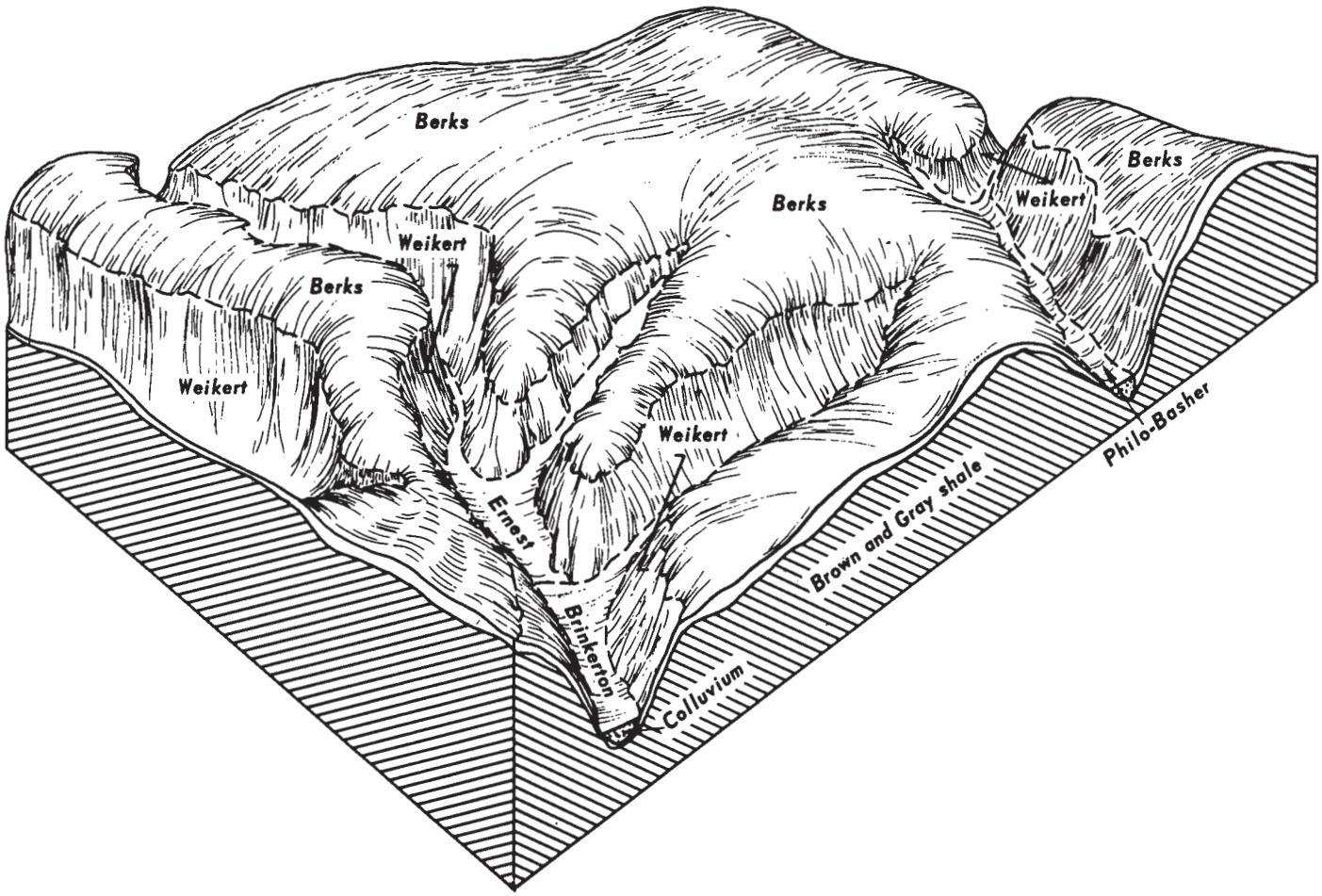

Figure 6.—Pattern of soils and underlying material in association 5.

6. *Calvin-Klinesville-Albrights association*

Sloping to steep, shallow to deep, well drained to somewhat poorly drained soils that have a loamy subsoil; on intermountain ridges and foot slopes

This association consists of soils that formed in material weathered from shale and sandstone. It is in several relatively narrow bands in the southwestern part of the county. The landscape consists of highly dissected rolling hills and steep-walled narrow valleys. The ridges in these areas are between higher mountains.

This association makes up 9 percent of the county. It is about 35 percent Calvin soils, 15 percent Klinesville soils, 9 percent Albrights soils, and 41 percent soils of minor extent.

The gently sloping to moderately steep Calvin soils are on ridges. These soils are moderately deep and well drained. They have a shaly, medium textured subsoil.

The gently sloping to steep Klinesville soils are on ridges. These soils are shallow and well drained. They have a shaly, medium textured subsoil.

The gently sloping and moderately steep Albrights soils formed mostly in colluvium that accumulated at the base of steep slopes and in drainageways. These soils are deep and moderately well drained and somewhat poorly drained. They have a medium textured and moderately fine textured subsoil and a fragipan.

Minor in this association are Meckesville soils on uplands and Barbour and Basher soils along streams.

This association is mainly wooded because the steep slopes limit the suitability of the soils for other uses. Some of the wooded areas were farmed but have reverted to woodland. Most of the association is well suited to trees, wildlife habitat, and recreational uses. A few scattered areas are used for farming, but droughtiness is a limitation for most farm crops. The main limitations for town and country uses are depth to bedrock, slope, a seasonal high water table, and moderately rapid permeability.

Areas Dominated By Soils Formed In Material Weathered From Limestone and Shale

The soils that make up these associations are mostly deep and well drained. Some of the soils, however, are shallow. All the soils in these associations formed in gently sloping to moderately steep intermountain valleys. The soil associations in this group are mostly in crops.

7. *Opequon-Edom-Weikert association*

Sloping to moderately steep, shallow and deep, well drained soils that have a loamy and clayey subsoil; in valleys

This association consists of soils that formed in material weathered mostly from interbedded, nearly pure, shaly limestone; yellowish brown shale; and acid brown shale (fig. 7). It is on narrow to moderately broad, rolling hills in the valley in the Shavers Creek area, north of Huntingdon; in the valley east of Tussey Mountain; and in the valley south of the Little Juniata River.

This association makes up about 8 percent of the county. It is about 21 percent Opequon soils, 21 percent Edom soils, 14 percent Weikert soils, and 44 percent soils of minor extent.

The sloping to steep Opequon soils formed in material weathered from shaly limestone and relatively pure hard limestone on hills. These soils are shallow and well drained. They have a fine textured subsoil.

The sloping to moderately steep Edom soils formed in material weathered from shale and shaly limestone on ridges. These soils are deep and well drained. They have a fine textured subsoil. The Edom soils are generally intermingled with either the Opequon or Weikert soils.

The sloping to moderately steep Weikert soils formed in material weathered from shale on hills and ridges. These soils are shallow and well drained. They have a shaly, medium textured subsoil.

Minor in this association are Meckesville, Hagerstown, Calvin, Klinesville, and Clarksburg soils on uplands and Basher and Barbour soils along streams.

Most areas of this association are in crops. These soils are suitable for all general farm crops associated with dairy farming operations. Erosion, however, is a problem, and intensive management practices are needed to control surface water. Droughtiness is a limitation on some of these soils. The main limitations for town and country uses are the hazard of ground water contamination, slope, and depth to bedrock.

8. *Hagerstown-Hublersburg association*

Gently sloping and sloping, deep, well drained soils that have a loamy and clayey subsoil; in valleys

This association consists of soils that formed mostly in material weathered from thick bedded limestone (fig. 8). It is in the moderately broad valleys in the northwestern and southeastern parts of the county. The landscape consists mainly of rolling hills.

This association makes up 7 percent of the county. It is about 33 percent Hagerstown soils, 23 percent Hublersburg soils, and 44 percent soils of minor extent.

The gently sloping to moderately steep Hagerstown soils formed in material weathered from thick bedded limestone and are relatively free of coarse fragments. These soils are deep and well drained and have a moderately fine texture and fine textured subsoil. They are nearly level and are on limestone ridges. Outcrops of limestone are common.

The gently sloping to moderately steep Hublersburg soils formed in material weathered from thick bedded limestone that contained impurities of shale, sandstone, and chert. These soils are deep and well drained. They have a moderately fine textured and fine textured subsoil.

Minor in this association are Elliber, Murrill, Morrison, Edom, Opequon, and Clarksburg soils on uplands and Basher and Newark soils along streams.

Most areas of this association are in crops. This association has the largest area of highly productive soils that can be intensively farmed with minimum of erosion protection. Crops are those generally associated with dairy farming operations. The main limitations for town and country uses are depth to bedrock, slope, and the hazard of ground water contamination.

Figure 7.—**Typical area of Opequon-Edom-Weikert association. Steep slopes require intensive management practices to control surface water and reduce erosion.**

Areas Dominated By Soils Formed In Material Weathered From Alluvium

The soils that make up this association are mostly deep and moderately well drained. Some of the soils, however, are poorly drained. These gently sloping and nearly level soils are on terraces and flood plains, and they are mostly in crops.

9. Monongahela-Raritan-Basher-Atkins association

Gently sloping and nearly level, deep, moderately well drained and poorly drained soils that have a loamy subsoil; on terraces and flood plains

This association consists of soils that formed in material deposited by streams. The most extensive areas are adjacent to the Juniata River and its Raystown Branch.

This association makes up 2 percent of the county. It is about 23 percent Monongahela soils, 14 percent Raritan soils, 12 percent Basher soils, 9 percent Atkins soils, and 42 percent soils of minor extent.

The gently sloping Monongahela soils formed in old alluvium. These soils are deep and moderately well drained. They have a moderately fine textured subsoil and a fragipan. These soils are on terraces, and they are not subject to flooding.

The gently sloping Raritan soils formed in old alluvium. These soils are deep and moderately well drained. They have a moderately fine textured subsoil and a fragipan. These soils are on terraces, and they are not subject to flooding.

The nearly level Basher soils formed in recent alluvium adjacent to streams and are frequently flooded. These soils are deep and moderately well drained. They have a medium textured subsoil.

The nearly level Atkins soils formed in recent alluvium and are frequently flooded. These soils are deep and poorly drained. They have a medium textured subsoil.

Minor in this association are Birdsboro, Tyler, and Purdy soils on uplands; Barbour soils along streams; and Urban land.

Most areas of this association are in crops or Urban land. The main enterprise is dairy farming. The better drained soils are used for general farm crops; poorly drained soils are used for hay and pasture or are wooded. This association has soils suitable for truck farming where markets are available. The main limi-

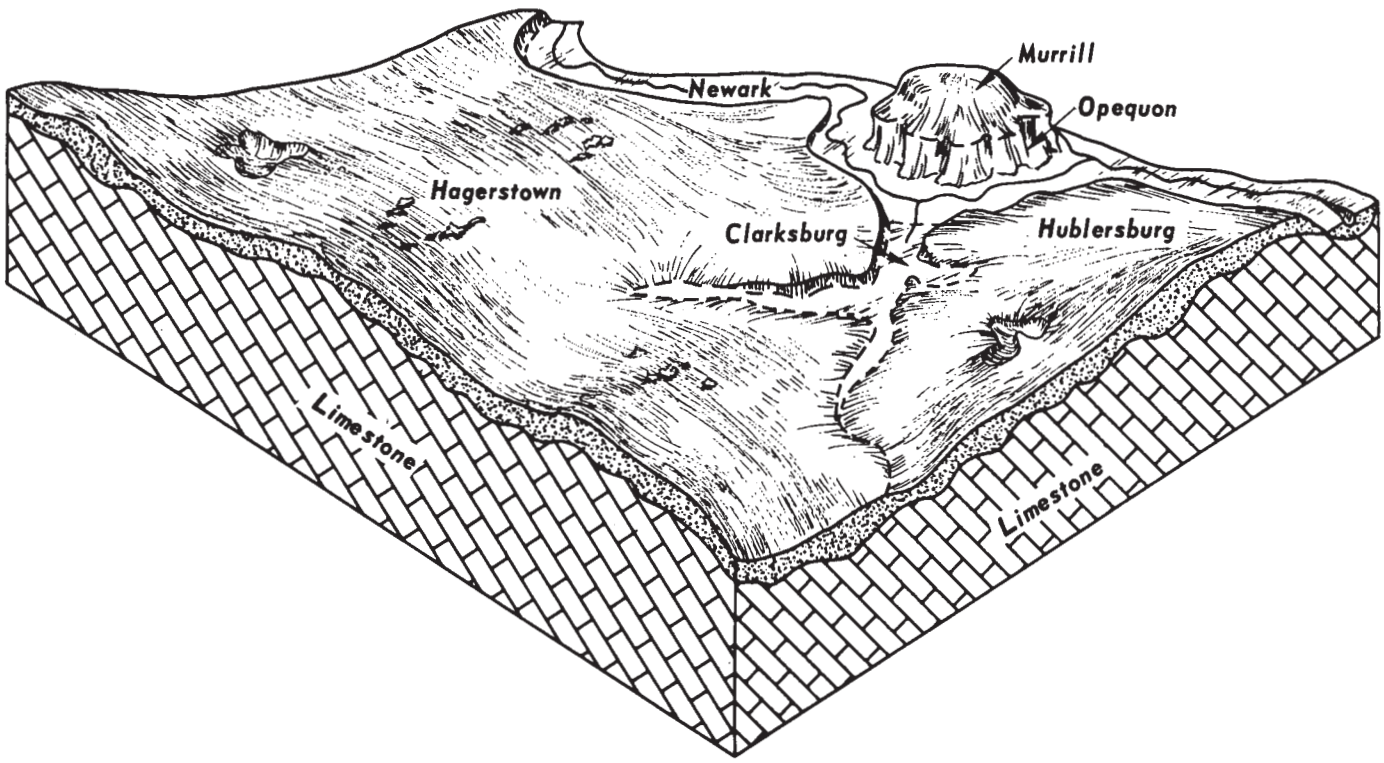

Figure 8.—**Pattern of soils and underlying material in association 8.**

tations for most town and country uses are the slowly permeable subsoil, a seasonal high water table, and flooding.

Descriptions of the Soils

This section describes each soil series in detail, and then, briefly, each mapping unit in that series. Unless stated otherwise, what is stated about the soil series holds true for the mapping units in that series. Thus, to get full information about any one mapping unit, it is necessary to read both the description of the mapping unit and the description of the soil series to which it belongs.

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the surface down to rock or other underlying material. Each series contains two descriptions of the profile. The first is brief and in terms familiar to a layman. The second is more detailed and is included for those who need to make thorough and precise studies of soils. The profile described in the series is representative of mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit or they are differences that are apparent in the name of the mapping unit. Color terms are for moist soil unless otherwise stated.

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Urban land, for example, does not belong to a soil series, but nevertheless, it is listed in alphabetic order along with the soil series.

Preceding the name of each mapping unit is a symbol that identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability subclass in which the mapping unit has been placed. The page where each mapping unit is described is listed in the "Index to Mapping Units" at the front of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*12*).[1]

The mapping unit descriptions in this section mention the need for management practices in various degrees of intensity to control runoff and reduce erosion on cultivated or disturbed soils. The use of artificial drainage practices to increase the suitability for crops is also mentioned.

Examples of management practices to control runoff and reduce erosion on cultivated or disturbed soils are establishing diversions, establishing waterways, and cover cropping. Practices used mainly on cultivated soils are stripcropping, contour farming, minimum tilling, and planting grass crops. A temporary practice used to reduce erosion while establishing a cover crop

[1] Italic numbers in parentheses refer to Literature Cited, p. 120.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent
Albrights silt loam, 3 to 8 percent slopes	2,694	0.5
Albrights silt loam, 8 to 15 percent slopes	1,202	.2
Albrights very stony silt loam, 0 to 8 percent slopes	516	(1)
Albrights very stony silt loam, 8 to 25 percent slopes	3,674	.6
Andover cobbly loam, 0 to 8 percent slopes	1,958	.3
Andover extremely stony loam, 0 to 8 percent slopes	9,296	1.6
Atkins silt loam	9,879	1.7
Barbour soils	1,869	.3
Barbour soils, high bottom	1,446	.2
Basher silt loam, neutral variant	1,666	.3
Bedington channery silt loam, 3 to 8 percent slopes	335	(1)
Bedington channery silt loam, 8 to 15 percent slopes	503	(1)
Bedington channery silt loam, 15 to 25 percent slopes	446	(1)
Berks shaly silt loam, 3 to 8 percent slopes	7,527	1.4
Berks shaly silt loam, 8 to 15 percent slopes	24,286	4.2
Berks-Weikert shaly silt loams, 15 to 25 percent slopes	21,910	3.8
Berks-Weikert association, steep	64,676	11.2
Birdsboro gravelly loam, 2 to 10 percent slopes	1,024	.2
Blairton silt loam, 2 to 8 percent slopes	1,004	.2
Blairton silt loam, 8 to 15 percent slopes	604	.1
Brinkerton silt loam, 0 to 3 percent slopes	1,631	.3
Brinkerton silt loam, 3 to 8 percent slopes	7,174	1.3
Buchanan gravelly loam, 3 to 8 percent slopes	5,281	.9
Buchanan gravelly loam, 8 to 15 percent slopes	2,635	.5
Buchanan gravelly loam, 15 to 25 percent slopes	410	(1)
Buchanan extremely stony loam, 3 to 8 percent slopes	4,664	.8
Buchanan extremely stony loam, 8 to 25 percent slopes	27,663	4.8
Calvin shaly silt loam, 3 to 8 percent slopes	4,507	.8
Calvin shaly silt loam, 8 to 15 percent slopes	8,127	1.4
Calvin shaly silt loam, 15 to 25 percent slopes	6,089	1.1
Clarksburg silt loam, 2 to 8 percent slopes	3,091	.5
Clymer channery loam, 3 to 8 percent slopes	356	(1)
Clymer channery loam, 8 to 15 percent slopes	327	(1)
Clymer very stony loam, 3 to 8 percent slopes	2,879	.5
Clymer very stony loam, 8 to 15 percent slopes	4,798	.8
Edom-Opequon complex, 3 to 8 percent slopes	232	(1)
Edom-Opequon complex, 8 to 15 percent slopes	626	.1
Edom-Opequon complex, 15 to 25 percent slopes	571	.1
Edom-Weikert complex, 3 to 8 percent slopes	2,232	.4
Edom-Weikert complex, 8 to 15 percent slopes	8,310	1.5
Edom-Weikert complex, 15 to 25 percent slopes	11,073	1.9
Edom-Weikert complex, 25 to 60 percent slopes	5,374	.9
Elliber very cherty loam, 5 to 15 percent slopes	570	.1
Elliber very cherty loam, 15 to 30 percent slopes	841	.2
Ernest silt loam, 3 to 8 percent slopes	5,889	1.0
Ernest silt loam, 8 to 15 percent slopes	2,846	0.5
Hagerstown silt loam, 2 to 8 percent slopes	4,633	.8
Hagerstown silty clay loam, 8 to 15 percent slopes, eroded	5,400	.9
Hagerstown silty clay loam, 15 to 25 percent slopes, eroded	2,654	.5
Hagerstown-Rock outcrop complex, 5 to 25 percent slopes	1,641	.3
Hazleton channery loam, 3 to 8 percent slopes	1,938	.3
Hazleton channery loam, 8 to 15 percent slopes	2,762	.5
Hazleton channery loam, 15 to 25 percent slopes	2,004	.4
Hazleton-Dekalb extremely stony sandy loams, 0 to 8 percent slopes	6,113	1.1
Hazleton-Dekalb association, moderately steep	27,305	4.8
Hazleton-Dekalb association, steep	66,102	11.6
Hublersburg silt loam, 2 to 8 percent slopes	1,443	.3
Hublersburg silt loam, 8 to 15 percent slopes	1,233	.2
Hublersburg silt loam, 15 to 25 percent slopes	180	(1)
Hublersburg cherty silt loam, 3 to 8 percent slopes	1,991	.6
Hublersburg cherty silt loam, 8 to 15 percent slopes	3,172	.6
Hublersburg cherty silt loam, 15 to 25 percent slopes	1,781	.3
Klinesville shaly silt loam, 8 to 15 percent slopes	3,489	.6
Klinesville shaly silt loam, 15 to 25 percent slopes	5,116	.9
Laidig gravelly loam, 3 to 8 percent slopes	549	.1
Laidig gravelly loam, 8 to 15 percent slopes	5,999	1.1
Laidig gravelly loam, 15 to 25 percent slopes	637	.1
Laidig extremely stony loam, 8 to 30 percent slopes	21,990	3.8
Laidig extremely stony loam, steep	5,229	1.0
Leetonia extremely stony loamy sand, 0 to 12 percent slopes	3,317	.6
Meckesville silt loam, 8 to 15 percent slopes	1,267	.2
Meckesville very stony silt loam, 3 to 8 percent slopes	398	(1)
Meckesville very stony silt loam, 8 to 25 percent slopes	10,697	1.9
Monongahela silt loam, 2 to 10 percent slopes	2,743	.5
Morrison sandy loam, 2 to 8 percent slopes	4,422	.8
Morrison sandy loam, 8 to 15 percent slopes	4,759	.9
Morrison sandy loam, 15 to 25 percent slopes	1,105	.2
Morrison very stony sandy loam, 2 to 8 percent slopes	2,136	.4
Morrison very stony sandy loam, 8 to 25 percent slopes	7,584	1.3
Murrill gravelly loam, 3 to 8 percent slopes	2,450	.4
Murrill gravelly loam, 8 to 15 percent slopes	2,142	.4
Murrill gravelly loam, 15 to 25 percent slopes	899	.2
Newark silt loam	4,691	.8
Opequon clay loam, 3 to 8 percent slopes, eroded	322	(1)
Opequon clay loam, 8 to 15 percent slopes, eroded	1,708	.3
Opequon clay loam, 15 to 25 percent slopes, eroded	3,639	.6
Opequon soils, steep	6,430	1.1
Philo and Basher silt loams	6,716	1.2

See footnote at end of table.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*—Continued

Soil	Acres	Percent	Soil	Acres	Percent
Philo and Basher silt loams, high bottom	3,595	0.6	Weikert shaly silt loam, 3 to 8 percent slopes	874	0.2
Purdy silt loam	763	.1	Weikert shaly silt loam, 8 to 15 percent slopes	3,102	.5
Raritan silt loam, 2 to 10 percent slopes	1,692	.3	Weikert shaly silt loam, 15 to 25 percent slopes	8,749	1.6
Rubble land	23,426	4.3	Wharton silt loam, 2 to 10 percent slopes	378	(1)
Tyler silt loam	860	.2	Strip mines	2,126	.4
Urban land	1,534	.3	Abandoned iron ore pits	560	.1
Vanderlip loamy sand, 5 to 25 percent slopes	5,967	1.0	Total	572,480	100.0
Vanderlip-Rock outcrop complex, 25 to 60 percent slopes	3,357	.6			

[1] Less than 0.1 percent.

or permanent grass crops in disturbed areas, particularly on construction sites that have steep slopes, is the application of a stabilized mulching material.

The three degrees of management intensity mentioned in the mapping unit descriptions are moderate, moderately intensive, and intensive. Examples of *moderate* management practices are stripcropping and establishing sod waterways. *Moderately intensive* management practices include stripcropping and establishing diversions and waterways. Areas that have soils requiring *intensive* management practices are limited in places to use of permanent grass crops.

Examples of drainage practices that increase the suitability of the soils for crops are surface field drains for surface water and main and lateral subsurface drains for subsurface water.

Albrights Series

The Albrights series consists of deep, nearly level to moderately steep, somewhat poorly drained and moderately well drained soils on mountain foot slopes and lower side slopes of the red shale ridges on the uplands. The soils formed in material weathered from shale, siltstone, and fine grained sandstone.

In a representative profile in a disturbed area, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is reddish brown, friable silt loam in the upper 6 inches; reddish brown, friable loam in the next 8 inches; mottled reddish gray, very firm and brittle channery loam in the next 8 inches; and mottled reddish gray, very firm and brittle channery loam in the lower 13 inches. The substratum, to a depth of 62 inches, is mottled reddish brown very channery loam.

Permeability is moderately slow. Available water capacity is low to moderate. A seasonal high water table is at a depth of one-half foot to 3 feet. The hazard of erosion, the seasonal high water table, slope, permeability, and stoniness in some areas are the main limitations to most uses of these soils.

Most areas of this soil are very stony and are wooded. A few areas have been cleared and used for cultivated crops, hay, and pasture.

Representative profile of Albrights silt loam, 3 to 8 percent slopes, in a hayfield 5 miles east of Salter:

Ap—0 to 10 inches; dark brown (7.5YR 3/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; many roots; 10 percent coarse fragments; neutral; abrupt smooth boundary.

B1—10 to 16 inches; reddish brown (5YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; very few thin clay films on ped faces; few roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B2t—16 to 24 inches; reddish brown (5YR 5/4) loam; moderate medium subangular blocky structure; friable, slightly sticky and plastic; common moderately thick clay films on ped faces and in pores; few roots; 10 percent coarse fragments; medium acid; clear wavy boundary.

Bx1—24 to 32 inches; reddish brown (5YR 4/4) channery loam; many fine distinct reddish gray (5YR 5/2) mottles and few fine distinct yellowish red (5YR 5/6) mottles; moderate very coarse prismatic structure parting to weak thin platy; firm and brittle; slightly sticky and plastic; common moderately thick clay films on ped faces and ped interiors; 18 percent coarse fragments; strongly acid; clear wavy boundary.

Bx2—32 to 45 inches; reddish gray (5YR 5/2) channery loam; many fine distinct reddish brown (5YR 4/4) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm and brittle, sticky and plastic; few moderately thick clay films on ped faces and ped interiors; 25 percent coarse fragments; strongly acid; clear wavy boundary.

C—45 to 62 inches; reddish brown (5YR 4/4) very channery loam; common fine distinct pinkish gray (5YR 6/2) mottles; massive; slightly firm, slightly sticky and nonplastic; 50 percent coarse fragments; few black stains on ped faces; strongly acid.

The solum ranges from 42 to 50 inches or more in thickness. Bedrock is at a depth of 3½ to 8 feet or more. The fragipan is at a depth of 20 to 32 inches. Reaction is extremely acid to strongly acid in the upper part of the solum and is strongly acid to medium acid in the lower part of the solum unless the soil is limed. Coarse fragments make up 0 to 30 percent of the Ap horizon and upper part of the B horizon and 10 to 50 percent of the Bx horizon. The Ap horizon ranges from dark brown (7.5YR 3/2) to dark reddish brown (5YR 3/4). The B horizon ranges from silt loam to clay loam in the fine-earth fraction. The B2t horizon ranges from reddish brown (5YR 5/4) to yellowish red (5YR 4/6). Mottles that have a chroma of 2 or less are in the lower part or the B2 horizon or upper part of the Bx horizon. The B2t horizon has weak to strong, subangular blocky structure. The Bx horizon ranges from reddish brown (2.5YR 4/4) to reddish gray (5YR 5/2). It has weak to moderate, prismatic and platy structure.

Albrights soils are associated with deep, well drained Meckesville and Hazleton soils; moderately deep, well drained Calvin soils; shallow, well drained Klinesville soils; and poorly drained Brinkerton soils.

AbB—Albrights silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is slow to medium, and in disturbed or cultivated areas, the erosion hazard is moderate.

Included with this soil in mapping are a few areas of well drained Meckesville soils, a few areas of soils that have stones on the surface, and a few areas of a soil that has more clay in the subsoil than this Albrights soil. Also included are small, wet seepage areas.

Most areas of this soil are in crops. This soil is suited to most general farm crops, hay, pasture, and trees. In places use of some deep rooted crops is limited by the seasonal high water table, unless the excess water is removed by artificial drainage systems. Moderate management practices are needed to control surface runoff and to reduce erosion and the loss of soil nutrients, organic matter, and other applied materials. The major limitations for most town and country uses are the seasonal high water table and the moderately slow permeability. Capability subclass IIe.

AbC—Albrights silt loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium, and in disturbed or cultivated areas, the erosion hazard is severe.

Included with this soil in mapping are a few areas of Meckesville and Calvin soils, a few small areas of soils that have stones on the surface, and a few areas of a soil that has more clay in the subsoil than this Albrights soil. Also included are small, wet seepage areas.

Most areas of this soil are in crops. This soil is suited to most general farm crops, hay, pasture, and trees. In places use of some deep rooted crops is limited by the seasonal high water table, unless the soil is artificially drained. Moderate management practices are needed to control surface water and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the seasonal high water table, the moderately slow permeability, and slope. Capability subclass IIIe.

AcB—Albrights very stony silt loam, 0 to 8 percent slopes. This nearly level and gently sloping soil has a profile similar to the one described as representative of the series, but it contains large stones and the surface layer has not been disturbed. Stones that are 10 to 36 inches in diameter cover 3 to 15 percent of the surface. Runoff is slow to medium, and in disturbed areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few areas of Meckesville and Calvin soils and a few areas of a soil that has more clay in the subsoil than this Albrights soil. Also included are small, wet seepage areas.

Most areas of this soil are wooded because the quantity of stones on the surface makes cultivation impractical. The soil is well suited to trees, wildlife habitat, and recreational uses. Moderate management practices are needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are the seasonal high water table, slow permeability, and stoniness. Capability subclass VIs.

AcD—Albrights very stony silt loam, 8 to 25 percent slopes. This sloping to moderately steep soil has a profile similiar to the one described as representative of the series, but it contains large stones and the surface layer has not been disturbed. Stones that are 10 to 36 inches in diameter cover 3 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is severe.

Included with this soil in mapping are a few areas of Meckesville soils and a few areas of a soil that has more clay in the subsoil than this Albrights soil. Also included are small, wet seepage areas.

Most areas of this soil are wooded because the quantity of stones on the surface makes cultivation impractical. The soil is well suited to trees, wildlife habitat, and recreational uses. In disturbed areas intensive management practices are needed to control surface water and reduce erosion. The major limitations for most town and country uses are the seasonal high water table, slow permeability, stoniness, and slope. Capability subclass VIs.

Andover Series

The Andover series consists of deep, nearly level and gently sloping, poorly drained soils on mountain foot slopes and in drainageways on the uplands. These soils formed in colluvial material weathered from acid sandstone and shale.

In a representative profile in an undisturbed area, the surface layer is very dark gray cobbly loam about 2 inches thick. The subsurface layer is mottled grayish brown cobbly loam 5 inches thick. The subsoil is mottled light brownish gray, friable cobbly loam in the upper 11 inches; mottled yellowish brown, very firm and brittle cobbly clay loam in the next 16 inches; and mottled brown, very firm and brittle cobbly clay loam in the lower 14 inches. The substratum, to a depth of 60 inches, is mottled brown gravelly sandy clay loam.

Permeability is slow. Available water capacity is moderate. A high water table is at or within one-half foot of the soil surface during wet seasons. Most of the acreage of these soils is wooded. A few areas have been cleared and are used for hay and pasture. Some other areas have been artificially drained and are used for cultivated crops. The high water table, slow permeability, and stoniness in some areas are the main limitations to most uses of these soils.

Representative profile of Andover cobbly loam in an area of Andover extremely stony loam, 0 to 8 percent slopes, in a wooded area in West Township, Rothrock State Forest, 1,000 feet southwest of intersection of Diamond Valley road and Tram road, 150 feet south of Tram road, and 100 feet west of a hunting camp:

O2—1 inch to 0; black (10YR 2/1) partly decomposed organic debris.

A1—0 to 2 inches; very dark gray (10YR 3/1) cobbly loam; weak fine granular structure; friable, nonsticky and slightly plastic; many small roots; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—2 to 7 inches; grayish brown (10YR 5/2) cobbly loam; common fine distinct brownish yellow (10YR 6/6) and strong brown (7.5YR 5/6) mottles; weak medium platy and weak medium granular structure; friable, nonsticky and slightly plastic; 25 percent coarse fragments; strongly acid; clear wavy boundary.

B2tg—7 to 18 inches; light brownish gray (10YR 6/2) cobbly loam; many coarse distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular

blocky; friable, slightly sticky and slightly plastic; common thin clay films on ped faces and in pores; common roots; 30 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1g—18 to 34 inches; yellowish brown (10YR 5/4) cobbly clay loam; faces of prisms gray (10YR 6/1) and faces of plates light brownish gray (10YR 6/2); many coarse prominent strong brown (7.5YR 5/8) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm and brittle, sticky and plastic; common moderately thick clay films on plates and in pores; 30 percent coarse fragments; strongly acid; clear wavy boundary.

Bx2g—34 to 48 inches; brown (10YR 5/3) cobbly clay loam; faces of prisms gray (10YR 6/1) and faces of plates grayish brown (10YR 5/2); many coarse distinct strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to thick platy; very firm and brittle, sticky and plastic; common thin clay films on plates and in pores; 40 percent coarse fragments; strongly acid; clear wavy boundary.

C—48 to 60 inches; brown (10YR 5/3) gravelly sandy clay loam; common medium distinct gray (10YR 5/1) mottles; massive; firm, slightly sticky and slightly plastic; 45 percent coarse fragments; strongly acid.

The solum ranges from 40 to 50 inches in thickness. Bedrock is at a depth of 5 to 8 feet or more. Depth to the fragipan ranges from 16 to 26 inches. Reaction throughout the profile is very strongly acid or strongly acid. Coarse fragments make up 30 to 40 percent of the B horizon and 30 to 50 percent of the C horizon. The A horizon ranges from very dark gray (10YR 3/1) to dark grayish brown (10YR 4/2). The matrix of the B2tg horizon ranges from dark gray (10YR 4/1) to light brownish gray (2.5Y 6/2). The fine-earth fraction in the B2tg and Bx horizons is loam, clay loam, and sandy clay loam. The Bx horizon ranges from brown (10YR 5/3) to light olive brown (2.5Y 5/6) in the interiors.

Andover soils are associated with deep, well drained Hazleton and Laidig soils; deep, somewhat poorly drained to moderately well drained Buchanan soils; moderately deep, well drained Berks soils; and shallow, well drained Weikert soils.

AnB—Andover cobbly loam, 0 to 8 percent slopes. This nearly level and gently sloping soil has a profile similar to the one described as representative of the series, but it does not have stones on the surface. Runoff is slow to medium, and the erosion hazard is slight to moderate.

Included with this soil in mapping in a few small depressions are soils that have a thick black surface layer and a few areas of Brinkerton and Buchanan soils.

Most areas of this soil are in crops. This soil is well suited to hay, pasture, trees, wildlife habitat, and recreational uses. It can be used for crops that have shallow or water-tolerant roots. In disturbed or cultivated areas, moderate management practices are needed to control runoff and to reduce erosion and the loss of soil nutrients or other applied materials. An artificial drainage system that has suitable outlets will help to remove excess water and increase the suitability for certain crops. The major limitations for most town and country uses are the seasonal high water table and slow permeability. Capability subclass IVw.

AoB—Andover extremely stony loam, 0 to 8 percent slopes. This nearly level and gently sloping soil has the profile described as representative of the series. Runoff is slow to medium, and in disturbed areas the erosion hazard is moderate. Stones cover 20 to 30 percent of the surface.

Included with this soil in mapping in a few depressions are soils that have a thick dark surface layer and a few areas of Buchanan and Brinkerton soils.

Most areas of this soil are wooded because the quantity of surface stones makes cultivation impractical. This soil is well suited to trees, wildlife habitat, and recreational uses. In disturbed areas moderate management practices are needed to control surface water and reduce soil erosion. The major limitations for most town and country uses are the seasonal high water table, slow permeability, and stoniness. Capability subclass VIIs.

Atkins Series

The Atkins series consists of deep, nearly level, poorly drained soils on flood plains. These soils formed in alluvium from upland soil material weathered mostly from acid shale and sandstone.

In a representative profile in a disturbed area, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is mottled gray, friable silty clay loam in the upper 9 inches and mottled dark gray, friable silt loam in the lower 26 inches. The substratum to a depth of 61 inches is mottled dark gray sandy loam.

Permeability is moderately slow to moderate. Available water capacity is moderate to high. A high water table is at or within one-half foot of the soil surface during wet seasons.

Most of the acreage of these soils has been cleared and is used for hay and pasture and for cultivated crops in a few places. A few places are idle or wooded. Flooding and the high water table are the main limitations to most uses of these soils.

Representative profile of Atkins silt loam in a hay field, 3 miles northeast of Huntingdon, along Standing Stone Creek:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; neutral; clear smooth boundary.

B21g—8 to 17 inches; gray (10YR 5/1) silty clay loam; common fine faint strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure; friable, slightly sticky and plastic; few thin clay films in pores; medium acid; gradual wavy boundary.

B22g—17 to 43 inches, dark gray (10YR 4/1) silt loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; strongly acid; gradual wavy boundary.

Cg—43 to 61 inches; dark gray (10YR 4/1) sandy loam; few fine faint strong brown (7.5YR 5/8) mottles; massive; loose, nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 50 inches in thickness. Bedrock is at a depth of 5 feet or more. Reaction throughout the profile is very strongly acid or strongly acid, unless the soil is limed. Coarse fragments make up 0 to 10 percent of the A horizon and B horizon and 0 to 20 percent of the C horizon. The A horizon ranges from dark gray (10YR 4/1) to grayish brown (10YR 5/2). The B horizon is dark gray (10YR 4/1) to light brownish gray (10YR 6/2). It ranges from silty clay loam to loam. The C horizon ranges from light silty clay loam to sandy loam.

Atkins soils are associated with deep, well drained Bar-

bour soils; moderately deep, well drained Berks and Calvin soils; and deep, well drained Hazleton soils.

At—Atkins silt loam. This soil is nearly level. Runoff is slow, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Barbour, Basher, and Philo soils and a few areas of a soil that has a reddish subsoil.

Most areas of this soil are cleared. This soil is well suited to pasture, trees, wildlife habitat, and recreational uses. Plants that have water-tolerant roots must be used because of the high water table and frequent flooding. In disturbed areas management practices, including use of a cover crop, are needed to minimize erosion from flooding. The major limitations for most town and country uses are flooding and a high water table. Capability subclass IVw.

Barbour Series

The Barbour series consists of deep, nearly level, well drained soils on flood plains. These soils formed in alluvium mostly from material derived from red sandstone and shale.

In a representative profile in a disturbed area, the surface layer is dark reddish brown fine sandy loam about 6 inches thick. The subsoil is reddish brown, friable sandy loam 18 inches thick. The substratum is reddish brown loamy sand in the upper 19 inches and reddish brown very gravelly loamy sand between depths of 43 and 60 inches.

Permeability and available water capacity are moderate. A seasonal high water table is 3 feet or more below the soil surface.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. A few areas are wooded. The hazard of flooding is the main limitation to most uses of these soils.

Representative profile of Barbour fine sandy loam in an area of Barbour soils, in a cultivated area 5 miles south of Huntingdon, along the Raystown Branch of the Juniata River:

Ap—0 to 6 inches; dark reddish brown (5YR 3/3) fine sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

B2—6 to 24 inches; reddish brown (5YR 4/3) sandy loam; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; few clay bridges between sand grains; 5 percent coarse fragments; strongly acid; clear wavy boundary.

IIC1—24 to 43 inches; reddish brown (5YR 4/4) loamy sand; single grained; very friable, nonsticky and nonplastic; 10 percent coarse fragments; strongly acid; clear wavy boundary.

IIIC2—43 to 60 inches; reddish brown (5YR 4/4) very gravelly loamy sand; single grained; very friable, nonsticky and nonplastic; 60 percent coarse fragments; strongly acid.

The solum ranges from 20 to 30 inches in thickness. Depth to the strongly contrasting substratum ranges from 20 to 40 inches. Bedrock is at a depth of 5 feet or more. Reaction throughout the profile is strongly acid or very strongly acid, unless the soil is limed. Coarse fragments as much as 3 inches in diameter make up 0 to 10 percent of the A horizon and B horizon and 0 to 60 percent of the C horizon. The Ap horizon is dark brown (10YR 4/3) to dark reddish brown (5YR 3/2) fine sandy loam, loam, and silt loam. The B horizon is dark brown (7.5YR 4/4) to reddish brown (5YR 5/3 or 2.5YR 5/4) sandy loam or fine sandy loam to silt loam. The IIC horizon is dark brown to reddish brown loamy sand to sand.

Barbour soils are associated with deep, moderately well drained Basher soils; deep, poorly drained Atkins soils; moderately deep, well drained Berks and Calvin soils; and deep, well drained Hazleton soils. Barbour soils have fewer coarse fragments than Berks, Calvin, and Hazleton soils. Barbour soils are on flood plains, and Berks, Calvin, and Hazleton soils are on uplands.

Ba—Barbour soils. These nearly level soils have the profile described as representative of the series. Texture of the surface layer ranges from fine sandy loam to silt loam. Runoff is slow to medium, and in disturbed areas the erosion hazard is moderate. These soils are flooded once in every 2 to 5 years.

Included with these soils in mapping are a few areas of Basher and Atkins soils. Also included are a few areas of a soil that has a yellowish brown subsoil.

Most areas of these soils are used for general crops, hay, and pasture. These soils are especially suited to truck crops. In disturbed areas these soils should be protected by a cover crop in winter to minimize the hazard of erosion. The major limitation for most town and country uses is flooding. Capability class I.

Bb—Barbour soils, high bottom. These soils are nearly level. The surface layer ranges from fine sandy loam to silt loam. Runoff is slow to medium, and in disturbed areas the erosion hazard is moderate. These soils are generally flooded once in every 5 to 30 years.

Included with these soils in mapping are a few small areas of Basher, Raritan, and Atkins soils. Also included are a few areas of a soil that has a gravelly surface layer and a few areas of a soil that has a yellowish brown subsoil.

Most areas of these soils are in crops. These soils are suitable for general field crops, hay, and pasture. They are especially suited to truck crops. In disturbed areas these soils should be protected by a cover crop in winter to minimize the hazard of erosion. The major limitation for most town and country uses is flooding. Capability class I.

Basher Series

The Basher series consists of deep, nearly level, moderately well drained soils on flood plains. These soils formed in stream deposits from material derived from red shale and sandstone.

In a representative profile in a disturbed area, the surface layer is dark reddish brown silt loam about 9 inches thick. The subsoil is reddish brown, friable silt loam in the upper 9 inches and mottled, reddish brown, friable silt loam in the lower 12 inches. The substratum, to a depth of 60 inches, is reddish brown, friable very gravelly sandy loam.

Permeability is moderate. Available water capacity is moderate to high. These soils are occasionally flooded on low bottoms and less frequently flooded on high bottoms. They have a seasonal high water table within 1½ to 3 feet of the surface.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. A few areas are idle or wooded. Flooding and the seasonal high water table are the main limitations to most uses of these soils.

Representative profile of Basher silt loam in an area of Philo and Basher silt loams, in a cultivated field 3½ miles west of Barneytown:

Ap—0 to 9 inches; dark reddish brown (5YR 3/4) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 4 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—9 to 18 inches; reddish brown (5YR 4/4) silt loam; moderate fine granular structure; friable, slightly sticky and nonplastic; very few thin clay films on ped faces and in pores; 5 percent coarse fragments; strongly acid; clear wavy boundary.

B2—18 to 30 inches; reddish brown (2.5YR 4/4) silt loam; common fine distinct dark reddish gray (5YR 4/2) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; very few thin clay films on ped faces and interiors; 5 percent coarse fragments; strongly acid; clear wavy boundary.

IIC—30 to 60 inches; reddish brown (2.5YR 4/4) very gravelly sandy loam; common fine distinct reddish gray (5YR 5/2) and gray (5YR 6/1) mottles; weak fine granular structure and single grained; friable and loose, nonsticky and nonplastic; 55 percent coarse fragments; strongly acid.

The solum ranges from 26 to 40 inches in thickness. Bedrock is at a depth of 5 to 15 feet. Reaction throughout the profile is strongly acid or medium acid. Depth to mottling ranges from 16 to 30 inches. The Ap horizon ranges from dark brown (7.5YR 3/2) to dark reddish brown (5YR 3/4). The B horizon is reddish brown (2.5YR 4/4) to brown (7.5YR 5/4) silt loam, fine sandy loam, and loam.

Basher soils are associated with moderately well drained Philo soils, well drained Barbour soils, and poorly drained Atkins soils. They are redder than Philo soils.

Soils of the Basher series in this county are mapped only in undifferentiated groups with Philo soils.

Basher Variant

The Basher variant consists of deep, nearly level, moderately well drained, medium textured soils on flood plains. These soils developed in stream deposits derived from red nonacid upland soils.

In a representative profile in a disturbed area, the surface layer is dark brown silt loam 8 inches thick. The subsoil is reddish brown, friable silt loam in the upper 8 inches and mottled, reddish brown, friable silt loam in the lower 33 inches. The substratum is mottled, dark gray heavy silt loam in the upper 6 inches and mottled, dark reddish brown, stratified fine sandy loam between depths of 55 and 65 inches.

Permeability is moderate. Available water capacity is high. A seasonal high water table is 1½ to 3 feet from the surface.

Most of the acreage of these soils has been cleared and is used for pasture and hay. A few areas are used for crops, or they are idle or wooded.

Representative profile of Basher silt loam, neutral variant, in a cultivated area one-half mile north of Bethel Church, along Shavers Creek:

Ap—0 to 8 inches; dark brown (7.5YR 4/2) silt loam; moderate fine granular structure; very friable, nonsticky and nonplastic; many roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1—8 to 16 inches; reddish brown (5YR 4/4) silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; many roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B21—16 to 31 inches; reddish brown (5YR 4/4) silt loam; few fine distinct pinkish gray (5YR 6/2) mottles; friable, nonsticky and nonplastic; very few thin clay films on ped faces; few roots; 3 percent coarse fragments; neutral; clear wavy boundary.

B22g—31 to 49 inches; reddish brown (5YR 4/4) heavy silt loam; many coarse distinct yellowish red (5YR 4/8) mottles; weak medium subangular blocky structure; friable, nonsticky and nonplastic; very few thin clay films on ped faces; few roots; 5 percent coarse fragments; neutral; gradual wavy boundary.

C1g—49 to 55 inches; dark gray (5YR 4/1) heavy silt loam; many coarse prominent dark reddish brown (2.5YR 3/4) mottles; massive; firm, nonsticky and nonplastic; 5 percent coarse fragments; neutral; clear smooth boundary.

IIC2—55 to 65 inches; dark reddish brown (5YR 3/4) stratified fine sandy loam; many distinct dark gray (5YR 4/1) mottles; single grained; loose, nonsticky and nonplastic; neutral.

The solum ranges from 38 to 62 inches in thickness. Bedrock is at a depth of 5 feet or more. Reaction ranges from neutral to slightly acid throughout the profile. The Ap horizon ranges from dark brown (7.5YR 3/2) to dark reddish gray (5YR 4/2) and from loam to silt loam. The B horizon ranges from brown (7.5YR 5/4) to reddish brown (2.5YR 4/4) and from silt loam to silty clay loam.

Basher variant soils are associated with deep, well drained Hagerstown, Hublersburg, and Edom soils; shallow, well drained Opequon soils; deep, moderately well drained Clarksburg soils; and deep, somewhat poorly drained Newark soils. Basher variant soils have less clay in the B horizon than the Hagerstown, Hublersburg, and Edom soils; and they lack the fragipan typical of the Clarksburg soils.

Bc—Basher silt loam, neutral variant. This soil is nearly level. Runoff is slow, and the erosion hazard is slight. This soil is flooded once in every 2 to 5 years.

Included with this soil in mapping are a few small areas of Newark soils and a few areas of a soil that has a surface layer of fine sandy loam and loam.

Most areas of this soil are in crops. The soil is well suited to crops, hay, pasture, and trees. Flooding and a seasonal high water table are limitations for some crops and for most town and country uses. Capability subclass IIw.

Bedington Series

The Bedington series consists of deep, gently sloping to moderately steep, well drained soils on plateaus and benches on the uplands. These soils formed in material weathered from acid shale, siltstone, and fine grained sandstone.

In a representative profile in a disturbed area, the surface layer is dark brown channery silt loam about 9 inches thick. The subsoil is yellowish brown, friable silt loam in the upper 8 inches; strong brown, friable silty clay loam and shaly silty clay loam in the next 29 inches; and yellowish red, friable, very shaly silt loam in the lower 4 inches. The substratum is strong brown very shaly silt loam. Olive brown, acid shale bedrock is at a depth of 54 inches.

Permeability is moderate. Available water capacity is moderate to high. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. A few areas are idle or wooded. The hazard of erosion, slope, and depth to bedrock are the main limitations to most uses of these soils.

Representative profile of Bedington channery silt

loam, 3 to 8 percent slopes, in a cultivated area 3 miles north of Nossville:

Ap—0 to 9 inches; dark brown (10YR 4/3) channery silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; neutral; abrupt smooth boundary.

B1—9 to 17 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; very few thin clay films on ped faces; 15 percent coarse fragments; medium acid; clear wavy boundary.

B21t—17 to 36 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable, sticky and plastic; few moderately thick clay films on ped faces; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22t—36 to 46 inches; strong brown (7.5YR 5/8) shaly silty clay loam; moderate medium subangular blocky structure; slightly firm, sticky and plastic; common moderately thick clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—46 to 50 inches; yellowish red (5YR 5/6) very shaly silt loam; weak fine subangular blocky structure; slightly firm, slightly sticky and slightly plastic; few thin clay films on ped faces; 50 percent coarse fragments; very strongly acid; clear wavy boundary.

C—50 to 54 inches; strong brown (7.5YR 5/6) very shaly silt loam; weak fine subangular blocky structure; slightly firm, slightly sticky and slightly plastic; few thin clay films on ped faces and shale fragments; 60 percent coarse fragments; very strongly acid; clear smooth boundary.

R—54 inches; olive brown (2.5Y 4/4) acid shale bedrock.

The solum ranges from 40 to 58 inches in thickness. Bedrock is at a depth of 3½ to 6 feet or more. Coarse fragments of shale, sandstone, or both make up 10 to 30 percent of the upper part of the solum and 20 to 60 percent of the lower part. Reaction is very strongly acid or strongly acid in the lower part. The Ap horizon ranges from brown (10YR 4/3) to very dark grayish brown (10YR 3/2). The B horizon ranges from yellowish brown (10YR 5/8) to reddish brown (5YR 4/4) and from shaly silt loam to very shaly silty clay loam.

Bedington soils are associated with moderately deep, well drained Berks and Calvin soils; shallow, well drained Weikert soils; deep, moderately well drained Ernest soils; deep, poorly drained Brinkerton soils; and moderately deep, somewhat poorly drained and moderately well drained Blairton soils. Bedington soils have more clay in the subsoil than Berks, Weikert, and Calvin soils.

BeB—Bedington channery silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas, the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Clymer, Berks, Weikert, and Blairton soils. Also included are a few small areas of soils that have gray mottles below a depth of 40 inches.

Most areas of this soil are in crops. The soil is suited to general field crops, hay, pasture, and trees. Moderate management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for some town and country uses are depth to bedrock and coarse fragments. Capability subclass IIe.

BeC—Bedington channery silt loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Clymer, Berks, Weikert, and Blairton soils.

Most areas of this soil are in crops. This soil is suited to general field crops, hay, pasture, and trees. In disturbed or cultivated areas, moderate management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IIIe.

BeD—Bedington channery silt loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but it is a few inches shallower to bedrock. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few areas of Clymer, Berks, and Wharton soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Intensive management practices are needed in cultivated or disturbed areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for town and country uses are slope and depth to bedrock. Capability subclass IVe.

Berks Series

The Berks series consists of moderately deep, gently sloping to steep, well drained soils on highly dissected uplands. The soils formed in material weathered from shale, siltstone, and sandstone.

In a representative profile in a cultivated area, the surface layer is dark brown shaly silt loam about 8 inches thick. The subsoil is yellowish brown, friable shaly silt loam in the upper 12 inches and yellowish brown, friable very shaly silt loam in the lower 4 inches. The substratum is yellowish brown very shaly silt loam. Olive brown acid shale bedrock is at a depth of 34 inches.

Permeability is moderate to moderately rapid. Available water capacity is very low. The water table is at a depth of 6 feet or more.

Most of the acreage of these soils is wooded or idle. A few areas are used for crops, hay, and pasture. The hazard of erosion, slope, depth to bedrock, and permeability are the main limitations to the use of these soils.

Representative profile of Berks shaly silt loam, 3 to 8 percent slopes, in a cultivated area, 1 mile southeast of Donation:

Ap—0 to 8 inches; dark brown (10YR 4/3) shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 20 percent coarse fragments; strongly acid; abrupt smooth boundary.

B21—8 to 15 inches; yellowish brown (10YR 5/6) shaly silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 30 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—15 to 20 inches; yellowish brown (10YR 5/6) shaly silt loam; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; 45 percent coarse fragments; very strongly acid; abrupt wavy boundary.

B3—20 to 24 inches; yellowish brown (10YR 5/6) very shaly silt loam; weak fine subangular blocky struc-

ture; friable, nonsticky and nonplastic; 60 percent coarse fragments; very strongly acid; clear wavy boundary.

C—24 to 34 inches; yellowish brown (10YR 5/6) very shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 80 percent coarse fragments; very strongly acid; diffuse irregular boundary.

R—34 inches; olive brown (2.5Y 4/4) acid shale.

The solum ranges from 20 to 32 inches in thickness. Bedrock is at a depth of 20 to 40 inches. Reaction throughout the profile is very strongly acid or strongly acid. Coarse fragments of shale and fine grained sandstone make up 15 to 40 percent of the Ap horizon, 30 to 60 percent of the B horizon, and 60 to 80 percent of the C horizon. The Ap horizon ranges from dark brown (10YR 3/3) to brown (10YR 5/3). The B horizon is yellowish brown (10YR 5/8) to strong brown (7.5YR 5/6), and texture of the fine-earth fraction is silt loam or loam. Structure of the B horizon is weak or moderate, fine or medium, subangular blocky; structure is generally obscured in the B3 horizon by coarse fragments.

Berks soils are associated with deep, well drained Bedington and Hazleton soils; moderately deep, well drained Calvin soils; shallow, well drained Weikert and Klinesville soils; deep, moderately well drained Ernest soils; deep, poorly drained Brinkerton soils; and moderately deep, somewhat poorly drained and moderately well drained Blairton soils. Berks soils lack the red color typical of the Calvin and Klinesville soils.

BkB—Berks shaly silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Weikert, Bedington, and Blairton soils. Also included are a few areas of a soil that has more clay in the subsoil than this Berks soil.

Most areas of this soil are used for general field crops, hay, pasture, and trees. Moderate management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitation for most town and country uses is depth to bedrock. Capability subclass IIe.

BkC—Berks shaly silt loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Weikert, Bedington, and Blairton soils. Also included are a few areas of soil that has more clay in the subsoil than this Berks soil.

Most areas of this soil are in crops. This soil is suited to field crops, hay, pasture, and trees. In cultivated or disturbed areas, the soil requires moderate to intensive management to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IIIe.

BlD—Berks-Weikert shaly silt loams, 15 to 25 percent slopes. These moderately steep soils are mapped together because they are so intermingled that it is not practical to separate them at the scale of the soil map. The Berks soil makes up about 60 percent of this mapping unit, and the Weikert soil makes up about 30 percent. Both soils have profiles similar to the ones described as representative of their respective series, but they are a few inches shallower over bedrock.

Most areas of these soils are in crops. The soils are better suited to pasture and trees than to most other uses. In disturbed or cultivated areas, intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass VIe.

BMF—Berks-Weikert association, steep. These soils are mapped together because their expected use and management are similar and are dominantly influenced by slope. Slopes are 25 to 70 percent. Areas of this association contain both soils. The soils could have been mapped separately, but it was not necessary to do so. Composition of this mapping unit is more variable than that of most other mapping units in this survey area, but mapping was controlled well enough to be interpreted for the expected uses of these soils. Berks shaly silt loam makes up about 50 percent of this mapping unit, and Weikert shaly silt loam makes up about 30 percent. Both soils have profiles similar to the ones described as representative of their respective series, but they are a few inches shallower over bedrock. Runoff is medium to rapid, and in disturbed areas the erosion hazard is severe.

Included with these soils in mapping are areas of Calvin, Klinesville, and Bedington soils. Also included are a few small areas of Ernest and Laidig soils.

Most areas of this association are wooded. This association is well suited to wildlife habitat and open space. In disturbed areas, intensive management is needed to control runoff and to reduce erosion. The major limitations for most uses are slope and depth to bedrock. Capability subclass VIIe.

Birdsboro Series

The Birdsboro series consists of deep, gently sloping, well drained soils on stream terraces. These soils formed in old alluvial deposits, derived mostly from red soil material from the uplands.

In a representative profile in a disturbed area, the surface layer is dark brown gravelly loam about 9 inches thick. The subsoil is reddish brown, friable heavy silt loam in the upper 7 inches; yellowish red, friable heavy silt loam in the next 9 inches; yellowish red, slightly firm clay loam in the next 12 inches; and dark red, slightly firm gravelly sandy clay loam in the lower 12 inches. The substratum, to a depth of 60 inches, is dark red very gravelly sandy loam.

Permeability is moderate. Available water capacity is moderate. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. The hazard of erosion is the main limitation to most uses of these soils.

Representative profile of Birdsboro gravelly loam, 2 to 10 percent slopes, in a hayfield, 1½ miles north of Maddensville, along Aughwick Creek:

Ap—0 to 9 inches; dark brown (7.5YR 3/2) gravelly loam; weak fine granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; neutral; abrupt smooth boundary.

B21t—9 to 16 inches; reddish brown (5YR 4/4) heavy silt loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few

thin clay films on ped faces and in pores; 5 percent coarse fragments; slightly acid (limed); clear wavy boundary.

B22t—16 to 25 inches; yellowish red (5YR 4/6) heavy silt loam; moderate fine blocky structure; friable, slightly sticky and plastic; few thin clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—25 to 37 inches; yellowish red (5YR 4/6) clay loam; moderate medium and coarse blocky structure; slightly firm, slightly sticky and slightly plastic; few thin clay films on ped faces and in pores; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—37 to 49 inches; dark red (2.5YR 3/6) gravelly sandy clay loam; moderate medium subangular blocky structure; slightly firm, slightly sticky and slightly plastic; very few clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.

IIC—49 to 60 inches; dark red (2.5YR 3/6) very gravelly sandy loam; massive; slightly firm, slightly sticky and nonplastic; very few clay films in pores; 50 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 50 inches in thickness. Bedrock is at a depth of 5 feet or more. Reaction throughout the profile is strongly acid or very strongly acid, unless the soil is limed. Coarse gravel makes up 0 to 20 percent of the solum and 20 to 60 percent of the C horizon. The B horizon ranges from dark reddish brown (5YR 3/2) to red (2.5YR 4/6) and from heavy silt loam to sandy clay loam.

Birdsboro soils are associated with deep, well drained Barbour soils; deep, moderately well drained Monongahela, Raritan, and Basher soils; and deep, somewhat poorly drained Tyler soils. Birdsboro soils have a better developed and thicker B horizon than Barbour soils.

BnB—Birdsboro gravelly loam, 2 to 10 percent slopes. This soil is gently sloping. Runoff is slow to medium, and in disturbed or cultivated areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few small areas of Monongahela, Raritan, and Tyler soils.

Most areas of this soil are in crops, and a few areas are used for urban development. The soil is suited to general field crops, hay, and pasture. Moderate management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. This soil is well suited to most town and country uses. Capability subclass IIe.

Blairton Series

The Blairton series consists of moderately deep, gently sloping to sloping, somewhat poorly drained to moderately well drained soils in drainageways and depressions on the uplands. These soils formed in material weathered from shale, siltstone, and fine grained sandstone.

In a representative profile in a disturbed area, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is yellowish brown, friable silty clay loam in the upper 10 inches and mottled light brownish gray, firm shaly silty clay loam in the lower 8 inches. The substratum is mottled dark brown very shaly loam. Black, acid shale bedrock is at a depth of 31 inches.

Permeability is moderately slow. Available water capacity is low to moderate. A seasonal high water table is one-half foot to 3 feet from the surface.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. A few areas are idle or wooded. Slope, depth to bedrock, and the seasonal high water table are the main limitations to most uses of these soils.

Representative profile of Blairton silt loam, 2 to 8 percent slopes, in a cultivated area 1 mile east of Broad Top City:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; common roots; 8 percent coarse fragments; medium acid; clear smooth boundary.

B21t—8 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable, sticky and plastic; few moderately thick clay films on ped faces; few roots; 5 percent coarse fragments; strongly acid; gradual wavy boundary.

B22tg—18 to 26 inches; light brownish gray (10YR 6/2) shaly silty clay loam; many fine distinct gray (N 5/0) and yellowish red (5 YR 5/6) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few moderately thick clay films on ped faces and on coarse fragments; few roots; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—26 to 31 inches; dark brown (10YR 4/3) very shaly loam; many medium distinct gray (N 5/0) and yellowish red (5YR 5/6) mottles; massive; firm slightly sticky and slightly plastic; few thin clay films in pores and on coarse fragments; few roots; 70 percent shale fragments; very strongly acid; clear wavy boundary.

R—31 inches; black (10YR 2/1) acid shale.

The solum ranges from 24 to 33 inches in thickness. Bedrock is at a depth of 20 to 40 inches. Reaction is strongly acid to extremely acid throughout the profile, unless the soil is limed. The Ap horizon ranges from very dark grayish brown (10YR 3/2) to dark brown (10YR 4/3). The B2t horizon ranges from yellowish brown (10YR 5/4) to light brownish gray (10YR 6/2). Mottles in the B2t horizon range from few to many and from gray (N 5/0) to yellowish red (5YR 4/6). The B horizon ranges from loam to silty clay loam in the fine-earth fraction.

The Blairton soils are associated with deep, well drained Bedington soils; moderately deep, well drained Berks soils; shallow, well drained Weikert soils; deep, moderately well drained Ernest soils; and poorly drained Brinkerton soils.

BoB—Blairton silt loam, 2 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of soils that have a surface layer of channery silt loam and a few small areas of Berks, Bedington, and Ernest soils.

Most areas of this soil are in crops, and some areas are in hay and pasture. Some deep rooted plants are adversely affected in places by the seasonal high water table. Moderate management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the seasonal high water table and depth to bedrock. Capability subclass IIIw.

BoC—Blairton silt loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of soils that have a surface layer of channery silt loam and a few areas of Bedington, Berks, and Ernest soils.

Most areas of this soil are in crops. The soil is well suited to most general farm crops, hay, and pasture. Some deep rooted plants are adversely affected in places by the seasonal high water table. Moderate to intensive management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are a seasonal high water table, depth to bedrock, and slope. Capability subclass IIIe.

Brinkerton Series

The Brinkerton series consists of deep, nearly level and gently sloping, poorly drained soils on foot slopes of the uplands. These soils formed in colluvial material weathered from shale, siltstone, and fine grained sandstone.

In a representative profile in an undisturbed area, the surface layer is mottled very dark gray silt loam 2 inches thick. The subsurface layer is mottled grayish brown heavy silt loam 5 inches thick. The subsoil is mottled, light brownish gray, firm silty clay loam in the upper 5 inches; mottled, grayish brown, firm silty clay loam in the next 13 inches; and mottled, gray, firm and brittle silty clay loam in the lower 16 inches. The substratum is mottled, yellowish brown very shaly silt loam to a depth of 60 inches.

Permeability is slow. Available water capacity is moderate. A high water table is at or within 6 inches of the surface during wet seasons.

Most of the acreage of these soils has been cleared and is used for pasture. A few areas are idle or wooded. The seasonal high water table is the main limitation to most uses of these soils.

Representative profile of Brinkerton silt loam, 3 to 8 percent slopes, in a wooded area 1¼ miles north of Masseyburg:

A1g—0 to 2 inches; very dark gray (10YR 3/1) silt loam; common fine distinct grayish (2.5Y 5/2) mottles; weak fine granular structure; slightly firm, slightly sticky and nonplastic; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2g—2 to 7 inches; grayish brown (2.5Y 5/2) heavy silt loam; few fine prominent strong brown (7.5YR 5/6) mottles; weak medium granular structure; slightly firm, slightly sticky and nonplastic; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B21tg—7 to 12 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky and plastic; few thin clay films on ped faces and in pores; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B22tg—12 to 25 inches; light brownish gray (2.5Y 5/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm, sticky and plastic; few moderately thick clay films on ped faces and in pores; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bxg—25 to 41 inches; gray (N 6/0) silty clay loam; common fine distinct olive gray (5YR 5/2) mottles and common fine prominent gray (N 5/0) mottles; moderate very coarse prismatic structure parting to moderate thin platy; very firm and brittle, sticky and plastic; few moderately thick clay films on ped faces; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—41 to 60 inches: yellowish brown (10YR 5/6) very shaly silt loam; common fine distinct olive gray (5Y 5/2) mottles; weak fine granular structure; friable, nonsticky and nonplastic; 70 percent coarse fragments; strongly acid.

The solum ranges from 40 to 50 inches in thickness. Bedrock is at a depth of 4 to 7 feet. Depth to the fragipan ranges from 18 to 30 inches. Coarse fragments make up 0 to 10 percent of the A and B2t horizons, 5 to 20 percent of the Bx horizon, and 40 to 70 percent of the C horizon. Reaction ranges from very strongly acid to medium acid, unless the soil is limed. The B2t horizon ranges from dark gray (10YR 4/1) to light brownish gray (2.5Y 6/2) and from heavy silt loam to silty clay loam. The Bx horizon is gray (N 6/0) to grayish brown (10YR 5/2) loam to silty clay loam.

Brinkerton soils are associated with deep, well drained Bedington soils; moderately deep, well drained Berks soils; shallow, well drained Weikert soils; deep, moderately well drained Ernest soils; and moderately well drained to somewhat poorly drained Blairton soils.

BrA—Brinkerton silt loam, 0 to 3 percent slopes. This soil is nearly level. Runoff is slow, and in disturbed or cultivated areas erosion hazard is slight.

Included with this soil in mapping are a few small areas of Ernest and Blairton soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, trees, wildlife habitat, and recreational uses. Because of the seasonal high water table, it is limited to plants that have shallow or water-tolerant roots. If suitable outlets are available, artificial drainage systems can be used to remove excess water and improve the suitability of the soil for some crops. Moderate management practices in disturbed or cultivated areas are needed to control surface water and to reduce erosion and the loss of soil nutrients and other applied materials. The major limitations for most town and country uses are the seasonal high water table and slow permeability. Capability subclass IVw.

BrB—Brinkerton silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is slow, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of soils that have stones on the surface and a few areas of Ernest soils.

Most areas of this soil are in crops, and a few areas are in woodland. The soil is well suited to hay, pasture, trees, wildlife, and recreational uses. Plants are limited to those that are water tolerant. If suitable outlets are available, artificial drainage systems can be used to remove excess water and increase the range of suitable crops. Moderate management practices are needed to control runoff and reduce erosion. The major limitations for most town and country uses are a seasonal high water table and slow permeability. Capability subclass IVw.

Buchanan Series

The Buchanan series consists of deep, gently sloping to moderately steep, somewhat poorly drained and moderately well drained soils on foot slopes and in drainageways and depressions of the uplands. These soils formed in colluvial material derived from sandstone, siltstone, and shale.

In a representative profile in a wooded area, the

surface layer is very dark grayish brown gravelly loam about 1 inch thick. The subsurface layer is yellowish brown gravelly loam 5 inches thick. The subsoil is yellowish brown, friable clay loam in the upper 5 inches; yellowish brown, friable clay loam in the next 8 inches; mottled yellowish brown, friable gravelly sandy clay loam in the next 10 inches; and mottled yellowish brown, firm and brittle gravelly sandy clay loam in the lower 20 inches. The substratum is yellowish brown very gravelly loam to a depth of 60 inches.

Permeability is slow. Available water capacity is moderate. A seasonal high water table is 6 inches to 3 feet from the surface.

Most of the acreage of these soils is extremely stony and is wooded. A few areas have been cleared and are used for crops, hay, and pasture. The hazard of erosion, slope, seasonal high water table, slow permeability, and stoniness in some areas are the main limitations to most uses of these soils.

Representative profile of Buchanan gravelly loam in an area of Buchanan extremely stony loam, 8 to 25 percent slopes, in a wooded area 3¼ miles south of Mount Union:

A1—0 to 1 inch; very dark grayish brown (10YR 3/2) gravelly loam; weak fine granular structure; friable, nonsticky and nonplastic; 25 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—1 to 6 inches; yellowish brown (10YR 5/4) gravelly loam; weak fine granular structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B1—6 to 11 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—11 to 19 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular and angular blocky structure; friable, sticky and plastic; few moderately thick clay films on ped faces; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22t—19 to 29 inches; yellowish brown (10YR 5/6) gravelly sandy clay loam; few coarse distinct gray (10YR 5/1) and light brownish gray (10YR 6/2) mottles; moderate medium subangular and angular blocky structure; friable, sticky and plastic; common moderately thick clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx—29 to 49 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam; common fine distinct dark gray 10YR 4/1) and strong brown (7.5YR 5/6) mottles; weak very coarse prismatic structure parting to moderate thick platy; firm and brittle, sticky and plastic; few thin clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear wavy boundary.

C—49 to 60 inches; yellowish brown (10YR 5/4) very gravelly loam; massive; 60 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 50 inches in thickness. Bedrock is at a depth of 5 to 8 feet or more. Depth to the fragipan ranges from 22 to 32 inches. Coarse fragments make up 10 to 40 percent of the A, B2t, and Bx horizons and as much as 60 percent of the C horizon. Reaction ranges from strongly acid to extremely acid throughout the profile. The B2t horizon ranges from yellowish brown (10YR 5/6) to light brown (7.5YR 6/4). The fine-earth fraction of the B2t and Bx horizons ranges from loam to sandy clay loam. The Bx horizon ranges from yellowish brown (10YR 5/6) to reddish brown (5YR 4/4).

Buchanan soils are associated with deep, well drained Hazleton and Laidig soils; moderately deep, well drained Dekalb and Berks soils; and deep, poorly drained Andover soils.

BuB—Buchanan gravelly loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series. The surface stones have been removed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Laidig and Andover soils and a few small areas of a soil that is more alkaline in the subsoil than this Buchanan soil.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture, including deep rooted plants that are water tolerant. If outlets are available, a suitable artificial drainage system can be used to improve the suitability of this soil for a wider range of crops. Moderate management practices are needed to control surface water and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the seasonal high water table and slow permeability. Capability subclass IIe.

BuC—Buchanan gravelly loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series. The surface stones have been removed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Laidig and Andover soils, a few areas of soils that are stony, and a few areas of a soil that is more alkaline in the subsoil than this Buchanan soil.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture, including deep rooted plants that are water tolerant. If suitable outlets are available, an artificial drainage system can be used to improve the suitability of this soil for a wider range of crops. Moderate to intensive management practices are needed to control surface water and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the seasonal high water table, slow permeability, and slope. Capability subclass IIIe.

BuD—Buchanan gravelly loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series. The surface stones have been removed. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Laidig and Berks soils, a few areas of soils that are stony, and a few areas of a soil that is more alkaline in the subsoil than this Buchanan soil.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Intensive management practices are needed in disturbed areas to control surface water and reduce erosion. The major limitations for most town and country uses are slope, the seasonal high water table, and slow permeability. Capability subclass IVe.

BxB—Buchanan extremely stony loam, 3 to 8 per-

cent slopes. This soil is gently sloping. Stones that are 10 to 36 inches in diameter cover 15 to 50 percent of the surface area. Runoff is medium, and in disturbed areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few small areas of Andover and Laidig soils. Also included are a few areas of soils that have stones covering less than 15 percent of the surface and a few areas of a soil that is more alkaline than this Buchanan soil.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreational uses. Areas that are disturbed require moderate management practices to control surface water and reduce erosion. The major limitations for most town and country uses are stoniness, the seasonal high water table, and slow permeability. Capability subclass VIIs.

BxD—Buchanan extremely stony loam, 8 to 25 percent slopes. This sloping to moderately steep soil has the profile described as representative of the series. Stones that are 10 to 36 inches in diameter cover 15 to 50 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Andover, Laidig, and Berks soils. Also included are a few areas of soils that have stones covering less than 15 percent of the surface and a few areas of a soil that is more alkaline in the subsoil than this Buchanan soil.

Most areas of this soil are wooded. It is well suited to trees, wildlife habitat, and recreational uses. Areas that are disturbed require moderate to intensive conservation measures to control surface water and reduce soil erosion. The major limitations for most town and country uses are stoniness, the seasonal high water table, slow permeability, and slope. Capability subclass VIIs.

Calvin Series

The Calvin series consists of moderately deep, gently sloping to moderately steep, well drained soils on highly dissected uplands. These soils formed in material weathered from shale, siltstone, and fine grained sandstone.

In a representative profile in a disturbed area, the surface layer is reddish brown shaly silt loam about 8 inches thick. The subsoil is reddish brown, friable shaly silt loam in the upper 4 inches; dark red, friable shaly silt loam in the next 8 inches; and dark red, friable very shaly silt loam in the lower 4 inches. The substratum is weak red very shaly silt loam. Dusky red shale and sandstone bedrock is at a depth of 36 inches.

Permeability is moderately rapid. Available water capacity is very low to low. The water table is below a depth of 36 inches.

Most of the acreage of these soils is wooded or idle. A few areas are used for crops, hay, and pasture. The hazard of erosion, slope, and depth to bedrock are the main limitations to most uses of these soils.

Representative profile of Calvin shaly silt loam, 3 to 8 percent slopes, in a cultivated area one-half mile north of Calvin:

Ap—0 to 8 inches; reddish brown (5YR 4/3) shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

B21—8 to 12 inches; reddish brown (2.5YR 4/4) shaly silt loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 30 percent coarse fragments; strongly acid; clear smooth boundary.

B22—12 to 20 inches; dark red (2/5YR 3/6) shaly silt loam; moderate medium subangular blocky structure; friable, sticky and slightly plastic; very few thin patchy clay films on ped faces; 40 percent coarse fragments; very strongly acid; clear smooth boundary.

B3—20 to 24 inches; dark red (2.5YR 3/6) very shaly silt loam; friable, nonplastic and slightly sticky; very few thin patchy clay films on ped faces; 50 percent coarse fragments; very strongly acid; clear smooth boundary.

C—24 to 36 inches; weak red (2.5YR 4/2) very shaly silt loam; massive; very friable, nonsticky and nonplastic; 70 percent coarse fragments; very strongly acid; clear wavy boundary.

R—36 inches; dusky red (2.5YR 3/2) shale and sandstone.

The solum ranges from 20 to 34 inches in thickness. Fractured bedrock is at a depth of 20 to 40 inches. Reaction is strongly acid or very strongly acid throughout the profile, unless the soil is limed. Coarse fragments make up 15 to 25 percent of the A horizon, 25 to 55 percent of the B horizon, and 50 to 70 percent of the C horizon. The B horizon ranges from yellowish red (5YR 5/6) to weak red (10YR 4/2) and is loam to silt loam in the fine-earth fraction.

Calvin soils are associated with deep, well drained Meckesville soils; moderately deep, well drained Berks soils; shallow well drained Klinesville and Weikert soils; deep, moderately well drained and somewhat poorly drained Albrights soils; and poorly drained Brinkerton soils. Calvin soils lack the B horizon development of Meckesville soils and are redder than the Berks and Weikert soils.

CaB—Calvin shaly silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Klinesville soils, a few areas of a soil that has more clay in the subsoil than this Calvin soil, and a few areas of soils that are more than 40 inches deep to bedrock.

Most areas of this soil are in crops. The soil is well suited to hay and pasture. It is used for general field crops. Moderately rapid permeability and very low to low available water capacity limit the growth of some cultivated crops. Moderate management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitation for most town and country uses is the depth to bedrock. Capability subclass IIe.

CaC—Calvin shaly silt loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but depth to bedrock is about 3 inches less. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Klinesville soils, some areas of a soil that has more clay in the subsoil than this Calvin soil, and some areas of soils that are more than 40 inches deep to bedrock.

Most areas of this soil are in crops. This soil is well suited to hay and pasture. It is used for general field

crops. Moderately rapid permeability and very low to low available water capacity limit the growth of some cultivated crops. Moderate to intensive management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IIIe.

CaD—Calvin shaly silt loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to that described as representative of the series, but depth to bedrock is 6 inches less. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few areas of Klinesville soils, a few areas of a soil that has more clay in the subsoil than this Calvin soil, and a few areas of soils that are more than 40 inches deep to bedrock.

Most areas of this soil are in crops. The soil is well suited to pasture, hay, and trees. Areas that are disturbed or cultivated require intensive management practices to control runoff and reduce erosion. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IVe.

Clarksburg Series

The Clarksburg series consists of deep, gently sloping, moderately well drained soils on foot slopes and in drainageways and depressions of the uplands. These soils formed in material weathered from limestone and calcareous shale.

In a representative profile in a disturbed area, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is brown, friable silty clay loam in the upper 12 inches; mottled brown, slightly firm silty clay loam in the next 7 inches; and mottled strong brown, firm and brittle silty clay loam in the lower 14 inches. The substratum is mottled strong brown, friable to firm very shaly silty clay loam. Very dark gray limestone bedrock is at a depth of 62 inches.

Permeability is slow. Available water capacity is moderate. A seasonal high water table is within 1½ to 3 feet of the surface.

Most of the acreage of these soils has been cleared and is used for cultivated crops, hay, and pasture. A few areas are wooded. The seasonal high water table and slow permeability are the main limitations to most uses of these soils.

Representative profile of Clarksburg silt loam, 2 to 8 percent slopes, in a cultivated area 2 miles south of Huntingdon on Pennsylvania Route 26:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine and medium subangular blocky structure; friable, nonsticky and nonplastic; many roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B21t—8 to 20 inches; brown (7.5YR 5/4) silty clay loam; moderate medium angular blocky structure; friable, slightly sticky and plastic; many thick clay films on ped faces and in pores; many roots; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22t—20 to 27 inches; brown (7.5YR 5/4) silty clay loam; common fine distinct gray (N 5/0) and yellowish red (5YR 5/6) mottles; moderate medium subangular blocky structure; slightly firm, sticky and plastic; many thick clay films on ped faces and in pores; few roots; 5 percent coarse fragments; slightly acid; clear wavy boundary.

Bx—27 to 41 inches; strong brown (7.5YR 5/6) silty clay loam; many medium faint dark gray (5YR 4/1) mottles; moderate very coarse prismatic structure; firm and brittle, slightly sticky and plastic; common moderately thick clay films on ped faces; 10 percent coarse fragments; slightly acid; clear wavy boundary.

C—41 to 62 inches; strong brown (7.5YR 5/6) very shaly silt loam; many medium faint dark gray (5YR 4/1) mottles; massive; friable to firm, slightly sticky and plastic; few thin clay films on ped faces; 65 percent coarse fragments; slightly acid; abrupt smooth boundary.

R—62 inches; very dark gray (N 3/0) limestone.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at a depth of 5 feet or more. Reaction ranges from strongly acid to slightly acid throughout the profile. Coarse fragments of chert, shale, and limestone make up 5 to 20 percent of the Ap and B2 horizon, 5 to 30 percent of the Bx horizon, and 50 to 80 percent of the C horizon. The B horizon ranges from dark yellowish brown (10YR 4/4) to strong brown (7.5YR 5/8) and from loam to silty clay loam.

Clarksburg soils are associated with deep, well drained Edom, Hagerstown, Hublersburg, and Elliber soils; shallow, well drained Opequon soils; and somewhat poorly drained Newark soils.

CbB—Clarksburg silt loam, 2 to 8 percent slopes. This soil is gently sloping. Runoff is slow to medium, and in disturbed or cultivated areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few areas of Hublersburg, Hagerstown, Edom, Weikert, Klinesville, and Opequon soils. Also included are some areas of soils that do not have gray mottles, a few areas of soils that have a thicker and darker colored surface layer than this Clarksburg soil, and a few areas of soils that are cherty.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. During years of above normal rainfall, deep rooted crops that are not water tolerant are limited in places by a seasonal high water table and occasional ponding. Moderate management practices, including use of a cover crop for winter protection, are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the seasonal high water table, slow permeability, and occasional ponding. Capability subclass IIe.

Clymer Series

The Clymer series consists of deep, gently sloping and sloping, well drained soils on plateaus in the uplands. These soils formed in material weathered from sandstone, siltstone, and interbedded shale.

In a representative profile in an undisturbed area, the surface layer, which is covered by a layer of organic material, is black channery loam about 2 inches thick. The subsurface layer is grayish brown channery loam to a depth of 6 inches. The subsoil is dark brown, friable channery loam in the upper 7 inches; strong brown, friable channery sandy clay loam in the next 6 inches; and strong brown and dark brown, friable channery loam in the lower 17 inches. The substratum is dark brown very channery sandy loam. Brown sandstone bedrock is at a depth of 46 inches.

Permeability is moderate to moderately rapid. Available water capacity is moderate to high. The water table is below a depth of 6 feet.

Most of the acreage of these soils is very stony and is wooded. A few areas have been cleared and are used for crops, hay, and pasture. Depth to bedrock, slope, the hazard of erosion on cleared areas, and stoniness in some areas are the main limitations to most uses of these soils.

Representative profile of Clymer channery loam, 3 to 8 percent slopes, in a wooded area 1.2 miles east of Broad Top City on Pennsylvania Route 913:

O1—2 inches to 1 inch; leaf litter, mostly oak leaves.
O2—1 inch to 0; partly decomposed organic material.
A1—0 to 2 inches; black (10YR 2/1) channery loam; weak fine granular structure; very friable, nonsticky and nonplastic; 20 percent coarse fragments; very strongy acid; abrupt smooth boundary.
A2—2 to 6 inches; grayish brown (10YR 5/2) channery loam; weak fine granular structure; friable, slightly sticky and nonplastic; 20 percent coarse fragments; very strongly acid; clear smooth boundary.
B1—6 to 13 inches; dark brown (7.5YR 4/4) channery loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 20 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—13 to 19 inches; strong brown (7.5YR 5/6) channery sandy clay loam; moderate fine subangular blocky structure; friable, sticky and plastic; common thin clay films on ped faces and in pores; 25 percent coarse fragments; very strongly acid; clear wavy boundary.
B22t—19 to 28 inches; strong brown (7.5YR 5/6) channery loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 25 percent coarse fragments; very strongly acid; gradual wavy boundary.
B23t—28 to 36 inches; dark brown (7.5YR 4/4) channery loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 25 percent coarse fragments; very strongly acid; clear smooth boundary.
C—36 to 46 inches; dark brown (7.5YR 4/4) very channery sandy loam; massive; friable, nonsticky and nonplastic; 85 percent coarse fragments; very strongly acid; clear smooth boundary.
R—46 inches; brown (10YR 4/3) partly weathered sandstone.

The solum ranges from 30 to 40 inches in thickness. Bedrock is at a depth of about 3½ to 7 feet. Reaction in the solum ranges from strongly acid to extremely acid, unless the soil is limed. Coarse fragments make up 15 to 25 percent of the A and B horizons and 60 to 85 percent of the C horizon. The B horizon ranges from yellowish brown (10YR 5/6) to dark brown (7.5YR 4/4) and from channery sandy loam to channery clay loam. The B2t horizon has weak or moderate, subangular blocky structure.

Clymer soils are associated with deep, well drained Hazleton soils; moderately deep, well drained Dekalb and Berks soils; deep, moderately well drained Buchanan soils; and deep, poorly drained Andover soils. Clymer soils have fewer coarse fragments throughout the profile and contain more clay in the B horizon than Hazleton, Dekalb, and Berks soils.

ClB—Clymer channery loam, 3 to 8 percent slopes. This gently sloping soil has a thick, dark, plowed surface layer, but otherwise it is similar to the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hazleton, Dekalb, Buchanan, and Bedington soils and a few small areas of soils that are stony.

Most areas of this soil are in crops. The soil is suited to most general field crops, hay, and pasture. Droughtiness is a management concern for some shallow rooted crops, and coarse fragments on the surface interfere with tillage operations. Moderate management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The channery surface layer is the major limitation for most town and country uses, and the bedrock limits deep excavations in some areas. Capability subclass IIe.

ClC—Clymer channery loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the surface layer is 8 inches thick. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with the soil in mapping are a few small areas of Hazleton, Dekalb, Buchanan, and Bedington soils. Also included are a few small areas of soils that are stony and a few areas of a soil that has a surface layer of sandy loam.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Droughtiness is a management concern for some shallow rooted crops, and coarse fragments interfere with tillage operations. Moderate to intensive management practices are needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients and other applied materials. The major limitations for town and country use are slope and coarse fragments. Capability subclass IIIe.

CvB—Clymer very stony loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but it has stones on the surface. Stones that are 10 to 36 inches in diameter cover 5 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hazleton, Dekalb, and Buchanan soils; a few small areas of soils where stones cover more than 15 percent of the surface; and a few areas of a soil that has a surface layer of sandy loam.

Most areas of this soil are wooded. This soil is well suited to trees, wildlife habitat, and recreational uses. The quantity of stones on the surface makes cultivation impractical (fig. 9). In disturbed areas moderate management practices are needed to control runoff and reduce erosion. The major limitation for most town and country uses is stoniness. Capability subclass VIs.

CvC—Clymer very stony loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but stones that are 10 to 36 inches in diameter cover 5 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate to severe.

Included with the soil in mapping are a few small areas of Buchanan, Hazleton, and Dekalb soils and a few small areas of a soil that has a surface layer of sandy loam.

Most areas of this soil are wooded. The quantity of

Figure 9.—**Area of Clymer very stony loam, 3 to 8 percent slopes. This soil is too stony for most cultivated crops.**

stones makes cultivation impractical. This soil is well suited to trees, wildlife habitat, and recreational uses. In disturbed areas moderate to intensive management practices are needed to control runoff and reduce erosion. The major limitations for town and country uses are stoniness and slope. Capability subclass VIs.

Dekalb Series

The Dekalb series consists of moderately deep, nearly level to steep, well drained soils on plateaus and mountains. These soils formed in material weathered from sandstone and, in some places, from interbedded shale.

In a representative profile in a wooded area under a layer of black decomposed organic matter, the surface layer is very dark grayish brown channery sandy loam about 2 inches thick. The subsurface layer is light yellowish brown channery sandy loam to a depth of 6 inches. The subsoil is yellowish brown, friable channery and very channery sandy loam to a depth of 23 inches. The substratum is yellowish brown very flaggy loamy sand. Sandstone bedrock is at a depth of 35 inches.

Permeability is rapid. Available water capacity is very low to low. The water table is below a depth of 6 feet.

Most of the acreage of these soils is extremely stony and is wooded. A few areas have been cleared and are used for crops, hay, and pasture. Slope, depth to bedrock, rapid permeability, the hazard of erosion in cleared areas, and stoniness in some areas are the main limitations to most uses of these soils.

Representative profile of Dekalb channery sandy loam, in an area of Hazleton-Dekalb extremely stony sandy loams, 0 to 8 percent slopes, in a wooded area 6 miles west of Huntingdon on Tussey Mountain:

O1—3 to 2 inches; partly decomposed leaves.
O2—2 inches to 0; black (5YR 2/1) partly decomposed organic matter.
A1—0 to 2 inches; very dark grayish brown (10YR 3/2) channery sandy loam; weak very fine granular structure; very friable, nonsticky and nonplastic; many roots; 30 percent coarse fragments; very strongly acid; abrupt smooth boundary.
A2—2 to 6 inches; light yellowish brown (10YR 6/4) channery sandy loam; weak fine granular structure; very friable, nonsticky and nonplastic; many roots; 30 percent coarse fragments; strongly acid; clear smooth boundary.
B2—6 to 15 inches; yellowish brown (10YR 5/4) channery sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; few roots; 40 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—15 to 23 inches; yellowish brown (10YR 5/4) very channery sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; few roots; 50 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—23 to 35 inches; yellowish brown (10YR 5/4) very flaggy loamy sand; single grained; loose, nonsticky and nonplastic; 80 percent coarse fragments; very strongly acid; gradual wavy boundary.

R—35 inches; gray sandstone.

The solum ranges from 20 to 30 inches in thickness. Bedrock is at a depth of 20 to 40 inches. Reaction ranges from strongly acid to extremely acid throughout, unless the soil is limed. Coarse fragments of cobbles, channers, and stones make up 20 to 60 percent of the solum and 50 to 90 percent of the C horizon. The B horizon ranges from yellowish brown (10YR 5/4) to strong brown (7.5YR 5/6). The fine-earth fraction of the B horizon is sandy loam to loam.

Dekalb soils are associated with deep, well drained Hazleton, Clymer, Vanderlip, Leetonia, and Laidig soils; moderately deep, well drained Berks soils; deep, somewhat poorly drained to moderately well drained Buchanan soils; and deep, poorly drained Andover soils. Dekalb soils lack the bleached A2 and Bir horizons typical of Leetonia soils, and they are more sandy than Berks soils.

Edom Series

The Edom series consists of deep, gently sloping to steep, well drained soils on dissected uplands. The soils formed in material weathered from shale and shaly limestone.

In a representative profile in a cultivated area, the surface layer is dark brown silty clay loam about 8 inches thick. The upper 3 inches of the subsoil is reddish brown silty clay; the next 18 inches is firm clay that is yellowish red in the upper part and reddish brown in the lower part; and the lower 9 inches is firm silty clay that is yellowish red in the upper part and reddish brown in the lower part. The substratum is strong brown very shaly silty clay loam. Calcareous shale and shaly limestone bedrock is at a depth of 46 inches.

Permeability is moderate. Available water capacity is moderate. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. The erosion hazard, depth to the fractured limestone bedrock, and slope are the main limitations for most uses of these soils.

Representative profile of Edom silty clay loam in an area of Edom-Opequon complex, 3 to 8 percent slopes, in a cultivated area, 1 mile south of Smithfield:

Ap—0 to 8 inches; dark brown (7.YR 3/2) silty clay loam; moderate fine and medium granular structure; friable, nonsticky and nonplastic; less than 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—8 to 11 inches; reddish brown (5YR 4/4) silty clay; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; common moderately thick clay films on ped faces; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B22t—11 to 18 inches; yellowish red (5YR 4/6) clay; strong medium angular blocky structure; firm, sticky and plastic; many thick clay films on ped faces; 10 percent coarse fragments; medium acid; clear smooth boundary.

B23t—18 to 29 inches; reddish brown (5YR 4/4) clay; strong medium angular blocky structure; firm, sticky and plastic; many thick clay films on ped faces; 10 percent coarse fragments; medium acid; clear wavy boundary.

B24t—29 to 35 inches; yellowish red (5YR 5/6) silty clay; weak medium subangular blocky structure; firm, sticky and plastic; common thin clay films on ped faces; 10 percent coarse fragments; medium acid; clear wavy boundary.

B3—35 to 38 inches; reddish brown (5YR 5/4) silty clay; weak fine and medium subangular blocky structure; firm, sticky and plastic; common thin clay films on ped faces; 30 percent coarse fragments; neutral; abrupt wavy boundary.

C—38 to 46 inches; strong brown (7.5YR 5/6) very shaly clay loam; weak medium subangular blocky structure; slightly firm, sticky and plastic; few thin clay films on ped faces; 70 percent coarse fragments; neutral; clear wavy boundary.

R—46 inches; gray (N 6/0) calcareous shale and shaly limestone.

The solum ranges from 20 to 40 inches in thickness. Bedrock is at a depth of 3½ to 6 feet or more. Reaction ranges from strongly acid to neutral in the upper part of the solum and from medium acid to mildly alkaline in the lower part of the solum and in the C horizon. Coarse fragments of shale and channery limestone make up 0 to 20 percent of the Ap horizon, 5 to 30 percent of the B horizon, and 50 to 90 percent of the C horizon. The Ap horizon is olive brown (2.5Y 4/4) to dark brown (7.5YR 3/2), and the fine-earth fraction is silt loam or silty clay loam. The B horizon is yellowish brown (10YR 5/6) to reddish brown (5YR 4/4) silty clay or clay.

Edom soils are associated with deep, well drained Hagerstown, Hublersburg, and Murrill soils; moderately deep, well drained Berks soils; shallow, well drained Weikert and Klinesville soils; and deep moderately well drained Clarksburg soils. Edom soils have a thinner Bt horizon than Hagerstown and Hublersburg soils and contain more clay in the Bt horizon than Murrill soils.

EeB—Edom-Opequon complex, 3 to 8 percent slopes. These gently sloping soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of this mapping unit, and Opequon clay loam makes up about 20 percent. The Edom soil has the profile described as representative of the Edom series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with these soils in mapping are a few areas of Hagerstown, Klinesville, and Weikert soils and a few areas of soils that have a channery surface layer.

Most areas of these soils are in crops. These soils are suited to general field crops, hay, and pasture. The heavy texture makes seedbed preparation difficult. Droughtiness and uneven growth and yield distribution are concerns for some crops because of low available water capacity and depth to bedrock in the Opequon soils. Moderate to intensive management is needed to control runoff and reduce erosion. The major limitations for most town and country uses of these soils are depth to bedrock and erosion. Capability subclass IIIe.

EeC—Edom-Opequon complex, 8 to 15 percent slopes. These sloping soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of this mapping unit, and Opequon clay loam makes up about 20 percent. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with these soils in mapping are a few small areas of Hagerstown, Klinesville, and Weikert soils and a few areas of soils that have a channery surface layer.

Most areas of these soils are used for general farm crops, but the soils are better suited to hay and pasture. The heavy textured surface layer makes seedbed preparation difficult, and depth to bedrock and low available water capacity of the Opequon soil limit use of the soils for some crops. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitations for most town and country uses of these soils are slope and depth to bedrock. Capability subclass IVe.

EeD—Edom-Opequon complex, 15 to 25 percent slopes. These moderately steep soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of this mapping unit, and Opequon clay loam makes up about 20 percent. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with these soils in mapping are a few areas of Klinesville and Weikert soils, a few areas of soils that have a channery surface layer, and a few areas that have rock outcrops.

Most areas of these soils are in crops. These soils are suited to pasture, hay, and trees. If these soils are used for general field crops, erosion and droughtiness are limitations. Intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion. The major limitations for most town and country uses of these soils are slope and depth to bedrock. Capability subclass VIe.

EgB—Edom-Weikert complex, 3 to 8 percent slopes. These gently sloping soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of this complex, and Weikert shaly silt loam makes up about 20 percent. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with these soils in mapping are a few small areas of Opequon, Klinesville, and Clarksburg soils.

Most areas of these soils are in crops. These soils are suited to general farm crops, hay, and pasture. Depth to bedrock and very low to low available water capacity in Weikert soils may cause uneven growth and affect yield. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitation for most town and country uses of these soils is depth to bedrock. Capability subclass IIIe.

EgC—Edom-Weikert complex, 8 to 15 percent slopes. These sloping soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of the mapping unit, and Weikert shaly silt loam makes up about 20 percent. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with these soils in mapping are a few small areas of Opequon, Klinesville, and Clarksburg soils.

Most areas of these soils are in crops. The soils are suited to general farm crops, hay, and pasture. Depth to bedrock and very low to low available water capacity in the Weikert soils may cause uneven growth and affect yields. Intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and applied materials. The major limitations for most town and country uses of these soils are depth to bedrock and slope. Capability subclass IVe.

EgD—Edom-Weikert complex, 15 to 25 percent slopes. These moderately steep soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 60 percent of this mapping unit, and Weikert shaly silt loam makes up about 20 percent. The Edom soil has a profile similar to the one described as representative of the Edom series, but it is a few inches shallower over bedrock. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with these soils in mapping are a few small areas of Klinesville and Opequon soils.

Most areas of these soils are in crops. These soils are suited to pasture, hay, and trees. Intensive management is needed in disturbed areas to control runoff and to reduce erosion. The major limitations for most town and country uses of these soils are depth to bedrock and slope. Capability subclass VIe.

EgF—Edom-Weikert complex, 25 to 60 percent slopes. These steep soils are mapped together because they occur in such intricate patterns that it is not practical to separate them at the scale of the soil map. Edom silty clay loam makes up about 50 percent of this mapping unit, and Weikert shaly silt loam makes up about 30 percent. Both soils have profiles similar to the ones described as representative of their respective series, but they are a few inches shallower over bedrock. Runoff is rapid, and in disturbed areas the erosion hazard is severe.

Included with these soils in mapping are a few small areas of Klinesville and Opequon soils. Also included are a few areas of bedrock outcrops.

Most areas of these soils are wooded. These soils are limited by the steep slope, but they are well suited to open space, trees, and wildlife habitat. Intensive management is needed in disturbed areas to control runoff and to reduce erosion. The major limitations for most town and country uses of these soils are slope and depth to bedrock. Capability subclass VIIe.

Elliber Series

The Elliber series consists of deep, gently sloping to steep, well drained soils on ridges of the intermountain valleys. These soils formed in material weathered from cherty limestone.

In a representative profile in a cultivated area, the surface layer is dark brown, friable very cherty loam about 10 inches thick. The subsoil is light yellowish brown, friable very cherty loam in the upper 7 inches; yellowish brown, friable very cherty loam in the next 10 inches; and light yellowish brown, friable very cherty loam in the lower 19 inches. The substratum is light yellowish brown very cherty sandy loam to a depth of 60 inches.

Permeability is moderately rapid. Available water

capacity is very low to low. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for cultivated crops, hay, and pasture. A few areas are used for orchards. The coarse fragments, slope, permeability, low available water capacity, and hazard of ground water contamination are the main limitations to most uses of these soils.

Representative profile of Elliber very cherty loam, 5 to 15 percent slopes, in a cultivated field, 1 mile north of Burnt Cabins:

Ap—0 to 10 inches; dark brown (10YR 3/3) very cherty loam; weak fine granular structure; friable, nonsticky and nonplastic; 50 percent coarse fragments; neutral; abrupt smooth boundary.

B1—10 to 17 inches; light yellowish brown (10YR 6/4) very cherty loam; weak medium subangular blocky structure; friable, nonsticky and nonplastic; very few clay films on ped faces; 55 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—17 to 27 inches; yellowish brown (10YR 5/4) very cherty loam; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; few thin clay films on ped faces; 60 percent coarse fragments; strongly acid; gradual wavy boundary.

B22t—27 to 46 inches; light yellowish brown (10YR 6/4) very cherty loam; weak fine and medium subangular blocky structure; friable, nonsticky and nonplastic; few thin clay films on ped faces; 75 percent coarse fragments; strongly acid; gradual wavy boundary.

C—46 to 60 inches; light yellowish brown (10YR 6/4) very cherty sandy loam; massive; loose; 80 percent coarse fragments; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at a depth of 4 to 8 feet. Reaction throughout the profile is strongly acid or very strongly acid, unless the soil is limed. Coarse fragments of chert and sandstone make up 40 to 55 percent of the Ap horizon and 40 to 75 percent of the B horizon. The Ap horizon ranges from dark brown (10YR 3/3) to dark grayish brown (10YR 4/2). The B horizon is yellowish brown (10YR 5/4), light yellowish brown (10YR 6/4), and strong brown (7.5YR 5/6). The fine-earth fraction is loam, silt loam, and sandy loam.

Elliber soils are associated with deep, well drained Hublersburg, Edom, Morrison, and Vanderlip soils; deep, moderately well drained Clarksburg soils; and deep, somewhat poorly drained Newark soils. Elliber soils have more coarse fragments and less clay in the B horizon than Hublersburg, Morrison, and Edom soils, and they lack the loamy sandy texture typical of Vanderlip soils.

ElC—Elliber very cherty loam, 5 to 15 percent slopes. This gently sloping to sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hublersburg, Morrison, and Vanderlip soils. Also included are a few areas of a soil that is less than 40 percent coarse fragments in the surface layer and subsoil.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees, but a few areas are used for general farm crops. Very low to low available water capacity is a limitation for shallow rooted crops. Moderate to intensive management practices are needed to control runoff and to reduce soil erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, coarse fragments, and the hazard of ground water contamination. Capability subclass IVs.

ElD—Elliber very cherty loam, 15 to 30 percent slopes. This soil is moderately steep to steep. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few areas of Hublersburg, Morrison, and Vanderlip soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Very low to low available water capacity is a limitation for some crops. Intensive management practices are needed to control runoff and reduce erosion. The major limitations for most town and country uses are slope, coarse fragments, and hazard of ground water contamination. Capability subclass VIs.

Ernest Series

The Ernest series consists of deep, gently sloping and sloping, moderately well drained soils on foot slopes and in drainageways of the uplands. These soils formed in colluvium from shale, siltstone, and some sandstone.

In a representative profile in a wooded area, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam 5 inches thick. The subsoil is yellowish brown, friable silty clay loam in the upper 7 inches; mottled, yellowish brown, friable silty clay loam in the next 8 inches; and mottled, yellowish brown, firm and brittle shaly silty clay loam in the lower 37 inches.

Permeability is slow. Available water capacity is moderate. A seasonal high water table is within 1½ to 3 feet of the surface.

Most of the acreage of these soils is in woodland. A few areas have been cleared and are used for cultivated crops, hay, and pasture. The hazard of erosion, slope, a seasonal high water table, and slow permeability are the main limitations to most uses of these soils.

Representative profile of Ernest silt loam, 3 to 8 percent slopes, in a wooded area 3 miles southeast of Shirleysburg:

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; strongly acid; abrupt smooth boundary.

A2—3 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak fine granular structure; friable, slightly sticky and slightly plastic; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B1—8 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular structure; friable, sticky and plastic; very few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B2t—15 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; friable, sticky and plastic; few moderately thick clay films on ped faces and in pores; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

Bx1—23 to 60 inches; yellowish brown (10YR 5/6) shaly silty clay loam; common fine distinct light gray (10YR 6/1) mottles; weak very coarse prismatic structure parting to weak thin platy; firm and brittle, sticky and plastic; few moderately thick clay films on ped faces and in pores; 35 percent coarse fragments; very strongly acid.

The solum ranges from 36 to 60 inches or more in thick-

ness. Bedrock is at a depth of 3½ to 5 feet or more. Reaction throughout the profile is very strongly acid or strongly acid, unless the soil is limed. Coarse fragments make up 0 to 20 percent of the B horizon and 10 to 35 percent of the Bx and C horizons. The B horizon ranges from yellowish brown (10YR 5/6) to dark brown (7.5YR 4/4). The fine-earth fraction is silt loam or silty clay loam.

Ernest soils are associated with deep, well drained Bedington soils; moderately deep, well drained Berks soils; shallow, well drained Weikert soils; moderately deep, moderately well drained and somewhat poorly drained Blairton soils; and deep, poorly drained Brinkerton soils.

ErB—Ernest silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Brinkerton, Blairton, Berks, and Bedington soils. Also included are a few areas of an Ernest soil that has a channery surface layer.

Most areas of this soil are wooded because they are commonly adjacent to long, narrow drainageways. Larger areas are in crops. The soil is suited to general field crops, hay, and pasture. The seasonal high water table is a management concern for deep rooted crops that are not water tolerant. If suitable outlets are available, artificial drainage systems can be used to remove excess water and increase the range of suitable crops. Moderate management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitation for most town and country uses are slow permeability and a seasonal high water table. Capability subclass IIe.

ErC—Ernest silt loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the combined thickness of the surface layer and subsoil is about 6 inches less. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Ernest soils that have a channery surface layer, a few areas of somewhat poorly drained soils, and a few seepage areas. Also included are a few small areas of Blairton, Brinkerton, and Berks soils.

Most areas of this soil are wooded or are used for pasture and hay. A few areas are used for general crops. The seasonal high water table is a management concern for plants that do not have water tolerant roots. A suitable artificial drainage system is needed to help remove excess water and permit growing a wider range of crops. In disturbed or cultivated areas, moderate to intensive management practices are needed to control surface water and to reduce erosion and the loss of soil nutrients and other applied materials. The major limitations for most town and country uses are slope, the seasonal high water table, and slow permeability. Capability subclass IIIe.

Hagerstown Series

The Hagerstown series consists of deep, gently sloping to moderately steep, well drained soils on the rolling uplands of the intermountain valleys. These soils formed in material weathered from relatively pure, thick bedded limestone.

In a representative profile in a cultivated area, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is reddish brown, firm silty clay loam in the upper 6 inches; yellowish red, firm clay in the next 34 inches; yellowish red, firm silty clay in the next 15 inches; and yellowish red, friable silty clay in the lower 7 inches. Limestone bedrock is at a depth of 70 inches.

Permeability is moderate. Available water capacity is moderate to high. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for cultivated crops, hay, and pasture. The ridges and steeper slopes are mostly wooded. The hazard of erosion, slope, bedrock outcrops, and the hazard of ground water contamination are the main limitations to most uses of these soils.

Representative profile of Hagerstown silt loam, 2 to 8 percent slopes, in a hayfield 2 miles north of Birmingham:

Ap—0 to 8 inches; dark brown (7.5YR 4/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B1—8 to 14 inches; reddish brown (5YR 4/4) silty clay loam; moderate fine and medium subangular blocky structure; firm, nonsticky and slightly plastic; neutral; clear smooth boundary.

B21t—14 to 23 inches; yellowish red (5YR 5/6) clay; strong fine and medium subangular blocky structure; firm, sticky and plastic; many moderately thick clay films on ped faces and in pores; neutral; clear wavy boundary.

B22t—23 to 35 inches; yellowish red (5YR 5/6) clay; strong medium subangular blocky structure; firm, sticky and plastic; many moderately thick clay films on ped faces and in pores; neutral; clear wavy boundary.

B23t—35 to 48 inches; yellowish red (5YR 5/6) clay; strong medium subangular blocky structure; firm, sticky and plastic; many moderately thick clay films on ped faces and in pores; neutral; gradual wavy boundary.

B24t—48 to 63 inches; yellowish red (5YR 5/6) silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; common moderately thick clay films on ped faces and in pores; slightly acid; gradual wavy boundary.

B3—63 to 70 inches; yellowish red (5YR 4/6) silty clay; weak medium subangular blocky structure; friable, sticky and plastic; few thin clay films on ped faces; neutral; clear irregular boundary.

R—70 inches; gray limestone.

The solum ranges from 45 to 72 inches in thickness. Bedrock is at a depth of 4 to 7 feet. Coarse fragments of quartzite and limestone make up 0 to 15 percent of the solum and 20 to 80 percent of the C horizon. Reaction throughout the profile ranges from medium acid to neutral. The A horizon is silt loam or silty clay loam. The B1 horizon ranges from strong brown (7.5YR 5/8) to reddish brown (5YR 4/4). The Bt horizon is yellowish red (5YR 5/6) to reddish brown (2.5YR 4/4). The B horizon is silty clay loam to clay and has blocky or subangular blocky structure.

Hagerstown soils are associated with deep, well drained Edom, Hublersburg, Morrison, and Murrill soils; shallow, well drained Opequon soils; deep, moderately well drained Clarksburg soils; and deep, somewhat poorly drained Newark soils. Hagerstown soils have fewer coarse fragments and are more alkaline throughout the solum than the Hublersburg soils. They have more clay in the Bt horizon than Murrill and Morrison soils, and they have a thicker B horizon than the Edom soils.

HaB—Hagerstown silt loam, 2 to 8 percent slopes.

This gently sloping soil has the profile described as representative of the series. Runoff is medium, and the erosion hazard is moderate.

Included with this soil in the mapping are a few small areas of Hagerstown soils that have a layer of silty clay loam and channery silty clay loam and a few small areas of Hublersburg, Murrill, and Edom soils.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitation for town and country uses is the hazard of ground water contamination. Capability subclass IIe.

HcC3—Hagerstown silty clay loam, 8 to 15 percent slopes, eroded. This sloping soil has a profile similar to the one described as representative of the series, but it has been eroded and the surface layer is silty clay loam. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few areas of Hublersburg, Opequon, Edom, and Elliber soils. Also included are a few areas of soils that have a surface layer of silt loam and a few small areas that have rock outcrops.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Intensive management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied chemicals. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IVe.

HcD3—Hagerstown silty clay loam, 15 to 25 percent slopes, eroded. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer is silty clay loam and is eroded. Runoff is medium to rapid, and in disturbed or cultivated areas the hazard of erosion is severe.

Included with this soil in mapping are a few areas of soils that have a surface layer of channery silt loam and a few areas that have rock outcrops. Also included are a few areas of Hublersburg, Elliber, Murrill, Opequon, and Edom soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Intensive management practices are needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass VIe.

HeD—Hagerstown-Rock outcrop complex, 5 to 25 percent slopes. This gently sloping to moderately steep soil and land type are mapped together because they are so intermingled that it is not practical to separate them at the scale of the soil map. The Hagerstown soil makes up about 40 to 60 percent of this mapping unit, and Rock outcrop makes up about 20 to 30 percent. The Hagerstown soil has a profile similar to the one described as representative of the series, but the surface layer ranges from silt loam to silty clay loam.

Included with this complex in mapping are many areas of Elliber soils. Also included are a few areas of Hublersburg and Edom soils.

Most areas of this complex are in pasture or woodland. The complex is well suited to permanent pasture. Rock outcrop severely limits use of tillage and harvesting equipment. Moderate to intensive management practices are needed in disturbed areas to control surface water and reduce erosion. The major limitations for most town and country uses are slope, rockiness, and the hazard of ground water contamination. Capability subclass VIs.

Hazleton Series

The Hazleton series consists of deep, nearly level to steep, well drained soils on the mountains and on plateaus. These soils formed in material weathered from sandstone.

In a representative profile in a wooded area, the surface layer is very dark gray, very friable channery loam about 2 inches thick. The subsurface layer is brown, friable channery loam 5 inches thick. The subsoil is light yellowish brown, friable channery loam in the upper 8 inches and strong brown, friable channery loam and very channery sandy loam in the lower 24 inches. The substratum is yellowish brown, friable very channery sandy loam. Gray sandstone is at a depth of 51 inches.

Permeability is moderately rapid. Available water capacity is low to moderate. The water table is at a depth of 6 feet or more.

Most of the acreage of these soils is extremely stony and is wooded. A few areas have been cleared and are used for cultivated crops, hay, and pasture. Slope, depth to bedrock, stoniness in some areas, and permeability are the main limitations to most uses of these soils.

Representative profile of Hazleton channery loam in an area of Hazleton-Dekalb association, moderately steep, in a wooded area, 1½ miles southeast of Whipples Dam:

O2—1½ inches to 0; black (10YR 2/1) partly decomposed organic matter.

A1—0 to 2 inches; very dark gray (10YR 3/1) channery loam; weak very fine granular structure; very friable; nonsticky and nonplastic; many roots; 40 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—2 to 7 inches; brown (10YR 5/3) channery loam; weak fine granular structure; friable, nonsticky and nonplastic; many roots; 40 percent coarse fragments; very strongly acid; clear smooth boundary.

B1—7 to 15 inches; light yellowish brown (10YR 6/4) channery loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; many roots; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

B21—15 to 26 inches; strong brown (7.5YR 5/6) channery loam; moderate fine subangular blocky structure; friable, nonsticky and nonplastic; very few thin clay films on ped faces; many roots; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

B22—26 to 32 inches; strong brown (7.5YR 5/6) channery loam; moderate fine subangular blocky structure; friable, nonsticky and nonplastic; very few thin clay films on ped faces; few roots; 45 percent coarse fragments; very strongly acid; gradual wavy boundary.

B3—32 to 39 inches; strong brown (7.5YR 5/6) very channery sandy loam; moderate fine subangular blocky structure; friable, nonsticky and nonplastic; few

roots; 55 percent coarse fragments; very strongly acid; clear irregular boundary.

C—39 to 51 inches; yellowish brown (10YR 5/6) very channery sandy loam; massive; friable; few roots; 70 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—51 inches; gray sandstone.

The solum ranges from 30 to 50 inches in thickness. Bedrock is at a depth of 3½ to 7 feet or more. Reaction throughout the profile is very strongly acid or strongly acid, unless the soil is limed. Coarse gravel and fragments of channery sandstone make up 15 to 60 percent of the solum and 45 to 80 percent of the C horizon. The A horizon ranges from yellowish brown (10YR 5/4) to very dark grayish brown (10YR 3/2). The B horizon is reddish brown (5YR 5/4) to brownish yellow (10YR 6/8). The solum is loam or sandy loam.

Hazleton soils are associated with deep, well drained Clymer soils; moderately deep Dekalb soils; deep, moderately well drained to somewhat poorly drained Buchanan soils; and deep, poorly drained Andover soils. Hazleton soils have less clay in the B horizon than Clymer soils.

HhB—Hazleton channery loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the surface stones have been removed and the surface layer has been plowed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Buchanan, Clymer, and Dekalb soils. Also included are a few areas of redder soils and a few small areas which are stony.

Most areas of this soil are wooded. This soil is well suited to trees. It is used for general field crops, hay, and pasture. Droughtiness is a concern for some crops, and coarse fragments interfere with tillage operations. Moderate management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are depth to bedrock, coarse fragments, and moderately rapid permeability. Capability subclass IIe.

HhC—Hazleton channery loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the surface stones have been removed and the surface layer has been plowed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Buchanan, Clymer, and Dekalb soils. Also included are a few areas of redder soils and a few small areas that are stony.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreational uses. A few areas have been cleared and are used for general farm crops, hay, and pasture. Droughtiness is a concern for some crops, and coarse fragments interfere with tillage operations. Moderately intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are slope, coarse fragments, and depth to bedrock. Capability subclass IIIe.

HhD—Hazleton channery loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface stones have been removed and the surface layer has been plowed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Buchanan, Clymer, and Dekalb soils. Also included are a few areas of redder soils and a few small areas that are stony.

Most areas of this soil are wooded. The soil is suited to trees, wildlife habitat, recreational uses, and hay and pasture. Intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, coarse fragments, and depth to bedrock. Capability subclass IVe.

HsB—Hazleton-Dekalb extremely stony sandy loams, 0 to 8 percent slopes. These nearly level to gently sloping soils are mapped together because they are so intermingled that it is not practical to separate them at the scale of the soil map. Stoniness is the major limitation to their use and management. Stones that are 10 to 36 inches or more in diameter cover 15 to 30 percent of the surface area. The Hazleton soil makes up about 60 percent of the mapping unit, and Dekalb channery sandy loam makes up about 20 to 30 percent. The Hazleton soil has a profile similar to the one described as representative of the Hazleton series, but the surface layer is sandy loam. The Dekalb soil has the profile described as representative of the Dekalb series. Runoff is slow to medium, and in disturbed areas the erosion hazard is moderate.

Included with these soils in mapping are a few small areas of Buchanan, Clymer, and Leetonia soils. Also included are some areas of redder soils and a few small areas of soils where stones cover more than 50 percent of the surface.

Most areas of these soils are wooded. The soils are well suited to trees, wildlife habitat, and recreational uses. The quantity of stones on the surface makes use of tillage equipment impractical. Moderate management is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are stoniness and depth to bedrock. Capability subclass VIIs.

HTD—Hazleton-Dekalb association, moderately steep. These soils are mapped together because an extremely stony surface is the major concern for both soils and because their expected use and management are similar. Slope is 8 to 25 percent. The composition of this mapping unit is more variable than that of most others, but mapping was controlled well enough to be interpreted for expected soil use. Hazleton channery loam makes up to 60 percent of the mapping unit, and Dekalb channery sandy loam makes up 15 to 20 percent. The Hazleton soil has the profile described as representative of the Hazleton series. Stones that are 10 to 36 inches or more in diameter cover 15 to 50 percent of the surface area. Runoff is medium, and in disturbed areas the erosion hazard is severe.

Included with these soils in mapping are a few small areas of Clymer, Meckesville, Buchanan, and Laidig soils. Also included are a few areas of exposed bedrock, some areas of red sandy loam, and a few areas of soils where stones cover more than 50 percent of the surface.

Most areas of these soils are wooded. The soils are

well suited to trees, wildlife habitat, and recreational uses. The quantity of stones on the surface makes tillage impractical. Intensive management is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope, stoniness, and depth to bedrock. Capability subclass VIIs.

HTF—Hazleton-Dekalb association, steep. These soils are mapped together because their expected use and management are similar and the major concerns on both soils are steep slopes and an extremely stony surface. Slope is 25 to 70 percent. The composition of this mapping unit is more variable than that of most others, but mapping was controlled well enough to be interpreted for expected soil use. Hazleton soils make up 50 to 60 percent of the mapping unit, and Dekalb soils make up 10 to 20 percent. These soils have profiles similar to the ones described as representative of their respective series, but the surface layer of each soil ranges from channery loam to sandy loam. Stones that are 10 to 36 inches in diameter cover 5 to 50 percent of the surface area. Runoff is medium, and in disturbed areas the erosion hazard is very severe.

Included with these soils in mapping are some areas of Laidig soils, a few small areas of Berks soils, a few areas of soils where stones cover more than 50 percent of the surface, and a few areas of exposed bedrock.

Most areas of these soils are in woodland. These soils are limited by the steep slope, but they are well suited to woodland, wildlife habitat, and recreation. Intensive management is needed in disturbed areas to control surface water and to reduce soil erosion. The major limitations for most town and country uses are slope and stoniness. Capability subclass VIIs.

Hublersburg Series

The Hublersburg series consists of deep, gently sloping to moderately steep, well drained soils in rolling and undulating upland intermountain valleys. These soils formed in material weathered from impure limestone.

In a representative profile in a cultivated area, the surface layer is dark grayish brown, friable cherty silt loam about 8 inches thick. The subsurface layer is light yellowish brown cherty silt loam to a depth of 14 inches. The subsoil is yellowish brown, friable silty clay loam in the upper 7 inches; yellowish brown, firm silty clay in the next 34 inches, the upper 25 inches of which is cherty; strong brown, firm silty clay in the next 10 inches; and strong brown, firm clay in the lower 9 inches.

Permeability is moderate. Available water capacity is moderate to high. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for cultivated crops, hay, and pasture. A few areas are wooded. The hazard of erosion, slope, coarse fragments, and the hazard of ground water contamination are the main limitations.

Representative profile of Hublersburg cherty silt loam, 3 to 8 percent slopes, in Tell Township, 7½ miles northeast of intersection of Pennsylvania Route 641 and Pennsylvania Route 35 in Shade Gap on Pennsylvania Route 35, 80 feet west of utility pole 14 along fence line, 20 feet south in orchard:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) cherty silt loam; moderate very fine granular structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; medium acid; abrupt smooth boundary.

A2—8 to 14 inches; light yellowish brown (10YR 6/4) cherty silt loam; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; slightly acid; clear wavy boundary.

B1—14 to 21 inches; yellowish brown (10YR 5/8) silty clay loam; moderate medium subangular blocky structure; friable, slightly sticky and plastic; 10 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—21 to 35 inches; yellowish brown (10YR 5/8) cherty silty clay; moderate medium subangular blocky structure; firm, sticky and plastic; common thin clay films on ped faces; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B22t—35 to 46 inches; yellowish brown (10YR 5/6) cherty silty clay; moderate coarse angular blocky structure; firm, sticky and plastic; common thin clay films on ped faces; common black coatings on large peds; 5 percent coarse fragments; strongly acid; diffuse wavy boundary.

B23t—46 to 55 inches; yellowish brown (10YR 5/8) silty clay; moderate coarse angular blocky structure; firm, sticky and plastic; many thin clay films on ped faces; common thin black coatings on some peds; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B24t—55 to 65 inches; strong brown (7.5YR 5/6) silty clay; moderate coarse angular blocky structure; firm, sticky and plastic; thin continuous clay films on ped faces; common thin black coatings on peds; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B25t—65 to 74 inches; strong brown (7.5YR 5/6) clay; moderate coarse angular blocky structure; firm, sticky and plastic; many thick clay films on ped faces; common black coatings on peds; 5 percent coarse fragments; very strongly acid.

The solum ranges from 60 to 80 inches in thickness. Bedrock is at a depth of 5 to 8 feet or more. Coarse fragments of chert and shale make up 0 to 25 percent of the solum. Reaction throughout the solum is very strongly acid or strongly acid, unless the soil is limed. The A horizon ranges from dark grayish brown (10YR 4/2) to light yellowish brown (10YR 6/4). The B horizon is yellowish brown (10YR 5/8) to strong brown (7.5YR 5/6) silty clay loam to clay with cherty analogs in some profiles. Structure of the B horizon is subangular blocky or angular blocky.

The Hublersburg soils of mapping units HuB, HuC, and HuD have a mixed mineralogy, and the other soils of the Hublersburg series have an illitic mineralogy. This difference does not alter the use or behavior of the soils.

The Hublersburg soils are associated with deep, well drained Hagerstown, Murrill, Elliber, and Morrison soils; deep, moderately well drained Clarksburg soils and Basher, variant soils; and deep, somewhat poorly drained Newark soils. Hublersburg soils have less clay in the B horizon than Hagerstown soils; they have fewer coarse fragments and more clay in B horizon than the Elliber soils; and they are finer textured than Murrill and Morrison soils.

HuB—Hublersburg silt loam, 2 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but it contains less coarse fragments in the surface layer and subsoil. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hagerstown, Morrison, and Clarksburg soils.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate

management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitation for most town and country uses is the hazard of ground water contamination. Capability subclass IIe.

HuC—Hublersburg silt loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but it contains less coarse fragments in the surface layer and subsoil. Runoff is medium, and in disturbed or cultivated areas the hazard of erosion is moderate.

Included with this soil in mapping are a few small areas of Hagerstown, Clarksburg, and Morrison soils.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The main limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IIIe.

HuD—Hublersburg silt loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner in places and it has fewer coarse fragments. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Hagerstown and Morrison soils.

Most areas of this soil are in crops. The soil is well suited to hay and pasture. It is used for general farm crops. Intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IVe.

HxB—Hublersburg cherty silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in the mapping are a few small areas of Hagerstown, Clarksburg, Murrill, and Elliber soils.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are coarse fragments and the hazard of ground water contamination. Capability subclass IIe.

HxC—Hublersburg cherty silt loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hagerstown, Murrill, Clarksburg, and Elliber soils.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IIIe.

HxD—Hublersburg cherty silt loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner in places. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in the mapping are a few small areas of Hagerstown, Murrill, and Elliber soils.

Most areas of this soil are in crops. The soil is well suited to hay and pasture. It is used for general farm crops. Intensive maintenance is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IVe.

Klinesville Series

The Klinesville series consists of shallow, sloping to moderately steep, well drained soils on the highly dissected uplands of the intermountain valleys. These soils formed in material weathered from shale, siltstone, and fine grained sandstone.

In a representative profile in a cultivated area, the surface layer is dark reddish gray shaly silt loam about 6 inches thick. The subsoil is reddish brown, friable shaly silt loam to a depth of 12 inches. The substratum is reddish brown, friable very shaly loam. Red acid shale is at a depth of about 18 inches.

Permeability is moderately rapid. Available water capacity is very low. The water table is below a depth of 6 feet.

Most of the acreage of these soils, except for that on the steeper slopes, has been cleared and used for cultivated crops, hay, and pasture. Many of these cropped areas are now idle, and some have reverted to woodland. The erosion hazard, slope, permeability, droughtiness, and depth to bedrock are the main limitations to most uses of these soils.

Representative profile of Klinesville shaly silt loam, 8 to 15 percent slopes, in a hayfield 2½ miles southwest of Todd:

Ap—0 to 6 inches; dark reddish gray (5YR 4/2) shaly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; many roots; 30 percent coarse fragments; medium acid; abrupt smooth boundary.

B2—6 to 12 inches; reddish brown (5YR 4/4) shaly silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; many roots; 35 percent coarse fragments; strongly acid; clear wavy boundary.

C—12 to 18 inches; reddish brown (5YR 4/3) very shaly loam; massive; friable, nonsticky and nonplastic; few roots; 65 percent coarse fragments; strongly acid; gradual wavy boundary.

R—18 inches; weak red (10R 4/2) acid shale.

The solum ranges from to 10 to 18 inches in thickness. Bedrock is at a depth of 12 to 20 inches. Reaction is very strongly acid or strongly acid throughout the profile, unless the soil is limed. Coarse fragments of shale make up 20 to 50 percent of the A horizon and 25 to 75 percent of the B

and C horizons. The Ap horizon ranges from dark reddish brown (5YR 3/2) to weak red (10YR 4/2), and the B horizon is yellowish red (5YR 4/6) to weak red (10YR 4/4). The fine-earth fraction of the profile is silt loam and loam.

The Klinesville soils are associated with deep, well drained Meckesville and Edom soils; moderately deep, well drained Calvin soils; deep, moderately well drained and somewhat poorly drained Albrights soils; and deep, poorly drained Brinkerton soils.

KlC—Klinesville shaly silt loam, 8 to 15 percent slopes. This sloping soil has the profile described as representative of the series. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Calvin, Edom, and Albrights soils; some areas of soils that have slopes of less than 8 percent; and a few small areas of a soil that has a surface layer of channery sandy loam.

Most areas of this soil are in crops. The soil is well suited to hay, pasture crops, and trees. Droughtiness is a limitation for most cultivated crops. In disturbed areas moderately intensive management is needed to control runoff and reduce erosion. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IVe.

KlD—Klinesville shaly silt loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but it is 2 to 3 inches shallower to bedrock. Runoff is rapid, and in disturbed or cultivated areas, the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Calvin, Edom, and Meckesville soils and a few areas of a soil that has a surface layer of channery sandy loam.

Most areas of this soil are in crops. The soil is well suited to pasture or trees. Droughtiness and excessive erosion are limitations to the use of this soil for cultivated crops. In disturbed areas, intensive management is needed to control runoff and reduce erosion. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass VIe.

Laidig Series

The Laidig series consists of deep, gently sloping to steep, well drained soils on convex upland mountain slopes and foot slopes. These soils formed in colluvium weathered from sandstone and shale.

In a representative profile in a wooded area under a covering of partly decomposed organic material, the surface layer is light brown gravelly loam about 3 inches thick. The subsoil is yellowish brown, friable gravelly loam in the upper 5 inches; yellowish brown, friable channery loam in the next 22 inches; and strong brown and yellowish brown, firm and slightly brittle channery loam and very channery loam in the lower 48 inches.

Permeability is moderately slow. Available water capacity is low to moderate. The water table is within 3 to 6 feet of the surface in places during wet seasons.

Most of the acreage of these soils is extremely stony and is wooded. A few areas have been cleared and are used for cultivated crops, hay, and pasture. Slope, moderately slow permeability, and stoniness are the main limitations to most uses of these soils.

Representative profile of Laidig gravelly loam in an area of Laidig extremely stony loam, 8 to 30 percent slopes, 2 miles northeast of Barree:

O1—5 to 3 inches; leaf and twig litter.

O2—3 inches to 0; black (5YR 2/1) partly decomposed organic matter.

A2—0 to 3 inches; light brown (7.5YR 6/4) gravelly loam; moderate fine granular structure; very friable, slightly sticky and slightly plastic; 20 percent coarse fragments; extremely acid; clear wavy boundary.

B1—3 to 8 inches; yellowish brown (10YR 5/6) gravelly loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—8 to 17 inches; yellowish brown (10YR 5/4) channery heavy loam; moderate medium subangular blocky structure; friable, slightly sticky and slightly plastic; thin patchy clay films on ped faces and in pores; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—17 to 30 inches; yellowish brown (10YR 5/6) channery loam; weak medium and coarse subangular blocky structure; friable, slightly sticky and slightly plastic; thin continuous clay films on ped faces; 40 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx1—30 to 36 inches; strong brown (7.YR 5/6) channery loam; weak very coarse prismatic structure parting to moderate medium angular blocky; firm and slightly brittle, slightly sticky and slightly plastic; few thin patchy clay films on ped faces and on coarse fragments; 35 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx2—36 to 46 inches; strong brown (7.5YR 5/6) channery loam; yellow (10YR 7/6) prism faces surrounded by yellowish red (5YR 5/8) rinds; weak very coarse prismatic structure parting to weak medium and coarse angular blocky; firm and slightly brittle, slightly sticky and slightly plastic; few thin patchy clay films on ped faces and on coarse fragments; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx3—46 to 60 inches; strong brown (7.5YR 5/6) channery loam; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) prism faces surrounded by yellowish red (5YR 5/8) rinds; weak very coarse prismatic structure parting to weak medium and coarse angular blocky; firm and slightly brittle, slightly sticky and slightly plastic; few thin patchy clay films on ped faces and on coarse fragments; few black coatings; 50 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx4—60 to 69 inches; yellowish brown (10YR 5/6) channery light loam; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) prism faces surrounded by yellowish red (5YR 5/8) rinds; weak very coarse prismatic structure parting to weak medium and coarse angular blocky; firm and slightly brittle, slightly sticky and slightly plastic; few thin patchy clay films on ped faces and on coarse fragments; 30 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx5—69 to 78 inches; strong brown (7.5YR 5/6) very channery loam; light brownish gray (10YR 6/2) and pale brown (10YR 6/3) prism faces surrounded by yellowish red (5YR 5/8) rinds; weak very coarse prismatic structure parting to weak medium and coarse angular blocky; firm and slightly brittle, slightly sticky and slightly plastic; very few thin patchy clay films on ped faces and on coarse fragments; 60 percent coarse fragments; very strongly acid.

The solum ranges from 60 to 80 inches in thickness. Bedrock is at a depth of 5 feet or more. Depth to the fragipan ranges from 30 to 42 inches. Reaction ranges from strongly acid to extremely acid throughout the solum, unless the soil is limed. Coarse fragments make up 15 to 45 percent of the profile above the fragipan and 30 to 70 percent of

the fragipan. The A horizon ranges from very flaggy sandy loam to gravelly loam. The A1 and Ap horizons are very dark grayish brown (10YR 3/2), and the A2 horizon is brownish yellow (10YR 6/6). The Bt horizon is sandy loam, sandy clay loam, and loam, and the Bx horizon is loam, sandy clay loam, and light sandy clay loam. The B horizon is reddish yellow (7.5YR 6/8) to dark yellowish brown (10YR 4/4). The Laidig soils in this survey area contain a few more coarse fragments than is defined for the series. This difference does not appreciably alter the use or management of the soils.

The Laidig soils are associated with deep, well drained Hazleton soils; moderately deep, well drained Dekalb and Berks soils; deep, moderately well drained and somewhat poorly drained Buchanan soils; and poorly drained Andover soils. Laidig soils have a Bt horizon and a fragipan, which Hazleton soils lack.

LaB—Laidig gravelly loam, 3 to 8 percent slopes. This gently sloping soil has a profile similiar to the one described as representative of the series, but the surface layer is 2 to 3 inches thicker and there are no stones on the surface. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Buchanan, Meckesville, and Murrill soils; some areas of soils that are cobbly; and some areas of a soil that has a surface layer of channery sandy loam.

Most areas of this soil are in crops. The soil is suitable for general farm crops, hay, and pasture. Management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the moderately slow permeability and a gravelly surface layer. Capability subclass IIe.

LaC—Laidig gravelly loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but there are no stones on the surface and the surface layer has been plowed. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Buchanan, Berks, Murrill, and Meckesville soils; some areas of soils that have a cobbly surface layer; and a few small areas of a soil that has a surface layer of channery sandy loam.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate to intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, a moderately slowly permeable subsoil, and a gravelly surface layer. Capability subclass IIIe.

LaD—Laidig gravelly loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but there are no stones on the surface and the surface layer has been plowed. Runoff is medium and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few areas of soils that are cobbly, a few small areas of soils that are very stony, and a few small areas of a soil that has a surface layer of channery sandy loam. Also included are a few small areas of Berks, Murrill, and Meckesville soils.

Most areas of this soil are in crops. The soil is well suited to hay, permanent pasture, or trees. Intensive management is needed in disturbed or cultivated areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope, a moderately slowly permeable subsoil, and a gravelly surface layer. Capability subclass IVe.

LcD—Laidig extremely stony loam, 8 to 30 percent slopes. This sloping to moderately steep soil has the profile described as representative of the series. Stones that are 10 to 36 inches in diameter cover 15 to 50 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Buchanan, Murrill, Meckesville, and Berks soils; a few areas of a soil that has a surface layer of stony sandy loam; and a few areas of soils where stones cover more than 50 percent of the surface.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreation uses. Moderate to intensive management is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope, stoniness, and a moderately slowly permeable subsoil. Capability subclass VIIs.

LDF—Laidig extremely stony loam, steep. These soils are steep and very steep. Stones that are 10 to 36 inches in diameter cover 15 to 50 percent of the surface. The composition of this unit is more variable than most other mapping units in the county, but mapping was controlled well enough to be interpreted for expected soil use. The steep and very steep slopes are the main limitations to use. Runoff is medium to rapid, and in disturbed areas the erosion hazard is very severe.

Included with this soil in mapping are areas of Dekalb, Hazleton, Murrill, Meckesville, and Berks soils; a few areas of soils where stones cover more than 50 percent of the surface; and a few areas of exposed bedrock. Also included are a few areas of soils that do not have a fragipan and a few areas of soils that have a weakly developed fragipan.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and open space. In disturbed areas intensive management is needed to control runoff and reduce erosion. Slippage of saturated soil over the fragipan is a limitation in places where steep slopes are excavated. The main limitations for most town and country uses are slope, stoniness, and moderately slow permeability. Capability subclass VIIs.

Leetonia Series

The Leetonia series consists of deep, well drained, nearly level to sloping soils on upland mountain ridges and plateaus. These soils formed in material weathered from sandstone, conglomerate, and quartzite.

In a representative profile in a wooded area under a covering of partly decomposed organic matter, the surface layer is black gravelly loamy sand about 1 inch thick. The subsurface layer is gray gravelly loamy sand to a depth of 6 inches. The subsoil is dark brown, loose gravelly loamy sand in the upper 6 inches; yellowish brown, friable gravelly loamy sand in the next 15 inches; and yellowish brown, friable very channery loamy sand in the lower 6 inches. The substratum is

yellowish brown very channery loamy sand. Gray sandstone bedrock is at a depth of 44 inches.

Permeability is moderately rapid. Available water capacity is very low to low. The water table is at a depth of 6 feet or more.

These soils are mostly wooded. Stoniness, coarse fragments, moderately rapid permeability, and depth to bedrock are the main limitations to most uses of these soils.

Representative profile of Leetonia gravelly loamy sand in an area of Leetonia extremely stony loamy sand, 0 to 12 percent slopes, in a wooded area 8 miles north of Greenwood Furnace:

O1—2 inches to 1 inch; leaf litter mostly from oak trees.
O2—1 inch to 0; black (10YR 2/1) partly decomposed organic material.
A1—0 to 1 inch; black (10YR 2/1) gravelly loamy sand; single grained; loose, nonsticky and nonplastic; 45 percent coarse fragments; very strongly acid; abrupt smooth boundary.
A2—1 to 6 inches; gray (10YR 5/1) gravelly loamy sand; single grained; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B21ir—6 to 12 inches; dark brown (7.5YR 4/4) gravelly loamy sand; weak fine granular structure; loose, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; abrupt smooth boundary.
B22—12 to 17 inches; yellowish brown (10YR 5/4) gravelly loamy sand; weak fine granular structure; friable, nonsticky and nonplastic; 35 percent coarse fragments; very strongly acid; clear smooth boundary.
B23—17 to 27 inches; yellowish brown (10YR 5/6) gravelly loamy sand; moderate fine subangular blocky structure; friable, nonsticky and nonplastic; 40 percent coarse fragments; very strongly acid; clear wavy boundary.
B3—27 to 33 inches; yellowish brown (10YR 5/4) very channery loamy sand; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 65 percent coarse fragments; very strongly acid; gradual wavy boundary.
C—33 to 44 inches; yellowish brown (10YR 5/4) very channery loamy sand; massive; loose, nonsticky and nonplastic; 80 percent coarse fragments; very strongly acid; gradual wavy boundary.
R—44 inches; gray acid sandstone.

The solum ranges from 20 to 34 inches in thickness. Bedrock is at a depth of 3½ to 4 feet. Reaction throughout the profile is extremely acid or very strongly acid. The A2 horizon ranges from light gray (10YR 6/1) to gray (10YR 5/1). The B21ir horizon is dark reddish brown (5YR 3/3) to dark brown (7.5YR 4/4), and the B22, B23, and B3 horizons are yellowish brown (10YR 5/4) to brownish yellow (10YR 6/6). Coarse fragments of stones, cobbles, and channers make up 35 to 65 percent of the B and C horizons. The fine-earth fraction of the B and C horizons is loamy fine sand to sand. The C horizon is yellowish brown (10YR 5/4) to strong brown (7.5YR 5/6).

Leetonia soils are associated with deep, well drained Hazleton and Clymer soils; moderately deep, well drained Dekalb soils; and deep, somewhat poorly drained to moderately well drained Buchanan soils. Leetonia soils are coarser textured than Hazleton and Clymer soils and have a spodic horizon, which the Hazleton and Clymer soils do not have.

LeB—Leetonia extremely stony loamy sand, 0 to 12 percent slopes. This soil is nearly level to sloping. Stones that are 10 to 36 inches in diameter cover 15 to 50 percent of the surface. Runoff is slow to medium, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Dekalb and Hazleton soils and a few areas of soils where stones cover more than 50 percent of the surface. Also included are a few areas of red sandy soils and a few areas of soils that do not have gray and dark brown gravelly loamy sand horizons. There are also a few small areas of soils that are similar to this Leetonia soil but are less than 40 inches deep to bedrock.

Most areas of this soil are wooded. The soil is well suited to woodland and wildlife habitat. Moderate management is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope, a moderately rapidly permeable subsoil, and stoniness. Capability subclass VIIs.

Meckesville Series

The Meckesville series consists of deep, gently sloping to moderately steep, well drained soils on convex upland mountain foot slopes. They formed in materials weathered mostly from sandstone, shale, and siltstone.

In a representative profile in a wooded area under a cover of partly decomposed organic material, the surface layer is dark brown gravelly silt loam about 3 inches thick. The subsurface layer is reddish brown gravelly silt loam to a depth of 8 inches. The subsoil is yellowish red, friable gravelly loam in the upper 4 inches and yellowish red and dark red, friable to firm gravelly clay loam in the next 28 inches. Below this is 32 inches of firm and brittle gravelly clay loam that is dark reddish brown in the upper 9 inches and mottled, dark red in the lower 23 inches.

Permeability is moderately slow. Available water capacity is moderate. The water table is within 3 to 6 feet of the surface during wet seasons.

Most of the acreage of these soils is very stony and is wooded. A few areas are used for cultivated crops, hay, and pasture. Slope, stoniness in some areas, and moderately slow permeability are the main limitations to most uses of these soils.

Representative profile of Meckesville gravelly silt loam, in an area of Meckesville very stony silt loam, 3 to 8 percent slopes, 2 miles southwest of Salter:

O1—2 inches to 1 inch; leaf litter.
O2—1 inch to 0; black (7.5YR 2/0) partly decomposed organic material.
A1—0 to 3 inches; dark brown (7.5YR 3/2) gravelly silt loam; weak fine granular structure; very friable, nonsticky and nonplastic; 30 percent coarse fragments; very strongly acid; abrupt smooth boundary.
A2—3 to 8 inches; reddish brown (5YR 4/4) gravelly silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 15 percent coarse fragments; very strongly acid; clear smooth boundary.
B1—8 to 12 inches; yellowish red (5YR 4/6) gravelly loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay fims on ped faces; 15 percent coarse fragments; very strongly acid; clear wavy boundary.
B21t—12 to 25 inches; yellowish red (5YR 4/6) gravelly clay loam; moderately fine and medium subangular blocky structure; friable, sticky and plastic; common thin clay films on ped faces; 15 to 20 percent coarse fragments; very strongly acid; clear wavy boundary.
B22t—25 to 40 inches; dark red (2.5YR 3/6) gravelly clay loam; moderate fine and medium subangular blocky structure; friable to firm, sticky and plastic; common moderately thick clay films on ped faces; 20

percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx1—40 to 49 inches; dark reddish brown (2.5YR 3/4) gravelly clay loam; weak very coarse prismatic structure parting to weak thin platy; firm and brittle, sticky and plastic; common moderately thick clay films on ped faces; 25 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx2—49 to 72 inches; dark red (2.5YR 3/6) gravelly clay loam; many fine and medium prominent pinkish gray (5YR 6/2) and reddish gray (5YR 5/2) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm and brittle, sticky and plastic; common moderately thick clay films on ped faces; 40 percent coarse fragments; very strongly acid.

The solum ranges from 42 to 75 inches in thickness. Bedrock is at a depth of 5 to 10 feet or more. Depth to the fragipan ranges from 30 to 40 inches. Coarse fragments make up 10 to 30 percent of the A and B horizons, 10 to 50 percent of the Bx horizon, and as much as 80 percent of the C horizon. Reaction is extremely acid or very strongly acid in the solum, unless the soil is limed. The B horizon ranges from yellowish red (5YR 5/6) to dark reddish brown (2.5YR 3/4). It is loam to clay loam that has gravelly analogs. The B1 and B2t horizozns have angular blocky and subangular blocky structure, and the Bx horizon is platy or prismatic.

Meckesville soils are associated with moderately deep, well drained Calvin soils; shallow, well drained Klinesville soils; and deep, moderately well drained to somewhat poorly drained Albrights soils.

MeC—Meckesville silt loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the surface layer is silt loam, and there are no stones on the surface. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Albrights, Calvin, Klinesville, and Hazleton soils and a few areas of a red soil that is sandy.

Most areas of this soil are used for general farm crops, hay, and pasture. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and the moderately slowly permeable subsoil. Capability subclass IIIe.

MkB—Meckesville very stony silt loam, 3 to 8 percent slopes. This gently sloping soil has the profile described as representative of the series. Stones that are 10 to 36 inches in diameter cover 5 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Albrights, Hazleton, Dekalb, and Calvin soils and a few small areas of soils where stones cover more than 15 percent of the surface. Also included are a few small areas of soils that do not have a fragipan or have a weakly developed fragipan and a few areas of a red sandy soil.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreational uses. Some small areas have been cleared and are used for pasture. In disturbed areas moderate management is needed to control runoff and reduce erosion. The major limitations for most town and country uses are stoniness and a moderately slowly permeable subsoil. Capability subclass VIs.

MkD—Meckesville very stony silt loam, 8 to 25 percent slopes. This sloping and moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner. Stones that are 10 to 36 inches in diameter cover 5 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Albrights, Hazleton, Dekalb, and Calvin soils. Also included are some small areas of soils that do not have a fragipan or have a weakly developed fragipan and a few areas of a red sandy soil.

Most areas of this soil are wooded or used for pasture. This soil is suited to trees and to wildlife habitat and recreational uses. In disturbed areas moderate to intensive management practices are needed to control runoff and reduce erosion. The major limitations for most town and country uses are slope, stoniness, and a moderately slowly permeable subsoil. Capability subclass VIs.

Monongahela Series

The Monongahela series consists of deep, gently sloping, moderately well drained soils on high terraces. These soils formed in old material deposited by streams.

In a representative profile in a cultivated area, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is dark brown, friable silt loam in the upper 8 inches; yellowish brown, friable loam in the next 10 inches; and mottled strong brown, firm and brittle sandy clay loam in the lower 20 inches. The substratum is mottled strong brown gravelly sandy loam to a depth of 60 inches.

Permeability is slow. Available water capacity is moderate. A seasonal high water table is within 1½ to 3 feet of the surface.

The hazard of erosion, moderately slow permeability, and a seasonal high water table are the main limitations to most uses of these soils.

Representative profile of Monongahela silt loam, 2 to 10 percent slopes, in a cultivated field 5 miles north of Huntingdon on Route 26:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—10 to 18 inches; dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; slightly acid; clear smooth boundary.

B2t—18 to 28 inches; yellowish brown (10YR 5/6) loam; fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; very few thin clay films on ped faces; 5 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1—28 to 36 inches; strong brown (7.5YR 5/6) sandy clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak medium and thick platy; firm and brittle, sticky and plastic; few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bx2—36 to 48 inches; strong brown (7.5YR 5/6) sandy clay loam; common fine distinct light brownish gray (10YR 6/2) and light gray (10YR 7/2) mottles; weak very coarse prismatic structure; firm and brittle, sticky and plastic; common moderately thick clay films on ped faces; 5 percent gravel; very strongly acid; gradual wavy boundary.

C—48 to 60 inches; strong brown (7.5YR 5/6) gravelly, sandy loam; few fine distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; massive; loose, nonsticky and nonplastic; 20 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 70 inches in thickness. Bedrock is at a depth of 5 to 10 feet or more. Depth to the fragipan ranges from 18 to 30 inches. Reaction is very strongly acid or strongly acid throughout the profile, unless the soil is limed. Coarse fragments of rounded shale and sandstone make up 0 to 15 percent of the Ap and B2 horizons and 0 to 25 percent of the Bx horizon. The B horizon is brown (10YR 5/3) to strong brown (7.5YR 5/8) sandy clay loam to silt loam.

Monongahela soils are associated with deep, well drained Birdsboro soils; deep, somewhat poorly drained Tyler soils; and deep, poorly drained Purdy soils. Monongahela soils lack the red color typical of Birdsboro soils.

MoB—Monongahela silt loam, 2 to 10 percent slopes. This soil is gently sloping. Runoff is medium, and in disturbed or cultivated areas, the erosion hazard is slight to moderate.

Included with this soil in mapping are a few small areas of Birdsboro, Raritan, and Tyler soils. Also included are a few areas of a soil that has a surface layer of gravelly loam and a few areas of soils that are medium acid.

Most areas of this soil are used for general farm crops, hay, and pasture. Moderate to moderately intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and the moderately slowly permeable subsoil. Capability subclass IIe.

Morrison Series

The Morrison series consists of deep, gently sloping to moderately steep, well drained soils in rolling and undulating upland valleys. These soils formed in material weathered from sandstone and dolomite.

In a representative profile in a wooded area under a cover of partly decomposed organic material, the surface layer is very dark brown sandy loam about 2 inches thick. The subsurface layer is yellowish brown sandy loam to a depth of 10 inches. The subsoil is strong brown, friable cherty sandy loam in the upper 7 inches; strong brown, friable cherty sandy clay loam in the next 12 inches; yellowish red, friable cherty clay loam in the next 11 inches; and strong brown, friable cherty sandy loam in the lower 16 inches. The substratum to a depth of 68 inches is strong brown, loose cherty sandy loam.

Permeability is moderately rapid. Available water capacity is very low to low. The water table is below a depth of 6 feet.

About half the acreage of these soils has been cleared and is used for cultivated crops, hay, and pasture. The rest is wooded. Slope, moderately rapid permeability, sinkholes, and stoniness in some areas are the main limitations to most uses of these soils.

Representative profile of Morrison sandy loam in an area of Morrison very stony sandy loam, 8 to 25 percent slopes, in a wooded area 2 miles north of Birmingham:

O1—2 inches to 1 inch; leaf litter.

O2—1 inch to 0; black (N 2/0) partly decomposed organic material.

A1—0 to 2 inches; very dark brown (10YR 2/2) sandy loam; weak fine granular structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; very strongly acid; clear smooth boundary.

A2—2 to 10 inches; yellowish brown (10YR 5/6) sandy loam; weak fine granular structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; strongly acid; clear wavy boundary.

B1—10 to 17 inches; strong brown (7.5YR 5/6) cherty sandy loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; very few clay films on ped faces; 20 percent coarse fragments; strongly acid; clear, wavy boundary.

B21t—17 to 29 inches; strong brown (7.5YR 5/8) cherty sandy clay loam; moderate fine subangular blocky structure; friable, sticky and plastic; common moderately thick clay films on ped faces; 20 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—29 to 40 inches; yellowish red (5YR 5/6) cherty clay loam; moderate fine angular blocky structure; friable, sticky and plastic; common moderately thick clay films on ped faces; 20 percent coarse fragments; strongly acid; gradual wavy boundary.

B3t—40 to 56 inches; strong brown (7.5YR 5/8) cherty sandy loam; weak fine and medium subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 30 percent coarse fragments; strongly acid; gradual wavy boundary.

C—56 to 68 inches; strong brown (7.5YR 5/8) cherty sandy loam; single grained; loose, nonsticky and nonplastic; 40 percent coarse fragments; strongly acid.

The solum ranges from 40 to 70 inches in thickness. Bedrock is at a depth of 6 feet or more. Reaction ranges from very strongly acid in the upper part of the solum to medium acid in the lower part, unless the soil is limed. Coarse fragments of chert and sandstone make up 0 to 15 percent of the A horizon and 10 to 30 percent of the B horizon. The B horizon ranges from strong brown (7.5YR 5/8) to yellowish red (5YR 4/6). The fine-earth fraction is sandy loam, sandy clay loam, and clay loam.

Morrison soils are associated with deep, well drained Hagerstown, Hazleton, Hublersburg, and Vanderlip soils and deep, moderately well drained Buchanan and Clarksburg soils. Morrison soils have more sand and less clay than Hagerstown and Hublersburg soils; they have more clay and fewer coarse fragments than Hazleton soils; and they lack the loamy sand B horizon typical of Vanderlip soils.

MrB—Morrison sandy loam, 2 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but it has been plowed and it does not have stones on the surface. Runoff is slow, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hublersburg, Vanderlip, Hazleton, and Buchanan soils. Also included are a few areas of soils that have a cobbly, channery, or cherty surface layer.

Most areas of the soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the hazard of ground water contamination and the presence of sinkholes. Capability subclass IIe.

MrC—Morrison sandy loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but the surface layer has been plowed and it does not have stones on the surface. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hublersburg, Hazleton, Vanderlip, and Buchanan soils and a few areas of soils that have a cobbly, channery, or cherty surface layer.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, and pasture. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, the hazard of ground water contamination, and the presence of sinkholes. Capability subclass IIIe.

MrD—Morrison sandy loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer has been plowed and there are no stones on the surface. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Hublersburg, Hazleton, Vanderlip, and Buchanan soils and a few areas of soils that have a cherty, channery, or cobbly surface layer.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, or trees. In disturbed areas moderate management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IVe.

MsB—Morrison very stony sandy loam, 2 to 8 percent slopes. This soil is gently sloping. Stones that are 10 to 24 inches in diameter cover 3 to 15 percent of the surface. Runoff is slow, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Vanderlip, Hazleton, and Buchanan soils and a few small areas of a soil that has a surface layer of loam. Also included are narrow areas of soils that have a subsoil of gravelly, cherty, and cobbly sandy loam and loamy sand that has some stratification; these areas total about 135 acres.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreational uses. It is cleared in places and used for permanent pasture. In disturbed areas moderate management is needed to control runoff and reduce erosion. The major limitations for most town and country uses are stoniness and the hazard of ground water contamination. Capability subclass VIs.

MsD—Morrison very stony sandy loam, 8 to 25 percent slopes. This sloping to moderately steep soil has the profile described as representative of the series. Stones that are 10 to 25 inches in diameter cover 3 to 15 percent of the surface. Runoff is medium, and in disturbed areas the erosion hazard is moderate.

Included with this soil in mapping are small areas of Vanderlip, Hazleton, and Buchanan soils and a few small areas of a soil that has a surface layer of loam.

Most areas of this soil are wooded. The soil is well suited to trees, wildlife habitat, and recreational uses. In disturbed areas moderate to moderately intensive management practices are needed to control runoff and reduce erosion. The major limitations for most town and country uses are slope, stoniness, and the hazard of ground water contamination. Capability subclass VIs.

Murrill Series

The Murrill series consists of deep, gently sloping to moderately steep, well drained soils on convex upland mountain foot slopes. These soils formed in material derived from sandstone, shale, and limestone.

In a representative profile in a cultivated area, the surface layer is brown gravelly loam about 8 inches thick. The subsoil is brown, friable gravelly clay loam in the upper 8 inches; firm, yellowish red heavy clay loam and gravelly clay loam in the next 36 inches; and variegated strong brown and yellowish red, firm gravelly clay loam in the lower 25 inches.

Permeability is moderate. Available water capacity is moderate to high. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. A few areas are wooded. The erosion hazard, slope, presence of sinkholes, and the hazard of ground water contamination are the main limitations to most uses of these soils.

Representative profile of Murrill gravelly loam, 3 to 8 percent slopes, in a cultivated area 5 miles northeast of Mill Creek in Big Valley:

Ap—0 to 8 inches; brown (10YR 4/3) gravelly loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; 20 percent coarse fragments; medium acid; abrupt smooth boundary.

B21t—8 to 16 inches; brown (7.5YR 4/4) gravelly clay loam; moderate very fine and fine subangular blocky structure; friable, slightly sticky and plastic; few thin clay films on ped faces; 15 percent coarse fragments; medium acid; clear wavy boundary.

B22t—16 to 36 inches; yellowish red (5YR 5/6) heavy clay loam; strong medium and coarse angular blocky structure; firm, sticky and plastic; thin continuous clay films on ped faces; few patchy black coatings; 10 percent coarse fragments; strongly acid; gradual wavy boundary.

B23t—36 to 52 inches; yellowish red (5YR 5/6) gravelly clay loam; weak medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films on ped faces and in pores; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

B24t—52 to 77 inches; variegated strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) gravelly clay loam; moderate medium subangular blocky structure; firm, sticky and plastic; thin patchy clay films on ped faces and in pores; 25 percent coarse fragments; strongly acid; gradual wavy boundary.

The solum ranges from 72 to 110 inches or more in thickness. Bedrock is at a depth of 6 feet or more. Reaction throughout the profile is strongly acid or very strongly acid, unless the soil is limed. Coarse fragments make up 10 to 20 percent of the A horizon and 5 to 40 percent of the B horizon. The B2t horizon ranges from yellowish brown (10YR 5/4) to yellowish red (5YR 4/6). The fine-earth fraction is loam to silty clay loam. Structure is blocky or subangular blocky.

Murrill soils are associated with deep, well drained Hagerstown, Hublersburg, and Edom soils; shallow, well drained Opequon soils; and deep, moderately well drained Buchanan and Clarksburg soils. Murrill soils have less clay and more sand in the B horizon than Hagerstown and Hublersburg soils, and they have a thicker solum than Edom and Opequon soils.

MuB—Murrill gravelly loam, 3 to 8 percent slopes.

This gently sloping soil has the profile described as representative of the series. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hagerstown, Opequon, and Buchanan soils and a few areas of a soil that has a cobbly or very stony surface layer.

Most areas of this soil are in crops. The soil is suited to general farm crops, hay, pasture, and trees. In cultivated or disturbed areas moderate management is needed to control runoff and to reduce erosion and losses of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are the hazard of ground water contamination and the presence of sinkholes. Capability subclass IIe.

MuC—Murrill gravelly loam, 8 to 15 percent slopes. This soil is sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Hagerstown, Opequon, and Buchanan soils and a few areas of a soil that has a cobbly or very stony surface layer.

Most areas of this soil are in crops. The soil is suited to most general farm crops, hay, pasture, and trees. Moderate to intensive management practices are needed in disturbed or cultivated areas to control runoff and to reduce erosion and losses of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, the hazard of ground water contamination, and the presence of sinkholes. Capability subclass IIIe.

MuD—Murrill gravelly loam, 15 to 25 percent slopes. This moderately steep soil has a profile similar to the one described as representative of the series, but the surface layer is 2 to 3 inches thinner. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is high.

Included with this soil in mapping are a few small areas of Hagerstown, Opequon, and Buchanan soils; a few small areas of limestone rock outcrops; and a few areas of soils that have a cobbly or very stony surface layer.

Most areas of this soil are in crops. This soil is well suited to hay, pasture, and trees. Intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and losses of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and the hazard of ground water contamination. Capability subclass IVe.

Newark Series

The Newark series consists of deep, nearly level, somewhat poorly drained soils on flood plains. These soils formed in limestone influenced material deposited by streams.

In a representative profile in a disturbed area, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is mottled dark grayish brown, friable silt loam in the upper 4 inches; mottled grayish brown and light brownish gray, friable silt loam in the next 15 inches; and dark gray, friable light silty clay loam in the lower 11 inches. The substratum to a depth of 60 inches is dark gray fine sandy loam.

Permeability is moderate. Available water capacity is high. A seasonal high water table is within one-half foot to 1½ feet of the surface.

Most of the acreage of these soils has been cleared and is used for pasture, unless the soil is drained. The drained areas are used mostly for crops. A few acres are either idle or wooded. Flooding and the seasonal high water table are the main limitations to most uses of these soils.

Representative profile of Newark silt loam, 3½ miles northeast of Spring Mount, along Pennsylvania Route 550:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine and medium granular structure; friable, nonsticky and nonplastic; neutral; abrupt wavy boundary.

B1—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; neutral; clear smooth boundary.

B21g—12 to 17 inches; grayish brown (10YR 5/2) silt loam; common fine prominent red (2.5YR 4/6) mottles; weak and moderate medium subangular blocky structure; friable, slightly sticky and nonplastic; neutral; abrupt wavy boundary.

B22g—17 to 27 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent red (2.5YR 4/6) mottles; weak and moderate medium subangular blocky structure; friable, nonsticky and nonplastic; neutral; abrupt wavy boundary.

B23g—27 to 38 inches; dark gray (10YR 4/1) light silty clay loam; weak medium subangular blocky structure; friable, slightly sticky and nonplastic; neutral; gradual wavy boundary.

Cg—38 to 60 inches; dark gray (10YR 4/1); fine sandy loam; massive; very friable, nonsticky and nonplastic; neutral.

The solum ranges from 24 to 40 inches in thickness. Bedrock is at a depth of 5 feet or more. Coarse fragments make up 0 to 5 percent of the solum and as much as 15 percent of the C horizon. Reaction ranges from medium acid to neutral throughout the profile, unless the soil is limed.

The B horizon ranges from yellowish brown (10YR 5/4) to dark grayish brown (2.5Y 4/2). It is silt loam or light silty clay loam. The Bg horizon is light gray (10YR 7/1) to dark grayish brown (2.5Y 4/2).

Newark soils are associated with the deep, well drained Hagerstown, Hublersburg, and Edom soils; the shallow, well drained Opequon soils; and the deep, moderately well drained Clarksburg soils.

Ne—Newark silt loam. This soil is nearly level. Slope is 0 to 3 percent. Runoff is slow, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of poorly drained soils, a few areas of a soil that has a surface layer of sandy loam, and a few areas of Basher variant soils.

Most areas of this soil are in pasture. The soil is well suited to hay, pasture, and trees. The seasonal high water table is a limitation for timely tillage and for deep rooted plants. In cultivated or disturbed areas, management that includes use of a cover crop is needed to protect the soil from erosion by flooding. The major limitations for most town and country uses are flooding and the seasonal high water table. Capability subclass IIw.

Opequon Series

The Opequon series consists of shallow, gently sloping to very steep, well drained soils on the dissected upland valleys. These soils formed in material weathered from relatively pure, thin-bedded limestone and shaly limestone.

In a representative profile in a cultivated area, the surface layer is dark brown and yellowish red clay loam and silty clay loam about 6 inches thick. The subsoil is yellowish red, firm clay in the upper 7 inches and yellowish red, firm channery clay in the lower 5 inches. Limestone bedrock is at a depth of about 18 inches.

Permeability is moderate. Available water capacity is low. The water table is below a depth of 6 feet.

Most of the acreage of these soils has been cleared and is used for crops, hay, and pasture. The more sloping areas are mostly wooded. Depth to bedrock, erosion hazard, slope, surface layer texture, and hazard of ground water contamination are the main limitations to most uses of these soils.

Representative profile of Opequon clay loam, 8 to 15 percent slopes, eroded, in a cultivated area 2 miles northwest of Petersburg:

Ap1—0 to 3 inches; dark brown (7.5YR 4/4) clay loam; weak to moderate fine granular structure; friable, slightly sticky and slightly plastic; few coarse fragments; neutral; clear wavy boundary.

Ap2—3 to 6 inches; yellowish red (5YR 4/6) silty clay loam; fine and medium subangular blocky structure; friable, sticky and plastic; thin silt coatings; few coarse fragments; neutral; abrupt wavy boundary.

B21t—6 to 13 inches; yellowish red (5YR 4/8) clay; moderate fine and medium blocky structure; firm, sticky and plastic; few thin clay films on ped faces; 10 percent coarse fragments; neutral; clear wavy boundary.

B22t—13 to 18 inches; yellowish red (5YR 4/8) channery clay; moderate medium blocky structure; firm, sticky and plastic; common moderately thick clay films on ped faces; 30 percent coarse fragments; neutral; effervesces with acid; abrupt wavy boundary.

R—18 inches; limestone bedrock that has thin brown (10YR 5/3) and brownish yellow (10YR 6/8) clay and silt deposits on rock faces.

The solum ranges from 12 to 18 inches in thickness. Bedrock is at a depth of 12 to 20 inches. Coarse fragments make up 0 to 35 percent of the profile. Reaction ranges from medium acid to neutral. The Bt horizon is red (2.5YR 4/6) to strong brown (7.5YR 5/8). It ranges from silty clay loam to clay in the fine-earth fraction.

Opequon soils are associated with deep, well drained Hagerstown, Edom, and Hublersburg soils; deep, moderately well drained Clarksburg and Basher variant soils; and deep, somewhat poorly drained Newark soils.

OpB3—Opequon clay loam, 3 to 8 percent slopes, eroded. This soil is gently sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few areas of Hagerstown, Murrill, and Clarksburg soils; a few areas of moderately deep soils; and a few areas of soils that have a channery silt loam surface layer.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. It is well suited to cultivated crops if rainfall is ample, but droughtiness is a limitation and seedbed preparation is difficult because of the shallow soil depth and heavy surface layer. Intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of soil nutrients, organic matter, and other applied materials. The major limitations for most town and country uses are depth to bedrock, the hazard of ground water contamination, and the presence of sinkholes. Capability subclass IVe.

OpC3—Opequon clay loam, 8 to 15 percent slopes, eroded. This sloping soil has the profile described as representative of the series. Runoff is medium to rapid, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few areas of Hagerstown and Murrill soils, a few areas of moderately deep soils, and a few areas of soils that have a channery silt loam surface layer.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. It is well suited to cultivated crops if rainfall is ample, but droughtiness is a limitation, and seedbed preparation is difficult because of shallow soil depth and the heavy soil texture. Intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of soil nutrients, organic matter and other applied material. The major limitations for most town and country uses are slope, depth to bedrock, the hazard of ground water contamination, and the presence of sinkholes. Capability subclass VIe.

OpD3—Opequon clay loam, 15 to 25 percent slopes, eroded. This soil is moderately steep. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Hagerstown and Murrill soils, a few areas of moderately deep soils, and a few areas of soils that have a silt loam and channery surface layer.

Most areas of this soil are in crops. The soil is well suited to pasture, hay, and trees. Droughtiness, erosion, and the clayey texture are limitations for cultivated crops. Intensive maintenance is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope, depth to bedrock, and the hazard of ground water contamination. Capability subclass VIIe.

ORF—Opequon soils, steep. These soils have a profile similar to the one described as representative of the Opequon series, but the surface layer ranges from clay loam to silty clay. Slope is more than 25 percent. Opequon soils make up about 60 percent of this mapping unit, Hagerstown soils make up about 15 percent, areas of Rock outcrop make up about 10 percent, and the rest is less extensive soils. This mapping unit is more variable in composition than most other mapping units in the county, but mapping is controlled well enough to be interpreted for the expected uses of these soils. Runoff is medium to rapid, and in disturbed areas the erosion hazard is very severe.

Included with these soils in mapping are areas of Hagerstown soils and areas of exposed bedrock. Also included are areas of Elliber, Hublersburg, and Morrison soils.

Most areas of these soils are wooded. The soils are well suited to trees and wildlife habitat. Very intensive management is needed in disturbed areas to control runoff and to reduce erosion. The major limitations for

most town and country uses are slope and depth to bedrock. Capability subclass VIIe.

Philo Series

The Philo series consists of deep, nearly level, moderately well drained soils on flood plains. These soils formed in stream deposits mostly from upland soil material derived from acid brown shale and sandstone.

In a representative profile in a disturbed area, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is dark brown, friable silt loam in the upper 13 inches; mottled, brown, friable loam in the next 7 inches; and mottled, yellowish brown, friable silt loam in the lower 13 inches. The substratum to a depth of 60 inches is mottled, dark brown, friable sandy loam.

Permeability is moderate. Available water capacity is moderate to high. These soils are occasionally flooded on low bottoms and less frequently flooded on high bottoms. A seasonal high water table is within 1½ to 3 feet of the surface. Most of the acreage has been cleared and is used for cultivated crops, hay, and pasture. A few areas are idle or wooded. The flooding hazard and seasonal high water table are the main limitations to most uses of these soils.

Representative profile of Philo silt loam in an area of Philo and Basher silt loams, in a cultivated area along Standing Stone Creek, 3½ miles north of Huntingdon on Pennsylvania Route 26:

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 2 percent coarse fragments; neutral; clear smooth boundary.

B1—7 to 14 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; very few thin patches of clay films on ped faces; 2 percent coarse fragments; medium acid; clear smooth boundary.

B21—14 to 20 inches; dark brown (7.5YR 4/4) silt loam; moderate fine subangular blocky structure; friable, slightly sticky and nonplastic; very few thin patches of clay films on ped faces; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B22—20 to 27 inches; brown (7.5YR 5/4) loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable, slightly sticky and nonplastic; very few thin patches of clay films on ped faces; 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

B23—27 to 40 inches; yellowish brown (10YR 5/4) silt loam; many medium faint light gray (10YR 7/2) mottles and many medium distinct reddish brown (5YR 4/4) mottles; weak medium and coarse subangular blocky structure; friable, slightly sticky and slightly plastic; very few thin patches of clay films on ped faces; 10 percent coarse fragments; strongly acid; gradual wavy boundary.

C—40 to 60 inches; dark brown (7.5YR 4/4) sandy loam; common medium distinct yellowish red (5YR 4/8) and light brownish gray (10YR 6/2) mottles; massive; friable, nonsticky and nonplastic; 10 percent coarse fragments; strongly acid.

The solum ranges from 30 to 40 inches in thickness. Bedrock is at a depth of 5 feet or more. Coarse gravel makes up 0 to 5 percent of the A horizon, 0 to 20 percent of the B horizon, and 5 to 40 percent of the C horizon. Reaction ranges from very strongly acid to medium acid throughout the profile, unless the soil is limed. Depth to mottles of low chroma ranges from 15 to 24 inches. The B horizon ranges from dark brown (7.5YR 4/4 and 10YR 4/3) to yellowish brown (10YR 5/6) and from silt loam to sandy loam. The C horizon ranges from brown (10YR 4/3) to brown (7.5YR 5/4) and from loam to sandy loam, including gravelly phases.

Philo soils are associated with deep, well drained Barbour soils; deep, moderately well drained Basher, Monongahela, and Ernest soils; deep, somewhat poorly drained Tyler soils; and deep, poorly drained Purdy and Brinkerton soils. Philo soils lack the red color typical of Barbour and Basher soils; they lack the Bt horizon and fragipan typical of Monongahela and Ernest soils; and they are better drained than Tyler, Purdy, and Brinkerton soils.

Ph—Philo and Basher silt loams. These nearly level soils are mapped together because they are so similar in use and management that it was not necessary to separate them. Slope is 0 to 3 percent. Most areas of this unit consist of Philo soils, some areas consist of Basher soils, and a few areas consist of both soils. The Philo soils make up 50 to 70 percent of the total acreage of this mapping unit, and the Basher soils make up about 20 to 40 percent. Both soils have the profile described as representative of their respective series. The Philo soil is yellower than the Basher soil. Runoff is slow, and in disturbed or cultivated areas the erosion hazard from flooding is slight to moderate. These soils are occasionally flooded.

Included with these soils in mapping are a few small areas of Atkins soils, a few small areas of soils that have a surface layer of loam or sandy loam, and a few small areas of soils that have a very gravelly surface layer.

Most areas of these soils are in crops. The soils are suited to general farm crops, hay, pasture, truck crops, trees, and recreational uses. Flooding and the seasonal high water table are limitations in places for some crops. The major limitations for most town and country uses are flooding and a seasonal high water table. Capability subclass IIw.

Po—Philo and Basher silt loams, high bottom. These nearly level soils are mapped together because they are so similar in use and management that it was not necessary to separate them at the scale of the soil map. Slope is 0 to 3 percent. The Philo soils make up 50 to 70 percent of the total acreage of this mapping unit, and the Basher soils make up about 20 to 40 percent. Most areas consist of Philo soils, some areas consist of Basher soils, and a few areas consist of both soils. The Philo soil is yellower than the Basher soil. Runoff is slow, and in disturbed or cultivated areas the erosion hazard from flooding is moderate. These soils occupy a slightly higher position on the flood plain than other Philo and Basher soils, and they are flooded less frequently, generally only at 5- to 30-year intervals.

Included with these soils in mapping are a few small areas of Atkins, Purdy, Tyler, Raritan, and Monongahela soils. Also included are a few small areas of soils that have a surface layer of sandy loam.

Most areas of these soils are in crops. The soils are suited to most cultivated crops, hay, pasture, and trees. The seasonal high water table is a limitation, in places, for some deep rooted crops. Management that includes a cover crop is needed to protect these soils from spring flooding. The major limitations for most town and country uses are flooding and a seasonal high water table. Capability subclass IIw.

Purdy Series

The Purdy series consists of deep, nearly level, poorly

drained soils on stream terraces. These soils formed in old soil material deposited by streams in pools and slack water areas.

In a representative profile in a disturbed area, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is mottled, grayish brown, friable silty clay loam in the upper 7 inches; mottled, grayish brown, slightly firm silty clay in the next 23 inches; and mottled, grayish brown, slightly firm silty clay loam in the lower 20 inches.

Permeability is slow. Available water capacity is high. The water table is within one-half foot of the surface during wet seasons.

Most of the acreage of these soils is used for woodland or pasture. The high water table and slow permeability are the main limitations to most of these soils.

Representative profile of Purdy silt loam in a pasture, 500 feet south on Pennsylvania Route 26 from the intersection of LR 31056:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; many coarse distinct light gray (10YR 6/1) mottles; weak fine granular structure; friable, nonsticky and nonplastic; medium acid; abrupt smooth boundary.

B1g—10 to 17 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable, slightly sticky and slightly plastic; very strongly acid; clear smooth boundary.

B21tg—17 to 40 inches; grayish brown (10YR 5/2) silty clay; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; slightly firm, sticky and plastic; common moderately thick clay films on ped faces; very strongly acid; clear wavy boundary.

B22tg—40 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; slightly firm, sticky and plastic; few moderately thick clay films on ped faces and in pores; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at a depth of 4 to 6 feet or more. Reaction is very strongly acid or strongly acid throughout the profile, unless the soil is limed. The B2tg horizon ranges from dark gray (10YR 4/1) to grayish brown (2.5YR 5/2) and from silty clay loam to silty clay.

Purdy soils in this county have a thicker solum than is defined as within the range for the series. This difference does not appreciably alter the use or management of the soils.

Purdy soils are associated with deep, well drained Birdsboro and Barbour soils; deep, moderately well drained Monongahela, Raritan, Philo, and Basher soils; deep, somewhat poorly drained Tyler soils; and deep, poorly drained Atkins and Brinkerton soils. Purdy soils have a B2t horizon that Atkins soils lack, and they lack the fragipan typical of Brinkerton soils.

Pu—Purdy silt loam. This soil is nearly level. Slope is 0 to 3 percent. Runoff is slow, and in disturbed or cultivated areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few small areas of Tyler and Monongahela soils.

Most areas of this soil are in crops. The soil is well suited to shallow rooted hay and pasture plants, trees, wildlife habitat, and recreational uses. If suitable outlets are available, an artificial drainage system can be used to drain excess water and improve the suitability of the soil for some crops. Moderate management is needed to control surface water and reduce erosion. The major limitations for most town and country uses are a high water table and slow permeability. Capability subclass IVw.

Raritan Series

The Raritan series consists of deep, nearly level to sloping, moderately well drained soils on stream terraces. These soils formed in old soil material deposited by streams.

In a representative profile in a disturbed area, the surface layer is reddish brown silt loam about 6 inches deep. The subsoil is reddish brown, friable silt loam in the upper 7 inches; yellowish red, friable heavy silt loam in the next 8 inches; and mottled, reddish brown, very firm and brittle silty clay loam in the lower 22 inches. The substratum, to a depth of 73 inches, is dark red very gravelly sandy loam.

Permeability is moderately slow. Available water capacity is moderate. A seasonal high water table is within 1½ to 3 feet of the surface.

Most of the acreage has been cleared and is used for cultivated crops, hay, and pasture. The hazard of erosion, seasonal high water table, and moderately slow permeability are the main limitations to most uses of these soils.

Representative profile of Raritan silt loam, 2 to 10 percent slopes, in a cultivated area, 4 miles south of Huntingdon along the Raystown Branch of the Juniata River:

Ap—0 to 6 inches; reddish brown (5YR 4/4) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 10 percent coarse fragments; strongly acid; abrupt smooth boundary.

B1—6 to 13 inches; reddish brown (5YR 4/4) silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

B2t—13 to 21 inches; yellowish red (5YR 5/6) heavy silt loam; moderate fine and medium subangular blocky structure; friable, slightly sticky and plastic; few thin clay films on ped faces; 5 percent gravel; very strongly acid; clear wavy boundary.

Bx—21 to 43 inches; reddish brown (2.5YR 4/4) silty clay loam; common fine distinct pinkish gray (5YR 6/2) mottles and common medium distinct yellowish red (5YR 6/5) mottles; moderate very coarse prismatic structure parting to moderate thick platy; very firm and brittle, slightly sticky and slightly plastic; common moderately thick clay films on ped faces; 5 percent gravel; very strongly acid; gradual wavy boundary.

IIC—43 to 73 inches; dark red (2.5YR 3/6) very gravelly sandy loam; single grained; loose, nonsticky and nonplastic; 60 percent coarse fragments; very strongly acid.

The solum ranges from 42 to 56 inches in thickness. Bedrock is at a depth of 5 feet or more. Depth to unconforming material is more than 40 inches. Coarse gravel makes up 0 to 15 percent of the solum and 25 to 60 percent of the substratum. Reaction ranges from medium acid to very strongly acid throughout the profile, unless the soil is limed. The B horizon mainly has hue of 5YR but ranges from strong brown (7.5YR 5/6) to reddish brown (2.5YR 4/4). It ranges from loam to silty clay loam.

Raritan soils are associated with deep, well drained Birdsboro and Barbour soils; deep, moderately well drained Monongahela, Philo, and Basher soils; deep, somewhat poorly drained Tyler soils; and deep, poorly drained Purdy and Atkins soils. Raritan soils are redder than Monongahela and Philo soils, and they have a B2t horizon and a fragipan, which are lacking in Basher soils.

RaB—Raritan silt loam, 2 to 10 percent slopes. This

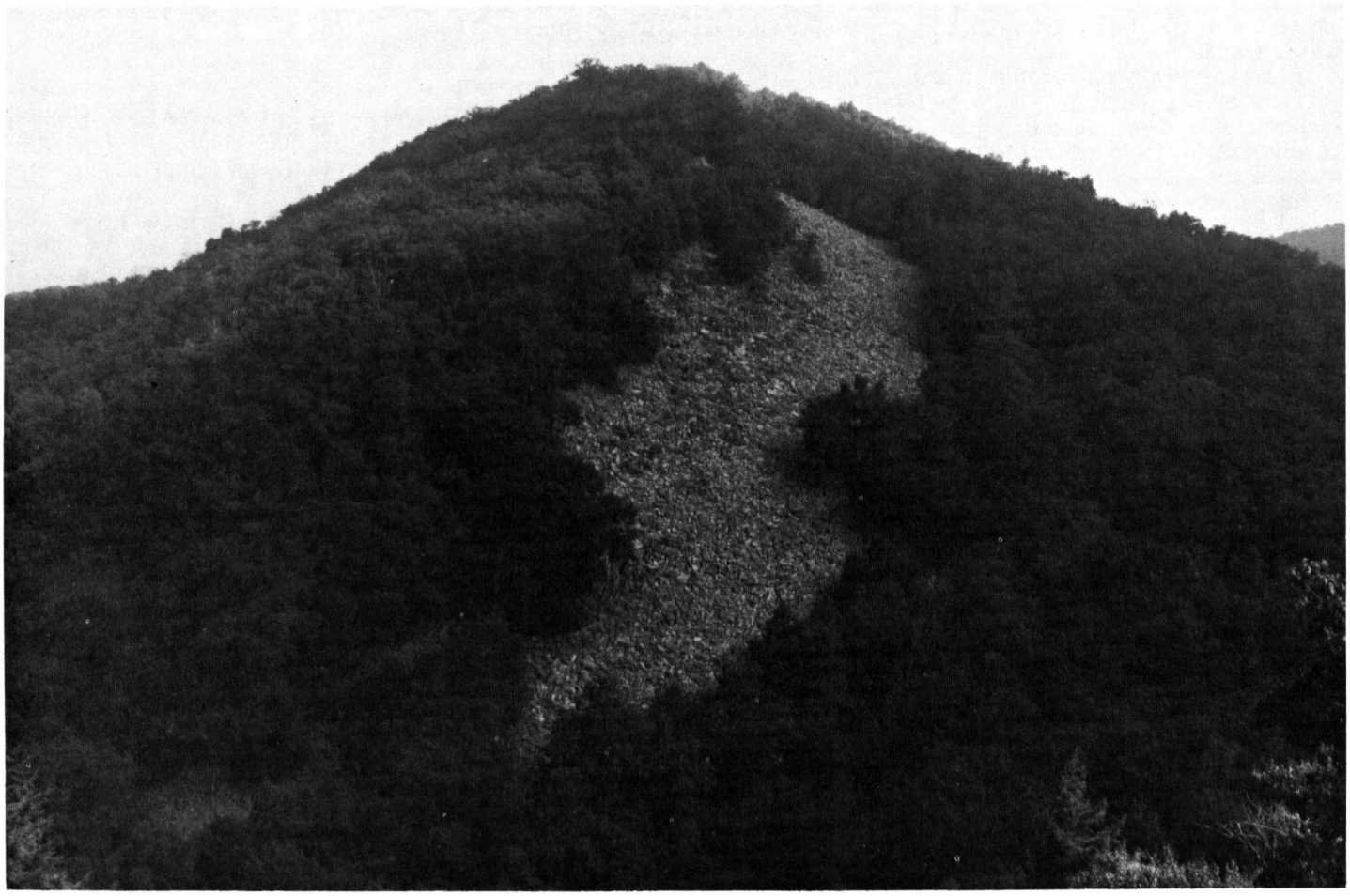

Figure 10.—**Area of Rubble land. These areas are too stony for most uses.**

soil is gently sloping. Runoff is medium, and in disturbed or cultivated areas the erosion hazard is slight to moderate.

Included with this soil in mapping are a few small areas of Barbour and Birdsboro soils and a few small areas of a soil that has a surface layer of gravelly loam or loam.

Most areas of this soil are in crops. The soil is suited to pasture, hay, trees, and some crops. If suitable outlets are available, an artificial drainage system can be used to remove excess water and improve the suitability of the soil for certain crops. Moderate to moderately intensive management is needed to control surface water and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope, a seasonal high water table, and moderately slow permeability. Capability subclass IIe.

Rubble Land

Ru—Rubble land. This miscellaneous land type is nearly level to very steep. Stones and boulders that are 10 to 36 inches or more in diameter cover 90 percent or more of the surface (fig. 10). Slopes are 0 to 70 percent. Areas of Rubble land are almost devoid of vegetation. Runoff is slow.

Included with Rubble land in mapping are a few small areas of Dekalb, Hazleton, Laidig, and Buchanan soils. Bedrock escarpments are common in the steeper areas.

Most areas of Rubble land are undisturbed unless they are used as a source of stones. This land type is well suited to open space and wildlife habitat. Capability subclass VIIIs.

Tyler Series

The Tyler series consists of deep, nearly level, somewhat poorly drained soils on stream terraces. These soils formed in old material deposited by streams.

In a representative profile in a disturbed area, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is mottled, yellowish brown, friable silt loam in the upper 5 inches; mottled, light brownish gray, firm light silty clay loam in the next 6 inches; mottled, yellowish brown, firm and brittle silty clay loam in the next 22 inches; and mottled, light yellowish brown, very firm and brittle clay loam in the lower 26 inches.

Permeability is slow. Available water capacity is

moderate. A seasonal high water table is within 6 to 18 inches of the surface.

Most of the acreage of these soils has been cleared and is used for hay and pasture. A few areas are used for cultivated crops, and a few areas are idle or wooded. The seasonal high water table and slow permeability are the main limitations to most uses of these soils.

Representative profile of Tyler silt loam in a cultivated field, west side of Pennsylvania Route 261, 1 mile north of Huntingdon:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable, nonsticky and nonplastic; 3 percent coarse fragments; neutral; abrupt smooth boundary.

B1—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak thin platy structure; friable, nonsticky and nonplastic; medium acid; clear smooth boundary.

B2t—12 to 18 inches; light brownish gray (10YR 6/2) light silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm, slightly sticky and slightly plastic; few thin clay films on ped faces; strongly acid; clear, wavy boundary.

Bx1—18 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure; firm and brittle, slightly sticky and slightly plastic; few thin clay films on ped faces; very strongly acid; gradual wavy boundary.

IIBx2—40 to 54 inches; light yellowish brown (10YR 6/4) clay loam; many medium distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure; very firm and brittle, slightly sticky and slightly plastic; few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

IIBx3—54 to 66 inches; light yellowish brown (10YR 6/4) clay loam; many medium distinct light gray (10YR 7/2) and gray (10YR 6/1) mottles; strong very coarse prismatic structure; very firm and brittle, slightly sticky and slightly plastic; few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; diffuse irregular boundary.

The solum ranges from 50 to 74 inches in thickness. Bedrock is at a depth of 5 feet or more. Depth to the fragipan ranges from 15 to 24 inches. Coarse gravel makes up 0 to 5 percent of the solum. Reaction in the solum is strongly acid or very strongly acid, unless the soil is limed. The B1 and B2 horizons range from light brownish gray (10YR 6/2) to yellowish brown (10YR 5/4), and the Bx horizon ranges from yellowish brown (10YR 5/6) to light yellowish brown (10YR 6/4). The B1 and B2 horizons are silt loam to silty clay loam, and the Bx horizons is silty clay loam to clay loam. Mottles of low chroma are below the A or Ap horizon.

Tyler soils are associated with deep, well drained Birdsboro and Barbour soils; deep, moderately well drained Monongahela, Raritan, Basher, and Philo soils; and deep, poorly drained Atkins and Purdy soils.

Ty—Tyler silt loam. This soil is nearly level. Runoff is slow to medium, and in disturbed or cultivated areas the erosion hazard is slight.

Included with this soil in mapping are a few small areas of Purdy and Monongahela soils and a few small areas of soils that have a gravelly surface layer. Also included are a few areas of a soil that has a reddish brown subsoil.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, trees, and wildlife habitat. The seasonal high water table limits the selection of plants to those which have shallow or water-tolerant roots. If suitable outlets are available, an artificial drainage system can be used to remove excess water and improve the suitability of the soil for some crops. The major limitations for most town and country uses are the seasonal high water table and slow permeability. Capability subclass IIIw.

Urban Land

Ur—Urban land. This miscellaneous land type consists of soil material that has been disturbed or mixed by man to the extent that the original soils are no longer recognizable. The original soils in these areas have been covered or destroyed by earthmoving or construction operations. Runoff and the erosion hazard are variable, and in some places there is a hazard of flooding.

Included with Urban land in mapping are small areas of cut and fill land along U.S. Highway 22.

Most areas of Urban land are used for housing, shopping centers, factories, and school sites. Urban land is generally unsuited to farming, and additions of soil may be needed for revegetation. Management needed to control surface water and reduce erosion varies with such factors as type of soil material, compaction, and slope.

Vanderlip Series

The Vanderlip series consists of deep, gently sloping to steep, well drained soils on upland ridges within intermountain valleys. These soils formed in material weathered from sandstone.

In a representative profile in an undisturbed area under a cover of partly decomposed organic material, the surface layer is a very dark grayish brown loamy sand about 3 inches thick. The subsurface layer is yellowish brown loamy sand to a depth of 21 inches. The subsoil is light yellowish brown, loose loamy sand in the upper 15 inches and strong brown, loose gravelly loamy sand in the lower 32 inches. The substratum to a depth of 76 inches is yellowish brown very channery loamy sand.

Permeability is rapid. Available water capacity is moderate. The water table is below a depth of 6 feet.

Most of the acreage of these soils is wooded. A few areas have been cleared and are used for crops, hay, pasture, and orchards. Rapid permeability, coarse texture, and slope are the main limitations to most uses of these soils.

Representative profile of Vanderlip loamy sand, 5 to 25 percent slopes, in a wooded area 0.6 mile north of the intersection of Route 31038 and U.S. Highway 22, 1.2 miles west of the intersection of U.S. Highway 22 and Pennsylvania Route 26 in Huntingdon:

O2—1 inch to 0; very dark gray (10YR 3/1) partly decomposed forest litter; very friable; few soft sandstone fragments; very strongly acid; abrupt wavy boundary.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) loamy sand; weak very fine granular structure; very friable, nonsticky and nonplastic; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

A2—3 to 21 inches; yellowish brown (10YR 5/4) loamy sand; single grained; very friable, nonsticky and

nonplastic; 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

B21—21 to 36 inches; light yellowish brown (10YR 6/4) loamy sand that has a few thin horizontal dark brown (10YR 4/3) loamy sand lamellae; single grained; loose; common clay bridging of sand grains in lamellae; 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

B22—36 to 68 inches; strong brown (7.5YR 5/6) gravelly loamy sand that has a few horizontal dark brown (7.5YR 4/4) loamy sand lamellae each ⅛ inch to 2 inches thick and totaling about 4 inches; single grained; loose; common clay bridging in lamellae; 30 percent coarse fragments; medium acid; diffuse wavy boundary.

C—68 to 76 inches; yellowish brown (10YR 5/4) very channery loamy sand; massive; loose; 50 percent coarse fragments; strongly acid.

The solum ranges from 40 to 72 inches in thickness. Bedrock is at a depth of 3½ to 20 feet or more. Reaction ranges from very strongly acid to medium acid throughout the profile, unless the soil is limed. Coarse fragments of sandstone, quartzite, or chert make up 0 to 20 percent of the upper part of the solum and 0 to 30 percent of the lower part. The B horizon ranges from strong brown (7.5YR 5/6) to light yellowish brown (10YR 6/4). The fine earth fraction is loamy sand or sand.

Vanderlip soils are associated with deep, well-drained Morrison, Clymer, Hazleton, Hublersburg, Elliber, and Edom soils and moderately deep, well drained Dekalb soils. Vanderlip soils have a coarser textured solum than all of these soils.

VaD—Vanderlip loamy sand, 5 to 25 percent slopes. This gently sloping to moderately steep soil has the profile described as representative of the series. Runoff is slow, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Morrison and Elliber soils, a few small areas that are very stony, and a few areas of soils that have a channery surface layer.

Most areas of this soil are in crops. The soil is well suited to hay and pasture, trees, and orchards. The surface layer is droughty because of the rapid permeability, and droughtiness limits the growth of shallow rooted cultivated crops. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitations for most town and country uses are slope and rapid permeability. Capability subclass IVe.

VrF—Vanderlip-Rock outcrop complex, 25 to 60 percent slopes. This steep soil and miscellaneous land type are mapped together because they are so intermingled that it was not practical to separate them at the scale of the soil map. The Vanderlip soil makes up about 30 to 70 percent of this mapping unit, and Rock outcrop makes up about 25 to 60 percent. The Vanderlip soil has a surface layer of loamy sand or channery loamy sand. Runoff is medium to rapid, and in disturbed areas the erosion hazard is very severe.

Included with this complex in mapping are a few areas of Morrison, Hazleton, and Elliber soils.

Most areas of this complex are in woodland because the rock outcrops and steep slopes make cultivation impractical. This complex is well suited to trees, wildlife habitat, open space, and recreation. Intensive management is needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope and rock outcrops. Capability subclass VIIs.

Weikert Series

The Weikert series consists of shallow, gently sloping to steep, well drained soils on the dissected uplands. These soils formed in material weathered from shale.

In a representative profile in disturbed area, the surface layer is dark grayish brown shaly silt loam about 6 inches thick. The subsoil is brown, friable, shaly silt loam to a depth of 12 inches. The substratum is dark brown very shaly silt loam. Light olive brown acid shale is at a depth of 15 inches.

Permeability is moderately rapid. Available water capacity is very low. The water table is below a depth of 6 feet.

Most of the acreage of these soils is wooded or idle. A few areas are used for cultivated crops, hay, and pasture. The erosion hazard, depth to bedrock, moderately rapid permeability, and droughtiness are the main limitations to most uses of these soils.

Representative profile of Weikert shaly silt loam, 15 to 25 percent slopes, in a cultivated area 2½ miles southeast of Union Church, on LR–3113, on State Game Lands No. 112:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) shaly silt loam; weak fine granular structure; very friable, nonsticky and nonplastic; 25 percent coarse fragments; strongly acid; abrupt smooth boundary.

B2—6 to 12 inches; brown (7.5YR 5/4) shaly silt loam; weak fine subangular blocky structure; friable, nonsticky and nonplastic; 40 percent coarse fragments; strongly acid; clear wavy boundary.

C—12 to 15 inches; dark brown (7.5YR 4/4), very shaly silt loam; massive; friable, nonsticky and nonplastic; 80 percent coarse fragments; very strongly acid; clear wavy boundary.

R—15 inches; light olive brown (2.5Y 5/4) acid shale.

The solum ranges from 8 to 17 inches in thickness. Bedrock is at a depth of 10 to 20 inches. Coarse fragments of shale and sandstone make up 20 to 35 percent of the Ap horizon, 35 to 65 percent of the B horizon, and 60 to 85 percent of the C horizon. Reaction is very strongly acid or strongly acid throughout the profile, unless the soil is limed. The B horizon ranges from yellowish brown (10YR 5/4) to dark brown (7.5YR 4/4). The fine-earth fraction is loam to silt loam.

Weikert soils are associated with deep, well drained Bedington soils; moderately deep, well drained Berks soils; deep, moderately well drained Ernest and Wharton soils; deep, poorly drained Brinkerton soils; and moderately deep, moderately well drained Blairton soils.

WeB—Weikert shaly silt loam, 3 to 8 percent slopes. This gently sloping soil has a profile similar to the one described as representative of the series, but the surface layer is 1 inch to 3 inches thicker. Runoff is rapid, and in disturbed or cultivated areas the erosion hazard is moderate.

Included with this soil in mapping are a few small areas of Bedington, Edom, Berks, and Blairton soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Very low available water capacity and moderately rapid permeability are limitations for most general farm crops. Moderately intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied materials. The major limitation for most town and country uses is depth to bedrock. Capability subclass IIIe.

WeC—Weikert shaly silt loam, 8 to 15 percent slopes. This sloping soil has a profile similar to the one described as representative of the series, but it is 1 inch to 2 inches thicker. Runoff is rapid to very rapid, and in disturbed or cultivated areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Bedington, Berks, Edom, Blairton, and Ernest soils.

Most areas of this soil are in crops. The soil is well suited to hay, pasture, and trees. Very low available water capacity and erosion are limitations for most cultivated crops. Moderately intensive to intensive management is needed in disturbed or cultivated areas to control runoff and to reduce erosion and the loss of organic matter, soil nutrients, and other applied material. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass IVe.

WeD—Weikert shaly silt loam, 15 to 25 percent slopes. This moderately steep soil has the profile described as representative of the series. Runoff is very rapid, and in disturbed areas the erosion hazard is severe.

Included with this soil in mapping are a few small areas of Berks, Bedington, and Ernest soils.

Most areas of this soil are in woodland. The soil is well suited to trees and pasture. Very low available water capacity, slope, and erosion are limitations for hay and most cultivated crops. Intensive management practices are needed in disturbed areas to control runoff and reduce erosion. The major limitations for most town and country uses are slope and depth to bedrock. Capability subclass VIe.

Wharton Series

The Wharton series consists of deep, gently sloping, moderately well drained soils on the upland plateau. These soils formed in material weathered from shale and sandstone.

In a representative profile in an undisturbed area, the surface layer is black silt loam 1 inch thick. The subsurface layer is yellowish brown silt loam to a depth of 6 inches. The subsoil is yellowish brown, friable heavy silt loam in the upper 4 inches; yellowish brown, friable silty clay loam in the next 13 inches; mottled, yellowish brown, firm silty clay loam in the next 19 inches; and mottled, yellowish brown, firm shaly silty clay in the lower 6 inches. The substratum to a depth of 61 inches is mottled, dark grayish brown very shaly silt loam.

Permeability is slow. Available water capacity is moderate to high. A seasonal high water table is within 1½ to 3 feet of the surface.

Most of the acreage of these soils is wooded. A few areas have been cleared and are used for cultivated crops, hay, and pasture. The erosion hazard, slope, seasonal high water table, and slow permeability are the main limitations to most uses of these soils.

Representative profile of Wharton silt loam, 2 to 10 percent slopes, in a wooded area one-half mile west of Robertsdale:

A1—0 to 1 inch; black (10YR 2/1) silt loam; weak fine granular structure; friable, nonsticky and nonplastic; 5 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—1 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate fine granular structure; friable, slightly sticky and slightly plastic; very few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/4) heavy silt loam; weak fine subangular blocky structure; friable, slightly sticky and slightly plastic; few thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

B21t—10 to 23 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; friable, sticky and plastic; common thin clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—23 to 36 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm, sticky and plastic; common moderately thick clay films on ped faces; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B23t—36 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct very dark gray (10YR 3/1) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to fine and medium subangular blocky; firm, sticky and plastic common moderately thick clay films on ped faces; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B3t—42 to 48 inches; yellowish brown (10YR 5/4) shaly silty clay; many coarse distinct light gray (10YR 7/1) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm, sticky and plastic; common moderately thick clay films on ped faces; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.

C—48 to 61 inches; dark grayish brown (10YR 4/2) very shaly silt loam; many fine distinct light gray (10YR 7/1) mottles and common fine distinct strong brown (7.5YR 5/6) mottles; massive; firm, nonsticky and nonplastic; few thin clay films on coarse fragments; 85 percent coarse fragments; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Bedrock is at a depth of 4 feet or more. Reaction throughout the profile is strongly acid to very strongly acid, unless the soil is limed. Coarse fragments of shale and sandstone make up 0 to 15 percent of the A and B2 horizons, 15 to 30 percent of the B3 horizon, and 55 to 85 percent of the C horizon. The B2t horizon ranges from yellowish brown (10YR 5/4) to strong brown (7.5YR 5/6) and from silty clay loam to clay. Depth to mottles that have chroma of 2 or less ranges from 15 to 30 inches.

Wharton soils are associated with deep, well drained Bedington and Hazleton soils; moderately deep, well drained Berks soils; deep, moderately well drained Buchanan soils; and moderately deep, moderately well drained Blairton soils. Wharton soils lack the fragipan typical of Buchanan soils.

WhB—Wharton silt loam, 2 to 10 percent slopes. This soil is gently sloping. Runoff is medium to rapid, and in disturbed areas the erosion hazard is moderate to severe.

Included with this soil in mapping are a few small areas of Bedington, Berks, Blairton, and Ernest soils. Also included are some areas of soils that are somewhat poorly drained and a few areas of soils having a channery or loam surface layer.

Most areas of this soil are in crops. The soil is suited to hay and pasture, trees, and water tolerant crops. Moderate to intensive management is needed to control runoff and to reduce erosion and the loss of soil nu-

trients, organic matter, and other applied material. If suitable outlets are available, an artificial drainage system can be used to help drain excess water and improve the suitability of the soil for some crops. The major limitations for most town and country uses are slope, a seasonal high water table, and slow permeability. Capability subclass IIIe.

Use and Management of the Soils [2]

In this section the system of capability classification used by the Soil Conservation Service is explained, and estimated yields of the principal crops grown in the county under two levels of management are given. Information about the management needs of a particular soil is given in the section "Descriptions of the Soils."

This section also contains information on the use of the soils for woodland and provides soil interpretations for wildlife habitat. It contains tables that give ratings of the soils for community development and for recreational uses and a section that provides information about engineering uses of the soils.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and they way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for range, forest trees, or engineering.

In the capability system, the kinds of soils are grouped at three levels: the capability class, subclass, and unit. These are discussed 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 choice for practical use, 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, require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants, 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 largely to pasture, range, woodland, or wildlife habitat. (None in Huntingdon county.)

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, water supply, or esthetic purposes.

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 too cold to too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils.

In this county the soils are classified only at the class and subclass levels. The management needs for crops and pasture are discussed in the mapping unit descriptions.

Estimated Yields

Table 2 shows estimates of yields, under two levels of management, of the principal crops grown in Huntingdon County. The estimates are averages for a period of 10 years or more—not just one season.

In columns A are yields to be expected under normal management. Normal management is defined as follows:

For cultivated crops:

1. Surface and internal drainage are improved, but not enough to provide optimum growing conditions where natural drainage is restricted.

[2] ROBERT L. BOND, agronomist, Soil Conservation Service, assisted in the preparation of this section.

2. Moderate amounts of lime and fertilizer are applied, but a more adequate program of soil testing is needed.
3. Most crop residue is returned to the soil. If low-residue crops are grown, organic matter is supplied by growing cover crops and applying manure or other organic material.
4. Seedbed preparation is either inadequate or excessive, and the soil may be worked when either too wet or too dry.
5. Weeds and insects are not adequately controlled.
6. Crop variety, seed quality, and plant population are not considered for a specified soil or location.
7. Control of erosion is inadequate.

For hay and pasture grasses:

1. Drainage is improved, but not enough to provide optimum growing conditions where natural drainage is restricted.
2. Moderate amounts of lime and fertilizer are applied, but a more adequate program of soil testing is needed.
3. Reseeding is usually delayed until after the legumes have disappeared from the forage stand and the grasses show serious nitrogen deficiency.
4. Grass-legume stands are of medium quality, crop variety and seed quality or quantity are not considered, and seedbed preparation may be inadequate.
5. Field operations are usually timely.
6. The entire pasture is grazed, and it may be overgrazed late in summer and in fall.
7. Runoff and erosion on steep slopes are not controlled.

Yields given in columns B are those to be expected nder improved management. Improved management s defined as follows:

For cultivated crops:

1. Surface and internal drainage provide optimum growing conditions where natural drainage is restricted.
2. Lime, phosphate, potash, nitrogen, and other elements are supplied according to crop needs indicated by soil tests.
3. All crop residue is returned to the soil. If low-residue crops are grown, organic matter is supplied by growing cover crops and by applying manure or other organic material.
4. Seedbed preparation is limited to that needed for crop production. Tillage is avoided when the soils are wet, and spring tillage is delayed until planting time. If plowed in fall, fields are left rough in winter.
5. Weeds and insects are adequately controlled.
6. Crop variety, seed quality, and plant population are considered for a specified soil and location.
7. Erosion is kept within tolerated limits.
8. Field operations are commonly timely.

For hay and pasture grasses:

1. Surface and internal drainage provide optimum growing conditions.
2. Lime and fertilizer are applied at seeding time according to crop needs and the needs indicated by soil tests and also are applied as top-dressing as needed.
3. Stands are reseeded and reestablished regularly.
4. Grass-legume stands are of high quality, and crop variety is considered for a specified soil and location.
5. Haymaking operations are timely.
6. Grazing is deferred and rotated as needed.

Woodland [3]

Huntingdon County originally had a dense cover of trees, but clearing for housing and farming and cutting for commercial purposes eliminated all of the virgin stands of timber. Now the commercial woodland, which makes up 74 percent of the land area, consists of second- and third-growth stands.

The chief forest cover types that make up the present woodland and the proportionate extent of each type as given by the Forest Service (*5*) follows:

	Percentage of total commercial woodland in Huntingdon County
White pine	2.4
Eastern white pine makes up 50 percent or more of the stand. Associates are yellow-poplar, northern red oak, and white oak.	
Elm, ash, and red maple	7.2
White ash, American elm, and red maple predominate. Associates are slippery elm, yellow birch, black gum, sycamore, and hemlock.	
Maple, beech, and birch	7.4
Sugar maple, beech, and yellow birch are the component species. Associates are varying admixtures of basswood, red maple, hemlock, northern red oak, ash, white pine, black birch, and yellow-poplar.	
Aspen and birch	0.7
Quaking aspen, bigtooth aspen, and gray birch predominate in mixture. Principal associates are pin cherry, red maple, yellow birch, white pine, ash, and sugar maple.	
Oak and hickory	75.4
White oak, red oak, and hickory predominate, but black oak is sometimes predominant. Principal associates are yellow-poplar, shag-bark hickory, white ash, red maple, beech, and black gum and an understory of flowering dogwood.	
Virginia pine and pitch pine	2.3
Virginia pine and pitch pine predominate. Principal associates are northern red oak, black oak, chestnut oak, scarlet oak, black gum, and hickories.	
Other oak types	4.6

In general the soils in the county are capable of supporting a good growth of yellow-poplar, ash, red oak, and sugar maple. Trees grow slowly on shallow soils and on deep, very poorly drained soils.

A landowner can encourage growth of the more de-

[3] By V. C. MILES, woodland conservationist, Soil Conservation Service.

TABLE 2.—*Estimated average yields*

[In columns A are yields for normal management, and in columns B are yields for improved management. The absence of data shown are

Soils	Corn		Oats		Wheat	
	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*
Albrights silt loam, 3 to 8 percent slopes	60	100	55	70	30	40
Albrights silt loam, 8 to 15 percent slopes	55	90	50	65	30	40
Albrights very stony silt loam, 0 to 8 percent slopes						
Albrights very stony silt loam, 8 to 25 percent slopes						
Andover cobbly loam, 0 to 8 percent slopes	45	75	40	55		
Atkins silt loam	70	100	40	60	15	30
Barbour soils	85	120	70	80	35	45
Barbour soils, high bottom	85	120	70	80	35	45
Bedington channery silt loam, 3 to 8 percent slopes	75	130	65	75	40	50
Bedington channery silt loam, 8 to 15 percent slopes	70	120	60	70	35	45
Bedington channery silt loam, 15 to 25 percent slopes	65	105	55	60	30	40
Berks shaly silt loam, 3 to 8 percent slopes	55	80	55	60	30	35
Berks shaly silt loam, 8 to 15 percent slopes	50	75	50	55	30	35
Berks-Weikert shaly silt loams, 15 to 25 percent slopes	45	70	45	50	25	30
Birdsboro gravelly loam, 2 to 10 percent slopes	85	130	70	80	40	50
Blairton silt loam, 2 to 8 percent slopes	40	75	40	60	20	35
Blairton silt loam, 8 to 15 percent slopes	35	70	40	55	15	30
Brinkerton silt loam, 0 to 3 percent slopes	45	90	40	60		
Brinkerton silt loam, 3 to 8 percent slopes	50	90	40	60		
Buchanan gravelly loam, 3 to 8 percent slopes	60	100	55	65	30	40
Buchanan gravelly loam, 8 to 15 percent slopes	55	90	50	60	30	35
Buchanan gravelly loam, 15 to 25 percent slopes	50	85	45	60	25	35
Calvin shaly silt loam, 3 to 8 percent slopes	55	80	50	60	30	35
Calvin shaly silt loam, 8 to 15 percent slopes	50	75	45	55	30	35
Calvin shaly silt loam, 15 to 25 percent slopes	45	70	40	50	25	30
Clarksburg silt loam, 2 to 8 percent slopes	65	100	55	70	30	40
Clymer channery loam, 3 to 8 percent slopes	65	120	60	75	30	45
Clymer channery loam, 8 to 15 percent slopes	60	110	55	70	25	40
Clymer very stony loam, 3 to 8 percent slopes						
Clymer very stony loam, 8 to 15 percent slopes						
Edom-Opequon complex, 3 to 8 percent slopes	50	75	45	55	20	25
Edom-Opequon complex, 8 to 15 percent slopes	45	70	45	55	20	25

See footnote at end of table.

of field and forage crops

indicates that the soil is not suited to the specified crop at the specified level of management. Soils not suited to any of the crops not listed]

Corn silage		Hay				Pasture			
		Alfalfa-grass mixture		Grass-legume mixture		Bluegrass		Tall grass	
A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*AUM* [1]	*AUM* [1]	*AUM* [1]	*AUM* [1]
12	20	2.1	3.5	1.7	3.0	2.3	4.5	3.8	7.0
11	18	2.0	3.5	1.7	3.0	2.3	4.5	3.3	7.0
						1.8	3.6		
						1.7	3.0		
9	15			1.1	2.0	1.5	3.0	1.8	3.8
14	20			1.6	3.0	3.0	4.5	3.8	5.7
17	24	2.8	4.5	2.2	3.5	3.0	5.3	4.7	8.5
17	24	2.8	4.5	2.2	3.5	3.0	5.3	4.7	8.5
15	26	2.6	5.0	2.0	3.5	2.7	5.3	4.3	9.5
14	24	2.5	4.5	2.0	3.5	2.7	5.3	4.1	8.5
13	21	2.4	4.0	1.9	3.0	2.5	4.5	4.0	7.7
11	16	2.1	3.5	1.6	3.0	2.1	4.5	3.5	6.7
10	15	2.0	3.0	1.5	2.5	2.0	3.8	3.3	5.7
9	14	1.9	3.0	1.4	2.0	1.8	3.0	3.1	5.7
17	26	3.0	5.0	2.2	3.5	3.0	5.3	5.0	9.5
8	15			1.2	2.5	1.7	3.8	2.0	4.8
7	14			1.2	2.0	1.7	3.0	2.0	3.8
9	18			1.4	2.5	1.8	3.8	2.3	4.8
10	18			1.6	2.5	2.1	3.8	2.7	4.8
12	20	2.1	3.5	1.7	3.0	2.3	4.5	3.5	6.7
11	18	2.0	3.5	1.7	3.0	2.3	4.5	3.3	6.7
10	17	2.0	3.0	1.6	2.5	2.1	3.8	3.3	5.7
11	16	2.1	3.5	1.6	3.0	2.1	4.5	3.5	6.7
10	15	2.0	3.0	1.5	2.5	2.0	3.8	3.3	5.7
9	14	1.9	3.0	1.4	2.0	1.8	3.0	3.1	5.7
13	20	2.1	3.5	1.7	3.0	2.2	4.5	4.0	6.7
13	24	2.1	4.5	1.5	3.5	2.0	5.3	3.5	8.5
12	22	2.0	4.0	1.4	3.0	1.8	4.5	3.3	7.7
						2.0	3.0		
						1.7	3.0		
10	15	1.6	3.0	1.1	2.5	1.5	3.8	2.7	5.7
9	14	1.5	3.0	1.0	2.5	1.3	3.8	2.5	5.7

TABLE 2.—*Estimated average yields*

Soils	Corn		Oats		Wheat	
	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*
Edom-Opequon complex, 15 to 25 percent slopes						
Edom-Weikert complex, 3 to 8 percent slopes	50	70	45	55	20	25
Edom-Weikert complex, 8 to 15 percent slopes	45	60	45	55	20	25
Edom-Weikert complex, 15 to 25 percent slopes						
Elliber very cherty loam, 5 to 15 percent slopes	60	95	55	60	30	35
Elliber very cherty loam, 15 to 30 percent slopes						
Ernest silt loam, 3 to 8 percent slopes	60	100	55	65	30	40
Ernest silt loam, 8 to 15 percent slopes	55	90	50	60	30	35
Hagerstown silt loam, 2 to 8 percent slopes	85	130	70	80	40	50
Hagerstown silty clay loam, 8 to 15 percent slopes, eroded	70	110	55	70	30	40
Hagerstown silty clay loam, 15 to 25 percent slopes, eroded						
Hagerstown-Rock outcrop complex, 5 to 25 percent slopes						
Hazleton channery loam, 3 to 8 percent slopes	50	110	60	70	35	45
Hazleton channery loam, 8 to 15 percent slopes	45	105	55	65	30	40
Hazleton channery loam, 15 to 25 percent slopes	45	100	50	60	25	30
Hublersburg cherty silt loam, 3 to 8 percent slopes	85	120	60	70	30	40
Hublersburg cherty silt loam, 8 to 15 percent slopes	80	115	55	65	30	35
Hublersburg cherty silt loam, 15 to 25 percent slopes	75	105	50	55	25	30
Hublersburg silt loam, 2 to 8 percent slopes	85	135	70	80	40	50
Hublersburg silt loam, 8 to 15 percent slopes	80	125	65	75	35	45
Hublersburg silt loam, 15 to 25 percent slopes	75	110	50	60	30	35
Klinesville shaly silt loam, 8 to 15 percent slopes			40	50	15	20
Klinesville shaly silt loam, 15 to 25 percent slopes						
Laidig gravelly loam, 3 to 8 percent slopes	65	100	60	70	35	40
Laidig gravelly loam, 8 to 15 percent slopes	60	95	55	65	30	35
Laidig gravelly loam, 15 to 25 percent slopes	55	85	50	60	25	30
Meckesville silt loam, 8 to 15 percent slopes	65	95	55	65	30	35
Meckesville very stony silt loam, 3 to 8 percent slopes						
Meckesville very stony silt loam, 8 to 25 percent slopes						
Monongahela silt loam, 2 to 10 percent slopes	65	100	55	65	30	40
Morrison sandy loam, 2 to 8 percent slopes	75	120	65	75	40	45
Morrison sandy loam, 8 to 15 percent slopes	70	110	60	70	35	40
Morrison sandy loam, 15 to 25 percent slopes	65	95	55	60	30	35

See footnote at end of table.

of field and forage crops—Continued

Corn silage		Hay				Pasture			
		Alfalfa-grass mixture		Grass-legume mixture		Bluegrass		Tall grass	
A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*AUM* [1]	*AUM* [1]	*AUM* [1]	*AUM* [1]
						1.1	3.0		
10	14	1.6	3.0	1.1	2.5	1.5	3.8	2.7	5.7
9	12	1.5	2.5	1.0	2.5	1.3	3.8	2.5	4.8
						1.1	3.0		
12	19	2.3	3.5	1.8	2.5	2.3	3.8	3.8	6.7
						2.1	3.3		
12	20	2.1	3.5	1.7	3.0	2.3	4.5	3.5	6.7
11	18	2.0	3.5	1.7	3.0	2.3	4.5	3.5	6.7
17	26	3.0	5.0	2.3	3.5	3.0	5.3	5.0	9.5
14	22	2.5	4.5	2.0	3.0	2.7	4.5	4.1	7.7
						2.7	4.5		
						2.3	3.8		
10	22	2.1	4.5	1.5	3.5	2.7	5.3	4.3	8.5
9	21	2.0	4.0	1.4	3.0	2.7	4.5	4.1	8.5
9	20	1.8	3.5	1.2	3.0	2.3	4.5	4.0	7.7
17	24	3.0	4.5	2.3	3.5	3.0	5.3	5.0	8.5
16	23	2.9	4.5	2.3	3.5	3.0	5.3	4.8	8.5
15	21	2.6	4.0	2.0	2.9	2.7	4.5	4.3	7.7
17	27	3.0	5.0	2.3	3.5	3.0	5.3	5.0	9.5
16	25	2.9	4.5	2.3	3.5	3.0	5.3	4.8	8.5
15	22	2.6	4.0	2.0	2.9	2.7	4.5	4.3	7.7
		1.3	2.5	1.1	2.0	1.5	3.0	2.1	4.8
						1.1	2.0		
13	20	2.3	4.0	1.8	3.0	2.3	4.5	3.8	7.7
12	19	2.3	4.0	1.8	3.0	2.3	4.5	3.8	7.7
11	17	2.2	3.5	1.7	2.5	2.3	3.8	3.6	6.7
13	19	2.3	4.0	1.8	3.0	2.3	4.5	3.8	7.7
						1.8	3.6		
						1.7	3.0		
12	20	2.1	3.5	1.7	3.0	2.3	4.5	3.5	6.7
15	24	2.6	4.5	2.0	3.5	2.7	5.3	4.3	8.5
14	22	2.5	4.0	2.0	3.0	2.7	4.5	4.1	7.7
13	19	2.4	4.0	1.9	3.0	2.3	4.5	4.0	7.7

TABLE 2.—*Estimated average yields*

Soils	Corn		Oats		Wheat	
	A	B	A	B	A	B
	Bu	*Bu*	*Bu*	*Bu*	*Bu*	*Bu*
Morrison very stony sandy loam, 2 to 8 percent slopes						
Morrison very stony sandy loam, 8 to 25 percent slopes						
Murrill gravelly loam, 3 to 8 percent slopes	75	120	65	75	40	45
Murrill gravelly loam, 8 to 15 percent slopes	70	110	60	70	35	40
Murrill gravelly loam, 15 to 25 percent slopes	65	95	55	60	30	35
Newark silt loam	75	130	70	80	40	45
Opequon clay loam, 3 to 8 percent slopes, eroded	40	70	40	50	20	25
Opequon clay loam, 8 to 15 percent slopes, eroded						
Opequon clay loam, 15 to 25 percent slopes, eroded						
Philo and Basher silt loams	75	130	60	80	35	45
Philo and Basher silt loams, high bottom	75	130	60	80	35	45
Purdy silt loam	45	80	40	55		
Raritan silt loam, 2 to 10 percent slopes	60	105	55	65	30	40
Tyler silt loam	55	95	55	60		
Vanderlip loamy sand, 5 to 25 percent slopes	45	70			15	30
Weikert shaly silt loam, 3 to 8 percent slopes	35	60	40	50	20	25
Weikert shaly silt loam, 8 to 15 percent slopes			35	45	15	20
Weikert shaly silt loam, 15 to 25 percent slopes						
Wharton silt loam, 2 to 10 percent slopes	60	90	55	65	30	40

[1] AUM (animal-unit-month) is a term used to express the carrying capacity of pasture. It is the number of animal units, or

sirable kinds of trees in his woodlands by using good woodland management. The soils and the climate of Huntingdon County are favorable for woodland, and help in planning a program of woodland improvement can be obtained from local technicians.

The returns from woodland on soils which are rated excellent, very good, and good as growing sites will generally justify the expenditure of money for management purposes. However, consideration should be given to the potential yield, quality of the particular species growing on the site, and the market potential. The species and proportion of poor quality stems growing on such sites may prohibit the investment of money for management purposes. Also, the conversion of such areas from their present state to their potential capacity may not be economically justifiable.

Soils that are fair growing sites are the most difficult to appraise for management. A thorough appraisal of the species, quality, and marketability of the trees on the site is essential. A proper analysis of all of these interrelated factors is essential to determine the intensity of management.

The returns from the soils which are poor growing sites generally will not economically justify management for wood products. Woodland, however, is in most cases one of the most practical land uses for these soils because the unfavorable soil characteristics will generally not show a profitable return in cropland or grassland. Although returns may be slight to none for woodland, this land use is one of the most economical.

Table 3 rates each soil as to management concerns and hazards, species suitability, and site quality for producing timber.

Erosion hazard refers to the risk of erosion. The ratings indicate the amount or intensity of management required to reduce or control erosion on the different soils. A rating of *slight* indicates that the risk of erosion is low when wood products are harvested and that few, if any, erosion control measures are needed. A rating of *moderate* indicates that erosion control

of field and forage crops—Continued

Corn silage		Hay				Pasture			
		Alfalfa-grass mixture		Grass-legume mixture		Bluegrass		Tall grass	
A	B	A	B	A	B	A	B	A	B
Tons	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*AUM* [1]	*AUM* [1]	*AUM* [1]	*AUM* [1]
						1.8	3.0		
						1.7	3.0		
15	24	2.6	4.5	2.0	3.5	2.7	5.3	4.3	8.5
14	22	2.5	4.0	2.0	3.0	2.7	4.5	4.1	7.7
13	19	2.4	4.0	1.9	3.0	2.3	4.5	4.0	7.7
15	26	2.6	4.5	2.0	3.5	2.7	5.3	4.3	8.5
8	14	1.6	3.0	1.4	2.5	1.8	3.8	2.7	5.7
		1.6	2.5	1.4	2.0	1.8	3.0	2.7	4.8
15	26	2.5	4.5	2.1	3.5	2.8	5.3	4.1	8.5
15	26	2.5	4.5	2.1	3.5	2.8	5.3	4.1	8.5
9	16			1.4	2.5	1.8	3.8	2.3	4.8
12	21	2.1	4.0	1.7	3.0	2.3	4.5	3.5	7.7
11	19		3.0	1.5	3.0	2.0	4.5	2.5	5.7
8	14	1.6	3.0	1.1	2.0	1.5	3.0		5.7
7	12	1.4	2.0	1.2	2.0	1.7	3.0	2.3	3.8
		1.3	2.0	1.1	2.0	1.5	3.0	2.1	3.8
						1.3	2.0		
12	18	2.1	3.5	1.7	3.0	2.3	4.5	3.5	6.7

[1] 1,000 pounds of live weight, that can be grazed on an acre of pasture for a period of 30 days.

measures are needed on skid trails and logging roads immediately after wood products are harvested. A rating of *severe* means that intensive management is needed to control erosion, especially gullying, where wood products are harvested. Harvesting and other operations should be done across the slope as much as possible. Skid trails and logging roads should be laid out on the most nearly level areas, and water-disposal systems should be carefully maintained during logging. Erosion control measures are needed on logging roads and skid trails immediately after logging.

Equipment limitations refers to limitations based on the characteristics of the soils and topographic features that restrict or prohibit the use of equipment for harvesting trees or planting seedlings. Steepness of slope, stoniness, and wetness are the principal soil limitations that restrict the use of equipment. The rating is *slight* if there are few limitations. It is *moderate* if some problems exist, such as stones and boulders on the surface, moderately steep slopes, or wetness of the soil during part of the year. The rating is *severe* if prolonged wetness of the soil, steep slopes, or stoniness severely limit the use of equipment. If the rating is severe, track-type equipment is needed for general use, and winches or similar special equipment are needed for some kinds of work.

Seedling mortality refers to the loss of naturally occurring or planted tree seedlings resulting from unfavorable characteristics of the soils. The rating is *slight* if no more than 25 percent of the planted seedlings are likely to die and satisfactory restocking from the initial planting can be expected. Adequate restocking ordinarily results from natural regeneration. A rating of *moderate* indicates that between 25 and 50 percent of planted seedlings are likely to die and some replanting is ordinarily needed. Natural regeneration cannot always be relied upon for adequate and early restocking. A rating of *severe* indicates that more than 50 percent of planted seedlings are likely to die and special preparation of the seedbed, superior

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
Albrights:					
AbB	Slight	Slight	Slight	Conifers: slight. Hardwoods: moderate.	Slight
AbC	Moderate	Slight	Slight	Conifers: slight. Hardwoods: moderate.	Slight
AcB	Slight	Moderate	Slight	Conifers: slight. Hardwoods: moderate.	Slight
AcD	Moderate	Moderate	Slight	Conifers: slight.. Hardwoods: moderate.	Slight
Andover: AnB, AoB	Slight	Severe	Severe	Conifers: moderate. Hardwoods: moderate.	Severe
Atkins: At	Slight	Severe	Severe	Conifers: severe. Hardwoods: severe.	Moderate
Barbour: Ba, Bb	Slight	Slight	Slight	Conifers: severe: Hardwoods: moderate.	Slight
Basher variant: Bc	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Bedington:					
BeB, BeC	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
BeD	Moderate	Moderate	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Berks:					
BkB, BkC, BlD	Slight	Slight	Moderate	Conifers: moderate. Hardwoods: slight.	Slight
BMF	Moderate	Severe	Moderate	Conifers: slight. Hardwoods: slight.	Moderate
Birdsboro: BnB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight

for woodland

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, red maple, yellow poplar.
Pin oak, red maple, American sycamore.	Eastern white pine, white spruce.	Fair	Red maple.
Yellow-poplar, northern red oak, white ash, sugar maple, black walnut, black cherry.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut.	Excellent	Northern red oak, white ash, sugar maple, black cherry, yellow-poplar.
Yellow-poplar, northern red oak, sugar maple, white ash, black walnut, eastern white pine, black cherry.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Excellent	Northern red oak, red maple, white ash, yellow-poplar, sugar maple, black cherry.
Yellow-poplar, northern red oak, sugar maple, white ash, black walnut.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Very good	Northern red oak, yellow-poplar, sugar maple, white ash.
Yellow-poplar, northern red oak, sugar maple, white ash, black walnut.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Very good	Northern red oak, yellow-poplar, sugar maple, white ash.
Northern red oak, black oak, Virginia pine, eastern white pine, red maple.	European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, black oak, Virginia pine.
Chestnut oak, black oak, Virginia pine, eastern white pine, Northern red oak.	Virginia pine, red pine, eastern white pine, Norway spruce.	Fair	Northern red oak, chestnut oak, Virginia pine.
Yellow-poplar, northern red oak, white ash, red maple, sugar maple.	Yellow-poplar, European larch, Norway spruce, white pine, Virginia pine, red pine.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
Blairton:					
BoB	Slight	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
BoC	Moderate	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Brinkerton: BrA, BrB	Slight	Severe	Severe	Conifers: severe. Hardwoods: severe.	Severe
Buchanan:					
BuB, BuC	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
BuD	Moderate	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
BxB	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
BxD	Moderate	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Calvin:					
CaB, CaC	Slight	Slight	Moderate	Conifers: moderate. Hardwoods: slight.	Slight
CaD	Slight	Moderate	Moderate	Conifers: moderate. Hardwoods: slight.	Slight
Clarksburg: CbB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Clymer: ClB, ClC, CvB, CvC	Slight	Slight	Slight	Conifers: moderate. Hardwoods: moderate.	Slight
Edom:					
EeB, EeC	Slight	Slight	Moderate	Conifers: moderate. Hardwoods: moderate.	Moderate
EeD	Slight	Moderate	Moderate	Conifers: moderate. Hardwoods: moderate.	Moderate

for woodland—Continued

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, Virginia pine, white spruce.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, Virginia pine, white spruce.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, white spruce, eastern white pine.	Good	Northern red oak, white ash, red maple, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, white spruce, eastern white pine.	Good	Northern red oak, red maple, white ash, yellow-poplar, sugar maple.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, white spruce, eastern white pine.	Good	Northern red oak, red maple, white ash, yellow-poplar, sugar maple.
Yellow-poplar, northern red oak, white ash, sugar maple, red maple.	Yellow-poplar, European larch, Norway spruce, white spruce, eastern white pine.	Good	Northern red oak, red maple, white ash, yellow-poplar, sugar maple.
Northern red oak, white ash, sugar maple, Virginia pine, red maple.	European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, white ash, sugar maple, red maple, Virginia pine.
Northern red oak, white ash, sugar maple, Virginia pine, red maple.	European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, white ash, sugar maple, red maple, Virginia pine.
Yellow-poplar, white ash, northern red oak, sugar maple.	Yellow-poplar, Norway spruce, eastern white pine, European larch.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, black oak.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Very good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Northern red oak, black oak, sugar maple, eastern white pine.	Virginia pine, eastern white pine, Norway spruce, red pine, European larch.	Good	Northern red oak, black oak, chestnut oak, sugar maple.
Northern red oak, black oak, sugar maple, eastern white pine.	Virginia pine, eastern white pine, Norway spruce, red pine, European larch.	Good	Northern red oak, black oak, chestnut oak, sugar maple.

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
Edom:					
EgB, EgC	Slight	Slight	Moderate	Conifers: moderate. Hardwoods: slight.	Moderate
EgD	Slight	Moderate	Moderate	Conifers: moderate. Hardwoods: slight.	Moderate
EgF	Moderate	Severe	Moderate	Conifers: moderate. Hardwoods: slight.	Moderate
Elliber:					
ElC	Slight	Slight	Slight	Conifers: moderate. Hardwoods: moderate.	Slight
ElD	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: moderate.	Slight
Ernest:					
ErB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
ErC	Moderate	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Hagerstown:					
HaB, HcC3	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
HcD3	Slight	Moderate	Slight	Conifers: severe. Hardwoods: moderate.	Slight
HeD	Slight	Moderate	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Hazleton:					
HhB, HhC	Slight	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
HhD	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
HsB, HTD	Slight	Moderate	Moderate	Conifers: moderate. Hardwoods: slight.	Slight

for woodland—Continued

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Northern red oak, chestnut, black oak, Virginia pine, eastern white pine.	Virginia pine, eastern white pine, Norway spruce, red pine, European larch.	Good	Northern red oak, chestnut, Virginia pine.
Northern red oak, chestnut, black oak, Virginia pine, eastern white pine.	Virginia pine, eastern white pine, Norway spruce, red pine, European larch.	Good	Northern red oak, chestnut, Virginia pine.
Northern red oak, chestnut, black oak, Virginia pine, eastern white pine.	Virginia pine, eastern white pine, Norway spruce, red pine, European larch.	Good	Northern red oak, chestnut, Virginia pine.
Yellow-poplar, northern red oak, white ash, sugar maple.	Red pine, European larch, Norway spruce, eastern white pine, black locust, yellow-poplar.	Very good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Red pine, European larch, Norway spruce, eastern white pine, black locust, yellow-poplar.	Very good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Very good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Very good	Northern red oak, white ash, sugar maple, red maple, yellow-poplar.
Yellow-poplar, black walnut, northern red oak, sugar maple, white ash.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Excellent	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, black walnut, northern red oak, sugar maple, white ash.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Excellent	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, black walnut.	Yellow-poplar, European larch, Norway spruce, eastern white pine, red pine.	Excellent	Northern red oak, white ash, sugar maple, yellow-poplar.
Northern red oak, black oak, white ash, sugar maple, yellow pine.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Northern red oak, black oak, white ash, sugar maple, yellow pine.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Virginia pine, eastern white pine, northern red oak, chestnut oak, black oak.	Virginia pine, eastern white pine, red pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine, red pine.

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
HTF	Moderate	Severe	Moderate	Conifers: moderate. Hardwoods: slight.	Slight
Hublersburg:					
HuB, HxB, HuC, HxC	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
HuD, HxD	Moderate	Moderate	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Klinesville:					
KlC	Slight	Slight	Severe	Conifers: slight. Hardwoods: slight.	Moderate
KlD	Moderate	Moderate	Severe	Conifers: slight. Hardwoods: slight.	Moderate
Laidig:					
LaB, LaC	Slight	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
LaD, LcD	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
LDF	Moderate	Severe	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Leetonia: LeB	Slight	Moderate	Severe	Conifers: slight. Hardwoods: slight.	Slight
Meckesville:					
MeC MkB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
MkD	Moderate	Moderate	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Monongahela: MoB	Slight	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Morrison:					
MrB, MrC, MsB	Slight	Slight	Slight	Conifers: moderate Hardwoods: slight.	Slight

for woodland—Continued

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Virginia pine, eastern white pine, northern red oak, chestnut oak, black oak.	Virginia pine, eastern white pine, red pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine, red pine.
Yellow-poplar, northern red oak, white ash, sugar maple, black walnut.	Yellow-poplar, European larch, Norway spruce, red pine, eastern white pine, black walnut, Virginia pine.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple, black walnut.	Yellow-poplar, European larch, Norway spruce, red pine, eastern white pine, black walnut, Virginia pine.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.
Northern red oak, black oak, chestnut oak, Virginia pine, eastern white pine.	Virginia pine, red pine, eastern white pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Northern red oak, black oak, chestnut oak, Virginia pine, eastern white pine.	Virginia pine, red pine, eastern white pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, Virginia pine, eastern white pine, red pine.	Good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Black oak, chestnut oak, pitch pine.	Pitch pine, red pine, Virginia pine.	Poor	Black oak, chestnut oak, pitch pine.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, eastern white pine.	Very good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, eastern white pine.	Very good	Northern red oak, black oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, yellow-poplar, black oak, white ash, sugar maple.

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
MrD, MsD	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Murrill: MuB, MuC	Slight	Slight	Slight	Conifers: moderate. Hardwoods: slight.	Slight
MuD	Slight	Moderate	Slight	Conifers: moderate. Hardwoods: slight.	Slight
Newark: Ne	Slight	Moderate	Slight	Conifers: severe. Hardwoods: severe.	Moderate
Opequon: OpB3, OpC3	Slight	Slight	Severe	Conifers: slight. Hardwoods: slight.	Moderate
OpD3	Moderate	Moderate	Severe	Conifers: slight. Hardwoods: slight.	Moderate
ORF	Severe	Severe	Severe	Conifers: slight. Hardwoods: slight.	Moderate
Philo: Ph, Po	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Purdy: Pu	Slight	Severe	Severe	Conifers: severe. Hardwoods: severe.	Severe
Raritan: RaB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight
Rubble land: Ru. Not suited to commercial trees.					
Tyler: Ty	Slight	Moderate	Moderate	Conifers: severe. Hardwoods: severe.	Moderate
Urban land: Ur. Not suited to commercial trees.					
Vanderlip: VaD	Slight	Moderate	Moderate	Conifers: slight. Hardwoods: slight.	Slight

for woodland—Continued

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Yellow-poplar, northern red oak, black oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, yellow-poplar, black oak, white ash, sugar maple.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, red pine, Virginia pine, eastern white pine.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, sugar maple, white ash, northern red oak.	White spruce, yellow-poplar, European larch, Norway spruce, eastern white pine.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.
Eastern white pine, northern red oak, Virginia pine, black oak, chestnut oak.	Virginia pine, eastern white pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Eastern white pine, northern red oak, Virginia pine, black oak, chestnut oak.	Virginia pine, eastern white pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Eastern white pine, northern red oak, Virginia pine, black oak, chestnut oak.	Virginia pine, eastern white pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Yellow-poplar, northern red oak, white ash, sugar maple, black walnut, eastern white pine.	Yellow-poplar, European larch, Norway spruce, eastern white pine, black walnut, red pine.	Excellent	Northern red oak, white ash, yellow-poplar, sugar maple.
Pin oak, red maple, American sycamore.	Eastern white pine, white spruce.	Fair	Red maple.
Northern red oak, white ash, sugar maple, yellow-poplar.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Good	Northern red oak, white ash, sugar maple, yellow-poplar.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine, white spruce.	Very good	Northern red oak, white ash, yellow-poplar, sugar maple.
Virginia pine, eastern white pine, northern red oak, black oak.	Red pine, Norway spruce, Virginia pine, eastern white pine, European larch.	Good	Northern red oak, black oak, Virginia pine.

TABLE 3.—*Soil interpretations*

Soils and map symbols	Management concerns				
	Erosion hazard	Equipment limitations	Seedling mortality	Plant competition	Windthrow hazard
VrF	Moderate	Severe	Moderate	Conifers: slight. Hardwoods: slight.	Slight
Weikert: WeB, WeC	Slight	Slight	Severe	Conifers: slight. Hardwoods: slight.	Moderate
WeD	Slight	Moderate	Severe	Conifers: slight. Hardwoods: slight.	Moderate
Wharton: WhB	Slight	Slight	Slight	Conifers: severe. Hardwoods: moderate.	Slight

planting techniques, and considerable replanting are needed for adequate and immediate restocking. Restocking cannot be expected to result from natural regeneration if the rating for seedling mortality is severe.

Plant competition refers to the rate at which brush, grass, and undesirable trees are likely to invade the different kinds of soil. Plant competition is *slight* if unwanted plants do not prevent adequate natural regeneration and early growth or do not interfere with adequate development of planted seedlings. It is *moderate* if competing plants delay natural or artificial regeneration, both establishment and growth, but do not prevent the natural development of a fully stocked normal stand. Competition is *severe* if adequate natural or artificial regeneration can be obtained only by intensive site preparation and maintenance, including weeding.

Windthrow hazard refers to the factors that control the development of tree roots and consequently control the likelihood that trees will be uprooted by wind. A rating of *slight* indicates that normally no trees are blown down by the wind. A rating of *moderate* indicates that some trees are expected to be blown down during periods of excessive soil wetness and high wind. If the rating is *severe,* many trees are expected to be blown down during periods of soil wetness and moderate or high winds.

Species suitability columns list trees that are well suited for planting or managing in existing stands. The objectives of the landowner will determine which species to favor when plantations are to be started. The trees listed in the "for planting or seeding" column would be recommended as being well suited to these particular soils.

Site quality indicates the general ability of these soils to produce timber. The ratings are based on sample plots within the county and adjacent counties. Other soils in the county that have characteristics similar to those of the soils studied were assumed to have approximately the same rating. The ratings are based on the site index, or the average height attained by the dominant and codominant trees at the age of 50 years. Foresters using this rating can determine the volume of timber that normal stands will produce at different ages.

Yield information on oak is based on data by G. L. Schnur (*10*). A site index of 85 or better is rated *excellent,* and the expected yield at age 50 is 13,750 or more board feet per acre (published data for oak do not go beyond site index 80, International rule). A site index of 75 to 84 is rated *very good,* and the expected yield at age 50 is about 13,750 board feet per acre. A site index of 65 to 74 is rated *good,* and the expected yield at age 50 is about 9,750 board feet per acre. A site index of 55 to 64 is rated *fair,* and the expected yield at age 50 is about 6,300 board feet per acre. A site index of less than 54 is rated *poor,* and the expected yield at age 50 is less than 3,250 board feet per acre.

Yield information for yellow-poplar is based on data from E. F. McCarthy, Central States Experiment Station (*8*). An excellent site has a site index of 95 or better, and expected yield at age 50 is 32,150 board feet per acre. A site index of 85 to 94 is rated *very good,* and the expected yield at age 50 is about 24,400 board feet per acre. A *good* rating (site index 75 to 84) indicates expected yield is 17,620 board feet per acre; a fair rating (site index 65 to 74) indicates expected yield is 11,400 board feet per acre; and a *poor* rating (site index 55 to 64) indicates expected yield is 5,600 board feet per acre. The "Species" column under Site quality indicates the trees commonly found on the soil.

The site index for other trees such as red maple, white pine, sugar maple, ash, and black cherry varies somewhat, but the better sites have the taller trees of

for woodland—Continued

Species to favor—		Site quality	
In existing stands	For planting or seeding	Rating	Species
Virginia pine, eastern white pine, northern red oak, black oak.	Red pine, Norway spruce, Virginia pine, eastern white pine, European larch.	Good	Northern red oak, black oak, Virginia pine.
Northern red oak, black oak, Virginia pine, chestnut oak, eastern white pine.	Red pine, Virginia pine, eastern white pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Northern red oak, black oak, Virginia pine, chestnut oak, eastern white pine.	Red pine, Virginia pine, eastern white pine, pitch pine.	Fair	Northern red oak, black oak, chestnut oak, Virginia pine.
Yellow-poplar, northern red oak, white ash, sugar maple.	Yellow-poplar, European larch, Norway spruce, eastern white pine.	Very good	Northern red oak, white ash, sugar maple, yellow-poplar.

the same species at the age of 50 years. As the site quality decreases, the height of the trees decreases accordingly. More information on site index for other tree species can be obtained from the United States Department of Agriculture, Soil Conservation Service, and from the Bureau of Forests, Pennsylvania Department of Environmental Resources.

Wildlife

The production of wildlife in Huntingdon County depends largely on the amount and distribution of food, cover, and water. If any of these elements is missing, inadequate, or inaccessible, the wildlife is scarce or absent.

Soils directly affect the kind and amount of vegetation that is used as food and cover. They also affect the development of water impoundments. In this way soils indirectly influence the kinds of wildlife that can live in an area.

If the soils are suitable, habitat for wildlife can be created or improved by planting suitable vegetation, by properly managing the existing plant cover, by fostering the natural establishment of desirable plants, or by using a combination of these measures.

In table 4, soils are rated according to their potential for suppporting the main kinds of wildlife habitat in the survey area. The ratings are based on the ability of the soils to produce plants and other elements that make up the wildlife habitat. These ratings can be used as an aid in:

1. Planning the broad use of parks, refuges, nature study areas, and other recreational developments for wildlife.
2. Selecting soils that are suitable for creating, improving, or maintaining specific kinds of wildlife habitat.
3. Determining the intensity of management needed for individual elements of wildlife habitat.
4. Eliminating sites that would be difficult or impractical to manage for specific kinds of wildlife.
5. Determining areas that are suitable for acquisition for use by wildlife.

A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management and fairly frequent attention are required for satisfactory results. A rating of *poor* means that limitations for the designated element of wildlife habitat or kind of wildlife are severe. Habitat can be created, improved, or maintained in most places, but management is difficult and requires intensive effort. A rating of *very poor* means that restrictions on the use of the soil for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impossible or impractical to create, improve, or maintain on soils having a rating of very poor.

In table 4, each soil is rated according to its suitability for various kinds of plants and other elements that make up wildlife habitat.

Grain and seed crops are seed-producing annuals used by wildlife. Examples are corn, sorghum, wheat, oats, barley, millet, buckwheat, soybeans, and sunflowers. The major soil properties affecting grain and seed crops are effective rooting depth, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife

TABLE 4.—*Suitability of the soils for elements of wildlife habitat and for kinds of wildlife*

Soils and map symbols	Elements of wildlife habitat							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow-water areas	Open-land wildlife	Woodland wildlife	Wetland wildlife
Albrights:										
AbB	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
AbC	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
AcB, AcD	Very poor	Poor	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
Andover:										
AnB	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor.
AoB	Very poor	Very poor	Fair	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor.
Atkins: At	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Barbour:										
Ba	Poor	Fair	Good	Good	Good	Poor	Very poor	Fair	Good	Very poor.
Bb	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Basher variant: Bc	Poor	Fair	Good	Good	Good	Poor	Poor	Fair	Good	Poor.
Bedington:										
BeB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
BeC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
BeD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Berks:										
BkB	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor.
BkC	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
BlD:										
Berks part	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
Weikert part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
BMF:										
Berks part	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Weikert part	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Birdsboro: BnB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Blairton:										
BoB	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
BoC	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
Brinkerton:										
BrA	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
BrB	Poor	Fair	Fair	Fair	Fair	Poor	Very poor	Fair	Fair	Very poor.
Buchanan:										
BuB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
BuC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
BuD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
BxB	Very poor	Very poor	Good	Good	Good	Poor	Very poor	Poor	Fair	Very poor.
BxD	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Calvin:										
CaB	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor.
CaC	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
CaD	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.

Clarksburg: CbB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Clymer:										
ClB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
ClC	Fair	Good	Good	Good	Very poor	Very poor	Very poor	Good	Good	Very poor.
CvB	Very poor	Poor	Good	Good	Good	Poor	Very poor	Poor	Good	Very poor.
CvC	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Edom:										
EeB:										
Edom part	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Opequon part	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
EeC:										
Edom part	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Opequon part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
EeD:										
Edom part	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Opequon part	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
EgB:										
Edom part	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Weikert part	Very poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor.
EgC:										
Edom part	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Weikert part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
EgD:										
Edom part	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Weikert part	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
EgF:										
Edom part	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Poor	Very poor.
Weikert part	Very poor	Very poor	Poor	Very poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor.
Elliber:										
ElC	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
ElD	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Ernest:										
ErB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
ErC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
Hagerstown:										
HaB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
HcC3	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
HcD3	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
HeD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Rock outcrop part of HeD not rated.										
Hazleton:										
HhB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
HhC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
HhD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
HsB:										
Hazleton part	Very poor	Very poor	Good	Fair	Fair	Poor	Very poor	Poor	Fair	Very poor.
Dekalb part	Very poor	Very poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
HTD:										
Hazleton part	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Dekalb part	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.

TABLE 4.—*Suitability of the soils for elements of wildlife habitat and for kinds of wildlife*—Continued

Soils and map symbols	Elements of wildlife habitat							Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow-water areas	Open-land wildlife	Woodland wildlife	Wetland wildlife
HTF:										
Hazleton part	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Dekalb part	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Hublersburg:										
HuB, HxB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
HuC, HxC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
HuD, HxD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Klinesville:										
KlC	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
KlD	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Laidig:										
LaB	Fair	Good	Good	Fair	Fair	Poor	Very poor	Good	Fair	Very poor.
LaC	Fair	Good	Good	Fair	Fair	Very poor	Very poor	Good	Fair	Very poor.
LaD	Poor	Fair	Good	Fair	Fair	Very poor	Very poor	Fair	Fair	Very poor.
LcD	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
LDF	Very poor	Very poor	Good	Fair	Fair	Very poor	Very poor	Poor	Fair	Very poor.
Leetonia: LeB	Very poor	Very poor	Fair	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor.
Meckesville:										
MeC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
MkB	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
MkD	Very poor	Poor	Good	Good	Good	Very poor	Very poor	Poor	Good	Very poor.
Monongahela: MoB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Morrison:										
MrB	Poor	Fair	Fair	Poor	Poor	Poor	Very poor	Fair	Poor	Very poor.
MrC	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
MrD	Poor	Fair	Fair	Poor	Poor	Very poor	Very poor	Fair	Poor	Very poor.
MsB	Very poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
MsD	Very poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Murrill:										
MuB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
MuC	Fair	Good	Good	Good	Good	Very poor	Very poor	Good	Good	Very poor.
MuD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
Newark: Ne	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Opequon:										
OpB3	Poor	Poor	Fair	Poor	Poor	Poor	Very poor	Poor	Poor	Very poor.
OpC3	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
OpD3	Poor	Poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
ORF	Very poor	Very poor	Fair	Poor	Poor	Very poor	Very poor	Poor	Poor	Very poor.
Philo:										
Ph	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
Po	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Purdy: Pu	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

Raritan: RaB	Fair	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.
Rubble land: Ru	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor	Very poor.
Tyler: Ty	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land: Ur. Too variable to rate; requires onsite investigation.										
Vanderlip:										
VaD	Poor	Fair	Good	Good	Good	Very poor	Very poor	Fair	Good	Very poor.
VrF	Very poor	Very poor	Good	Good	Good	Very poor	Very poor	Poor	Fair	Very poor.
Weikert:										
WeB	Very poor	Poor	Poor	Very poor	Very poor	Poor	Very poor	Poor	Very poor	Very poor.
WeC	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
WeD	Very poor	Poor	Poor	Very poor	Very poor	Very poor	Very poor	Poor	Very poor	Very poor.
Wharton: WhB	Good	Good	Good	Good	Good	Poor	Very poor	Good	Good	Very poor.

food and cover. Examples are fescue, bluegrass, switchgrass, brome, timothy, orchardgrass, clover, alfalfa, trefoil, and crownvetch. The major soil properties affecting grasses and legumes are effective rooting depth, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope.

Wild herbaceous plants are native or naturally established herbaceous grasses and forbs (including weeds) that provide food and cover for wildlife. Examples are bluestem, indiangrass, goldenrod, beggarweed, pokeweed, and fescue. The major soil properties affecting wild herbaceous plants are thickness of soil, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard.

Hardwood trees are nonconiferous trees and associated woody understory plants that provide cover for wildlife or that produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. They are generally established naturally, but they may be planted. Examples of native kinds are oak, poplar, cherry, apple, hawthorn, dogwood, sassafras, sumac, hickory, black walnut, blackberry, grape, blackhaw, mapleleaf viburnum, blueberry, honeysuckle, and briers. Examples of commercially available fruiting shrubs suitable for planting on soils rated good are autumn-olive, Asiatic crabapple, silky dogwood, and Tatarian honeysuckle. The major soil properties affecting hardwood trees and shrubs are effective rooting depth, available water capacity, and wetness.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that furnish cover or supply food in the form of browse, seeds, or fruitlike cones. They are commonly established through natural processes but may be planted or transplanted. Examples are pine, spruce, hemlock, cedar, and juniper. The major soil properties affecting coniferous plants are effective rooting depth, available water capacity, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover used extensively by wildlife that use wetland as habitat. Examples of wetland plants are smartweed, wild millet, rushes, sedges, reeds, and cattail. The major soil properties affecting wetland plants are wetness, soil reaction, slope, and surface stoniness.

Shallow-water areas are areas of surface water, having an average depth of less than 5 feet, that are useful to wildlife. They may be natural wet areas, or they may be created by dams or levees or by water-control devices in marshes or streams. Examples are muskrat marshes, waterfowl feeding areas, and wildlife ponds. The major soil properties affecting shallow-water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Table 4 also gives ratings for the soils according to their suitability for providing habitat for various kinds of wildlife.

Open-land wildlife are birds and mammals that inhabit croplands, pastures, meadows, and areas overgrown with grasses, herbs, shrubs, and vines. Examples are bobwhite quail, pheasant, meadowlark, field sparrow, killdeer, cottontail rabbit, red fox, and woodchuck. The major elements of habitat used in rating soils for openland wildlife are grain and seed crops, grasses and legumes, and wild herbaceous plants.

Woodland wildlife are such birds and mammals as wild turkey, ruffed grouse, woodcock, thrushes, vireos, woodpeckers, squirrel, gray fox, raccoon, white-tailed deer, and black bear. The major elements of habitat are hardwood trees and coniferous trees, grasses and legumes, and wild herbaceous plants.

Wetland wildlife are birds and mammals that inhabit swampy, marshy, or open-water areas. Examples are ducks, geese, herons, rails, kingfishers, muskrat, mink, and beaver. The major elements of habitat are wetland plants and shallow-water areas.

Town and Country Planning

This section provides information on the properties of soils and their effect on selected uses of soils for town and country planning in Huntingdon County. It will help community planners, developers, and individual landowners determine the most suitable use for a particular area. Other useful information can be found on the soil maps and in other parts of the survey, particularly the section "Descriptions of the Soils" and the section "Engineering Uses of the Soils." Although the soil maps and tables serve as a guide and can eliminate some sites from further consideration, they do not supplant direct detailed onsite investigations when a development is being planned. Not considered in rating the soils are location in relation to established business centers or transportation lines or other factors that are important in determining the ultimate use of an area.

Soil limitations in table 5 are indicated by the ratings slight, moderate, and severe. *Slight* means that soil properties are generally favorable for the rated use or, in other words, that limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance. Following are explanations of the columns in table 5.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 18 inches and 6 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or rock, and susceptibility to flooding. Slope is a soil property that affects difficulty of layout and construction and also the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are con-

sidered that affect the pond floor and embankment. Those that affect the pond flood are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to and condition of bedrock becomes important. The soil properties that affect the embankment are the engineering properties of the embankment material as interpreted from the Unified soil classification system and the amounts of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Dwellings with basements as rated in table 5 are for homesites or other buildings of three stories or less in height that have no more than an 8-foot excavation for basements. Buildings with foundation loads in excess of those equal to three story dwellings and with more than an 8-foot excavation for basements are excluded from the ratings. Considered in rating the soils are the depth to water table, shrink-swell potential, the depth to and the kind of bedrock, soil texture, the percent of slope, potential frost action, and the hazard of flooding.

Lawns and landscaping at homesites are rated where enough lime and fertilizer are used for lawn grasses and ornamental plants to grow. Suitable soil material is needed in sufficient quantities so desirable trees and other plants can survive and grow well. Among the important soil properties for lawns and landscaping are depth of bedrock or layers that restrict water and roots, texture, slope, depth to water table, and the presence of stones or rocks.

Local roads and streets, as rated in table 5, have an all-weather surface expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. These roads are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand and most cuts and fills are less than 6 feet deep.

Local roads and streets are most affected in design and construction by load supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade. The classification systems are discussed in the section "Engineering Soil Classification Systems."

Sanitary landfill is a method of disposing of refuse. The waste is spread in thin layers, compacted, and covered with soil throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Some soil properties that affect suitability for landfill are ease of excavation, hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated the ratings in table 5 apply only to a depth of about 6 feet, and therefore limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper than that. For some soils, reliable predictions can be made to a depth of 10 to 15 feet, but regardless of that, every site should be investigated before it is selected.

Recreational Development

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 6 the soils of Huntingdon County are rated according to limitations that affect their use for camp areas, service buildings, paths and trails, picnic areas, playgrounds, and golf fairways.

In table 6 the soils are rated as having slight, moderate, or severe limitations for the specified uses. For all of these ratings, it is assumed that a good cover of vegetation can be established and maintained. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they easily can be overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, intense maintenance, or a combination of these, is required.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp sites are subject to heavy foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Service buildings and dwellings without basements, as rated in table 6, are not more than three stories high and are supported by foundation footings placed in undisturbed soil. The features that affect the rating of a soil for service buildings are those that relate to capacity to support load and resist settlement under load, and those that relate to ease of excavation. Soil properties that affect capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, content of stones, and outcropping of bedrock.

Paths and trails are used for local and cross country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Picnic areas are attractive natural or landscaped tracts used mainly for preparing meals and eating outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry; are free of flooding during the season of use; do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Playgrounds are used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free

TABLE 5.—*Limitations of the soils for town and country planning*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Lawns and landscaping	Local roads and streets	Sanitary landfill (trench)
Albrights:						
AbB	Severe: seasonal high water table; moderately slow permeability.	Moderate: slope; depth to bedrock; inflow hazard.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; frost action potential.	Severe: seasonal high water table.
AbC	Severe: seasonal high water table; moderately slow permeability.	Severe: slope	Severe: seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table; frost action potential.	Severe: seasonal high water table.
AcB	Severe: seasonal high water table; moderately slow permeability.	Moderate: slope; stoniness; depth to bedrock; inflow hazard.	Severe: seasonal high water table.	Moderate: stoniness; seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.
AcD	Severe: slope; seasonal high water table; moderately slow permeability.	Severe: slope	Severe: slope; seasonal high water table.	Severe: slope	Severe: slope	Severe: seasonal high water table.
Andover:						
AnB	Severe: high water table; slow permeability; stoniness.	Moderate: slope; coarse fragments; inflow hazard.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
AoB	Severe: high water table: slow permeability; stoniness.	Severe: stoniness	Severe: high water table.	Severe: high water table; stoniness.	Severe: high water table.	Severe: high water table.
Atkins: At	Severe: flooding; high water table; moderately slow permeability.	Severe: flooding; high water table; permeable substratum.	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: flooding; high water table; frost action potential.	Severe: flooding; high water table; permeable substratum.
Barbour:						
Ba	Severe: flooding	Severe: flooding; permeable substratum.	Severe: flooding	Moderate: flooding.	Severe: flooding	Severe: flooding; permeable substratum.
Bb	Severe: flooding	Severe: flooding; permeable substratum.	Severe: flooding	Slight	Moderate: flooding.	Severe: flooding; permeable substratum.
Basher variant: Bc	Severe: flooding; high water table.	Severe: flooding	Severe: flooding	Moderate: flooding.	Severe: flooding	Severe: flooding; high water table; permeable substratum.
Bedington:						
BeB	Moderate: depth to bedrock.	Severe: permeable substratum.	Slight	Slight	Slight	Moderate: depth to bedrock.
BeC	Moderate: slope; depth to bedrock.	Severe: slope; permeable substratum.	Moderate: slope	Moderate: slope	Moderate: slope	Moderate: depth to bedrock.
BeD	Severe: slope	Severe: slope; permeable substratum.	Severe: slope	Severe: slope	Severe: slope	Moderate: slope; depth to bedrock.

Berks:						
BkB	Severe: depth to bedrock.	Severe: depth to bedrock; moderately rapid permeability.	Moderate: depth to bedrock.	Moderate: depth to bedrock.	Moderate: depth to bedrock.	Severe: moderately rapid permeability.
BkC	Severe: depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability.	Moderate: slope; depth to bedrock.	Moderate: slope; depth to bedrock.	Moderate: slope; depth to bedrock.	Severe: moderately rapid permeability.
BID	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability.	Severe: slope	Severe: slope	Severe: slope	Severe: moderately rapid permeability.
BMF	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability.	Severe: slope	Severe: slope	Severe: slope	Severe: slope; moderately rapid permeability.
Birdsboro:						
BnB	Slight [1]	Severe: permeable substratum.	Slight	Slight	Slight	Severe: permeable substratum.
Blairton:						
BoB	Severe: seasonal high water table; moderately slow permeability; depth to bedrock.	Severe: depth to bedrock.	Severe: seasonal high water table.	Moderate: seasonal high water table; depth to bedrock.	Moderate: seasonal high water table; frost action potential.	Severe: seasonal high water table; depth to bedrock.
BoC	Severe: seasonal high water table; moderately slow permeability; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: seasonal high water table.	Moderate: slope; seasonal high water table; depth to bedrock.	Moderate: slope; seasonal high water table; frost action potential.	Severe: seasonal high water table; depth to bedrock.
Brinkerton:						
BrA	Severe: high water table; slow permeability.	Slight: inflow hazard.	Severe: high water table.	Severe: high water table.	Severe: high water table; frost action potential.	Severe: high water table.
BrB	Severe: high water table; slow permeability.	Moderate: slope; inflow hazard.	Severe: high water table.	Severe: high water table.	Severe: high water table; frost action potential.	Severe: high water table.
Buchanan:						
BuB	Severe: seasonal high water table; slow permeability.	Moderate: slope; coarse fragments; inflow hazard.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; frost action potential.	Severe: seasonal high water table.
BuC	Severe: seasonal high water table; slow permeability.	Severe: slope	Severe: seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: seasonal high water table; frost action potential.	Severe: seasonal high water table.
BuD	Severe: slope; seasonal high water table; slow permeability.	Severe: slope	Severe: slope; seasonal high water table.	Severe: slope	Severe: slope	Severe: seasonal high water table.
BxB	Severe: seasonal high water table; slow permeability; stoniness.	Severe: stoniness	Severe: seasonal high water table; stoniness.	Severe: stoniness	Moderate: seasonal high water table; stoniness; frost action potential.	Severe: seasonal high water table; stoniness.
BxD	Severe: slope; seasonal high water table; slow permeability; stoniness.	Severe: slope; stoniness.	Severe: slope; seasonal high water table; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: seasonal high water table; stoniness.

[1] See footnote at end of table.

TABLE 5.—*Limitations of the soils for town and country planning*—Continued

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Lawns and landscaping	Local roads and streets	Sanitary landfill (trench)
Calvin:						
CaB	Severe: depth to bedrock.	Severe: depth to bedrock; moderately rapid permeability.	Moderate: depth to bedrock.	Moderate: depth to bedrock.	Slight	Severe: moderately rapid permeability.
CaC	Severe: depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability.	Moderate: slope; depth to bedrock.	Moderate: slope; depth to bedrock.	Moderate: slope	Severe: moderately rapid permeability.
CaD	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability.	Severe: slope	Severe: slope	Severe: slope	Severe: moderately rapid permeability.
Clarksburg:						
CbB	Severe: seasonal high water table; slow permeability.	Moderate: slope; inflow hazard.	Moderate: seasonal high water table.	Slight	Slight	Severe: seasonal high water table.
Clymer:						
ClB	Moderate: depth to bedrock.	Severe: moderately rapid permeability.	Moderate: depth to bedrock.	Slight	Slight	Severe: moderately rapid permeability.
ClC	Moderate: slope; depth to bedrock.	Severe: slope; moderately rapid permeability.	Moderate: slope; depth to bedrock.	Moderate: slope	Moderate: slope	Severe: moderately rapid permeability.
CvB	Moderate: depth to bedrock.	Severe: moderately rapid permeability.	Moderate: stoniness; depth to bedrock.	Moderate: stoniness.	Slight	Severe: moderately rapid permeability.
CvC	Moderate: slope; depth to bedrock.	Severe: slope; moderately rapid permeability.	Moderate: slope; stoniness; depth to bedrock.	Severe: slope	Severe: slope	Severe: moderately rapid permeability.
Edom:						
EeB:						
Edom part	Moderate[1]: depth to bedrock.	Moderate[1]: slope; depth to bedrock; moderate permeability.	Moderate: depth to bedrock.	Moderate: too clayey.	Slight	Severe[1]: too clayey.
Opequon part	Severe[1]: depth to bedrock.	Severe[1]: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe[1]: depth to bedrock; too clayey.
EeC:						
Edom part	Moderate[1]: slope; depth to bedrock.	Severe: slope	Moderate: slope; depth to bedrock.	Moderate: slope; too clayey.	Moderate: slope	Severe[1]: too clayey.
Opequon part	Severe[1]: depth to bedrock.	Severe[1]: slope; depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe[1]: depth to bedrock; too clayey.
EeD:						
Edom part	Severe[1]: slope	Severe[1]: slope	Severe: slope	Severe: slope	Severe: slope	Severe[1]: too clayey.
Opequon part	Severe[1]: slope; depth to bedrock.	Severe[1]: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe[1]: depth to bedrock; too clayey.
EgB:						
Edom part	Moderate[1]: depth to bedrock.	Moderate[1]: slope; depth to bedrock.	Moderate: depth to bedrock.	Moderate: too clayey.	Slight	Severe[1]: too clayey.

Weikert part	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Severe [1]: moderately rapid permeability.
EgC:						
Edom part	Moderate [1]: slope; depth to bedrock.	Severe [1]: slope	Moderate: slope; depth to bedrock.	Moderate: slope; too clayey.	Moderate: slope	Severe [1]: too clayey.
Weikert part	Severe: depth to bedrock.	Severe: slope; depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Moderate: slope; depth to bedrock.	Severe [1]: moderately rapid permeability.
EgD:						
Edom part	Severe [1]: slope	Severe [1]: slope	Severe: slope	Severe: slope	Severe: slope	Severe: too clayey.
Weikert part	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope	Severe: moderately rapid permeability.
EgF:						
Edom part	Severe [1]: slope	Severe [1]: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; too clayey.
Weikert part	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope	Severe: slope; moderately rapid permeability.
Elliber:						
ElC	Moderate [1]: slope	Severe [1]: slope; moderately rapid permeability; coarse fragments.	Moderate: slope; depth to bedrock.	Severe: coarse fragments.	Moderate: slope	Severe: moderately rapid permeability.
ElD	Severe [1]: slope	Severe [1]: slope; moderately rapid permeability; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope	Severe: moderately rapid permeability.
Ernest:						
ErB	Severe: seasonal high water table; slow permeability.	Moderate: slope; depth to bedrock.	Moderate: seasonal high water table.	Slight	Slight	Severe: seasonal high water table.
ErC	Severe: seasonal high water table; slow permeability.	Severe: slope	Moderate: slope; seasonal high water table.	Moderate: slope	Moderate: slope	Severe: seasonal high water table.
Hagerstown:						
HaB	Moderate [1]: depth to bedrock.	Moderate [1]: slope; moderate permeability; depth to bedrock.	Moderate: depth to bedrock; sinkhole hazard.	Slight	Slight	Severe [1]: too clayey.
HcC3	Moderate [1]: slope, depth to bedrock.	Severe [1]: slope	Moderate: slope; depth to bedrock; sinkhole hazard.	Moderate: slope	Moderate: slope	Severe [1]: too clayey.
HcD3	Severe [1]: slope	Severe [1]: slope	Severe: slope; sinkhole hazard.	Severe: slope	Severe: slope	Severe [1]: too clayey.
HeD	Severe [1]: slope	Severe [1]: slope; rockiness.	Severe: slope, rock outcrops; sinkhole hazard.	Severe: slope	Severe: slope; rockiness.	Severe [1]: too clayey.
Rock outcrop part of HeD not rated.						
Hazleton:						
HhB	Moderate: depth to bedrock.	Severe: moderately rapid permeability.	Slight	Slight	Slight	Severe [1]: moderately rapid permeability.

See footnote at end of table.

TABLE 5.—*Limitations of the soils for town and country planning*—Continued

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Lawns and landscaping	Local roads and streets	Sanitary landfill (trench)
HhC	Moderate: slope; depth to bedrock.	Severe: moderately rapid permeability.	Moderate: slope	Moderate: slope	Moderate: slope	Severe[1]: moderately rapid permeability.
HhD	Severe: slope	Severe: slope; moderately rapid permeability.	Severe: slope	Severe: slope	Severe: slope	Severe[1]: moderately rapid permeability.
HsB:						
Hazleton part	Severe: stoniness	Severe: moderately rapid permeability; stoniness.	Severe: stoniness	Severe: stoniness	Moderate: stoniness.	Severe: moderately rapid permeability; stoniness.
Dekalb part	Severe: depth to bedrock; stoniness.	Severe: rapid permeability; depth to bedrock; stoniness.	Severe: stoniness; depth to bedrock.	Severe: stoniness	Moderate: depth to bedrock; stoniness.	Severe: rapid permeability; depth to bedrock; stoniness.
HTD:						
Hazleton part	Severe: slope; stoniness.	Severe: slope; moderately rapid permeability; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: stoniness; moderately rapid permeability.
Dekalb part	Severe: slope; depth to bedrock; stoniness.	Severe: slope; rapid permeability; depth to bedrock; stoniness.	Severe: slope; depth to bedrock; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: stoniness; depth to bedrock; rapid permeability.
HTF:						
Hazleton part	Severe: slope; stoniness.	Severe: slope; moderately rapid permeability; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; stoniness; moderately rapid permeability.
Dekalb part	Severe: slope; depth to bedrock; stoniness.	Severe: slope; moderately rapid permeability; depth to bedrock; stoniness.	Severe: slope; depth to bedrock; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; depth to bedrock; stoniness; rapid permeability.
Hublersburg:						
HuB	Slight[1]	Moderate[1]: slope	Slight	Slight	Slight	Severe: too clayey.
HuC	Moderate[1]: slope	Severe[1]: slope	Moderate: slope	Moderate: slope	Moderate: slope	Severe: too clayey.
HuD	Severe[1]: slope	Severe[1]: slope	Severe: slope	Severe: slope	Severe: slope	Severe: too clayey.
HxB	Slight[1]	Moderate[1]: slope; coarse fragments.	Slight	Slight	Slight	Severe: too clayey.
HxC	Moderate[1]: slope	Severe[1]: slope	Moderate: slope	Moderate: slope	Moderate: slope	Severe: too clayey.
HxD	Severe[1]: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: too clayey.
Klinesville:						
KlC	Severe: depth to bedrock.	Severe: slope; depth to bedrock; coarse fragments.	Moderate: slope; depth to bedrock.	Severe: depth to bedrock.	Moderate: slope; depth to bedrock.	Severe: moderately rapid permeability.
KlD	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock; coarse fragments.	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope	Severe: moderately rapid permeability.

Laidig:						
LaB	Severe: moderately slow permeability.	Moderate: slope; coarse fragments.	Slight	Slight	Slight	Slight.
LaC	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope	Slight.
LaD	Severe: slope; moderately slow permeability.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope.
LcD	Severe: slope; moderately slow permeability; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: stoniness.
LDF	Severe: slope; moderately slow permeability; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; stoniness.
Leetonia: LeB	Severe: stoniness	Severe: slope; moderately rapid permeability; stoniness.	Severe: stoniness	Severe: stoniness; too sandy.	Moderate: stoniness.	Severe: stoniness; moderately rapid permeability.
Meckesville:						
MeC	Severe: moderately slow permeability.	Severe: slope	Moderate: slope	Moderate: slope	Moderate: slope	Slight.
MkB	Severe: moderately slow permeability; stoniness.	Moderate: stoniness; slope; coarse fragments.	Moderate: stoniness.	Moderate: stoniness.	Slight	Moderate: stoniness.
MkD	Severe: slope; moderately slow permeability; stoniness.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: slope; stoniness.
Monongahela: MoB	Severe: seasonal high water table; slow permeability.	Moderate: slope	Moderate: seasonal high water table.	Slight	Slight	Severe: seasonal high water table.
Morrison:						
MrB	Slight [1]	Severe [1]: moderately rapid permeability.	Slight	Slight	Slight	Severe [1]: moderately rapid permeability.
MrC	Moderate [1]: slope; sinkhole hazard.	Severe [1]: slope; moderately rapid permeability.	Moderate: slope	Moderate: slope	Moderate: slope	Severe [1]: moderately rapid permeability.
MrD	Severe [1]: slope	Severe [1]: slope; moderately rapid permeability.	Severe: slope	Severe: slope	Severe: slope	Severe [1]: moderately rapid permeability.
MsB	Moderate [1]: stoniness.	Severe [1]: moderately rapid permeability; stoniness.	Moderate: stoniness.	Moderate: stoniness.	Slight	Severe [1]: moderately rapid permeability.
MsD	Severe [1]: slope	Severe [1]: moderately rapid permeability; stoniness.	Moderate: stoniness.	Moderate: stoniness.	Slight	Severe [1]: moderately rapid permeability.

See footnote at end of table.

TABLE 5.—*Limitations of the soils for town and country planning*—Continued

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings with basements	Lawns and landscaping	Local roads and streets	Sanitary landfill (trench)
Murrill:						
MuB	Slight[1]	Moderate[1]: slope; coarse fragments; moderate permeability.	Slight	Slight	Slight	Slight.[1]
MuC	Moderate[1]: slope	Severe[1]: slope	Moderate: slope	Moderate: slope	Moderate: slope	Slight.[1]
MuD	Severe[1]: slope	Severe[1]: slope	Severe: slope	Severe: slope	Severe: slope	Moderate[1]: slope.
Newark: Ne	Severe: flooding; seasonal high water table.	Severe: flooding	Severe: flooding; high water table.	Severe: flooding	Severe: flooding	Severe: flooding; high water table.
Opequon:						
OpB3	Severe[1]: depth to bedrock.	Severe[1]: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe[1]: depth to bedrock.
OpC3	Severe[1]: depth to bedrock.	Severe[1]: slope; depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe: depth to bedrock.	Severe[1]: depth to bedrock.
OpD3	Severe[1]: slope; depth to bedrock.	Severe[1]: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe[1]: depth to bedrock.
ORF	Severe[1]: slope; depth to bedrock.	Severe[1]: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.	Severe[1]: depth to bedrock.
Philo: Ph, Po	Severe: flooding; seasonal high water table.	Severe: flooding; high water table.	Severe: flooding	Moderate: flooding.	Severe: flooding	Severe: flooding; seasonal high water table.
Purdy: Pu	Severe: high water table; slow permeability.	Moderate: depth to bedrock; inflow hazard.	Severe: high water table.	Severe: high water table.	Severe: high water table; frost action potential.	Severe: high water table.
Raritan: RaB	Severe: seasonal high water table; moderately slow permeability.	Severe: permeable substratum.	Severe: seasonal high water table.	Slight	Moderate: frost action potential.	Severe: seasonal high water table.
Rubble land: Ru. Rubble land too variable to be rated; requires onsite investigation.						
Tyler: Ty	Severe: seasonal high water table; slow permeability.	Slight: inflow hazard.	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; frost action potential.	Severe: seasonal high water table.
Urban land: Ur. Urban land too variable to be rated; requires onsite investigation.						
Vanderlip: VaD, VrF. Rock outcrop part of VrF not rated.	Severe[1]: slope	Severe[1]: slope; rapid permeability.	Severe[1]: slope	Severe: slope; too sandy.	Severe: slope	Severe: slope; rapid permeability.

Weikert:						
WeB	Severe: depth to bedrock.	Severe: depth to bedrock; moderately rapid permeability.	Moderate: depth to bedrock.	Severe: depth to bedrock.	Moderate: depth to bedrock.	Severe: moderately rapid permeability.
WeC	Severe: depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability; coarse fragments.	Moderate: slope; depth to bedrock.	Severe: depth to bedrock.	Severe: slope; depth to bedrock.	Severe: moderately rapid permeability.
WeD	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock; moderately rapid permeability; coarse fragments.	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope	Severe: moderately rapid permeability.
Wharton: WhB	Severe: slow permeability; seasonal high water table.	Moderate: slope; depth to bedrock.	Moderate: seasonal high water table.	Slight	Moderate: frost action potential.	Severe: seasonal high water table.

[1] Possible ground water pollution because of rapid permeability, coarse texture, creviced bedrock, and the presence of sinkholes.

TABLE 6.—*Recreational development*

Soil series and map symbols	Camp areas	Service buildings and dwellings without basements	Paths and trails	Picnic areas	Playgrounds	Golf fairways
Albrights:						
AbB	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
AbC	Moderate: slope; seasonal high water table; moderately slow permeability.	Moderate: slope; seasonal high water table.	Moderate: seasonal high water table.	Moderate: slope; seasonal high water table.	Severe: slope; seasonal high water table.	Moderate: slope; seasonal high water table.
AcB	Moderate: seasonal high water table; moderately slow permeability; stoniness.	Moderate: seasonal high water table; stoniness.	Moderate: seasonal high water table; stoniness.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table; stoniness.
AcD	Severe: slope	Severe: slope	Moderate: slope; seasonal high water table; stoniness.	Severe: slope	Severe: slope; seasonal high water table.	Severe: slope.
Andover:						
AnB	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table; coarse fragments.	Severe: high water table.
AoB	Severe: high water table; stoniness.	Severe: high water table; stoniness.	Severe: high water table.	Severe: high water table.	Severe: high water table; stoniness; coarse fragments.	Severe: high water table; stoniness.
Atkins: At	Severe: flooding; high water table.	Severe: flooding; high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: flooding; high water table.
Barbour:						
Ba	Moderate: flooding.	Severe: flooding	Slight	Moderate: flooding.	Moderate: flooding.	Moderate: flooding.
Bb	Moderate: flooding.	Severe: flooding	Slight	Slight	Slight	Slight.
Basher variant: Bc	Moderate: flooding; seasonal high water table.	Severe: flooding	Slight	Moderate: flooding.	Moderate: flooding; seasonal high water table.	Moderate: flooding.
Bedington:						
BeB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments.
BeC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
BeD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Berks:						
BkB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: depth to bedrock; coarse fragments.

BkC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; depth to bedrock; coarse fragments.
BID:						
Berks part	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Weikert part	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments; depth to bedrock.	Severe: slope.
BMF:						
Berks part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Weikert part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; coarse fragments; depth to bedrock.	Severe: slope.
Birdsboro: BnB	Slight	Slight	Slight	Slight	Moderate: slope	Slight.
Blairton:						
BoB	Moderate: seasonal high water table; moderately slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table; depth to bedrock.
BoC	Moderate: slope; seasonal high water table; moderately slow permeability.	Moderate: slope; seasonal high water table.	Moderate: seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table.	Moderate: slope; seasonal high water table; depth to bedrock.
Brinkerton: BrA, BrB	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Buchanan:						
BuB	Moderate: seasonal high water table; coarse fragments.	Moderate: seasonal high water table.	Moderate: seasonal high water table; coarse fragments.	Moderate: seasonal high water table; coarse fragments.	Severe: seasonal high water table; coarse fragments.	Moderate: seasonal high water table; coarse fragments.
BuC	Moderate: slope; seasonal high water table; coarse fragments.	Moderate: slope; seasonal high water table.	Moderate: seasonal high water table; coarse fragments.	Moderate: slope; seasonal high water table; coarse fragments.	Severe: slope; seasonal high water table; coarse fragments.	Moderate: slope; seasonal high water table; coarse fragments.
BuD	Severe: slope	Severe: slope	Moderate: slope; seasonal high water table; coarse fragments.	Severe: slope	Severe: slope; seasonal high water table; coarse fragments.	Severe: slope.
BxB	Severe: stoniness	Severe: stoniness	Severe: stoniness	Moderate: seasonal high water table; stoniness.	Severe: seasonal high water table; coarse fragments; stoniness.	Severe: stoniness.
BxD	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: stoniness	Severe: slope	Severe: slope; seasonal high water table; coarse fragments; stoniness.	Severe: slope; stoniness.
Calvin:						
CaB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: depth to bedrock; coarse fragments.
CaC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; depth to bedrock; coarse fragments.

TABLE 6.—*Recreational development*—Continued

Soil series and map symbols	Camp areas	Service buildings and dwellings without basements	Paths and trails	Picnic areas	Playgrounds	Golf fairways
CaD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Clarksburg: CbB	Moderate: seasonal high water table; slow permeability.	Slight	Slight	Slight	Moderate: slope; seasonal high water table; slow permeability.	Slight.
Clymer:						
ClB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments.
ClC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
CvB	Moderate: coarse fragments; stoniness.	Moderate: stoniness.	Moderate: coarse fragments; stoniness.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments; stoniness.
CvC	Moderate: slope; coarse fragments; stoniness.	Moderate: slope; stoniness.	Moderate: coarse fragments; stoniness.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments; stoniness.
Edom:						
EeB:						
Edom part	Moderate: too clayey.	Slight	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope; too clayey.	Moderate: too clayey.
Opequon part	Moderate: too clayey.	Severe: depth to bedrock.	Moderate: too clayey.	Moderate: too clayey.	Severe: depth to bedrock.	Severe: depth to bedrock.
EeC:						
Edom part	Moderate: slope; too clayey.	Moderate: slope	Moderate: too clayey.	Moderate: slope; too clayey.	Severe: slope	Moderate: slope; too clayey.
Opequon part	Moderate: slope; too clayey.	Severe: depth to bedrock.	Moderate: too clayey.	Moderate: slope; too clayey.	Severe: slope; depth to bedrock.	Severe: depth to bedrock.
EeD:						
Edom part	Severe: slope	Severe: slope	Moderate: slope; too clayey.	Severe: slope	Severe: slope	Severe: slope.
Opequon part	Severe: slope	Severe: slope; depth to bedrock.	Moderate: slope; too clayey.	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.
EgB:						
Edom part	Moderate: too clayey.	Slight	Moderate: too clayey.	Moderate: too clayey.	Moderate: slope; too clayey.	Moderate: too clayey.
Weikert part	Moderate: coarse fragments.	Moderate: depth to bedrock.	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: depth to bedrock; coarse fragments.	Moderate: depth to bedrock; coarse fragments.
EgC:						
Edom part	Moderate: slope; too clayey.	Moderate: slope	Moderate: too clayey.	Moderate: slope; too clayey.	Severe: slope	Moderate: slope; too clayey.
Weikert part	Moderate: slope; coarse fragments.	Moderate: slope; depth to bedrock.	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; depth to bedrock; coarse fragments.	Moderate: slope; depth to bedrock; coarse fragments.
EgD:						
Edom part	Severe: slope	Severe: slope	Moderate: slope; too clayey.	Severe: slope	Severe: slope	Severe: slope.
Weikert part	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; depth to bedrock; coarse fragments.	Severe: slope.

EgF:						
Edom part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Weikert part	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope; depth to bedrock; coarse fragments.	Severe: slope.
Elliber:						
ElC	Severe: coarse fragments.	Moderate: slope	Severe: coarse fragments.	Severe: coarse fragments.	Severe: slope; coarse fragments.	Severe: coarse fragments.
ElD	Severe: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope; coarse fragments.	Severe: slope; coarse fragments.	Severe: slope; coarse fragments.
Ernest:						
ErB	Moderate: seasonal high water table.	Slight	Slight	Slight	Moderate: slope; seasonal high water table; slow permeability.	Slight.
ErC	Moderate: slope; seasonal high water table; slow permeability.	Moderate: slope	Slight	Moderate: slope	Severe: slope	Moderate: slope.
Hagerstown:						
HaB	Slight	Slight	Slight	Slight	Slight	Slight.
HcC3	Moderate: slope; too clayey.	Moderate: slope	Moderate: too clayey.	Moderate: slope; too clayey.	Severe: slope	Moderate: slope; too clayey.
HcD3, HeD	Severe: slope	Severe: slope	Moderate: slope; too clayey.	Severe: slope	Severe: slope	Severe: slope.
Rock outcrop part of HeD not rated.						
Hazleton:						
HhB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments.
HhC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
HhD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
HsB	Severe: stoniness	Severe: stoniness	Severe: stoniness	Moderate: coarse fragments.	Severe: coarse fragments.	Severe: stoniness.
HTD	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: stoniness	Severe: slope	Severe: slope; coarse fragments; stoniness.	Severe: slope; stoniness.
HTF	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; coarse fragments; stoniness.	Severe: slope; stoniness.
Hublersburg:						
HuB	Slight	Slight	Slight	Slight	Slight	Slight.
HuC	Moderate: slope	Moderate: slope	Slight	Moderate: slope	Moderate: slope	Moderate: slope.
HuD	Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
HxB	Moderate: coarse fragments.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Moderate: coarse fragments.	Moderate: coarse fragments.
HxC	Moderate: slope; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
HxD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Klinesville:						
KlC	Moderate: slope; coarse fragments.	Moderate: slope; depth to bedrock.	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; depth to bedrock; coarse fragments.	Moderate: slope; depth to bedrock; coarse fragments.

TABLE 6.—*Recreational development*—Continued

Soil series and map symbols	Camp areas	Service buildings and dwellings without basements	Paths and trails	Picnic areas	Playgrounds	Golf fairways
KID	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; depth to bedrock; coarse fragments.	Severe: slope.
Laidig:						
LaB	Moderate: coarse fragments; moderately slow permeability.	Slight	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments.
LaC	Moderate: slope; coarse fragments; moderately slow permeability.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
LaD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
LcD	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: stoniness	Severe: slope	Severe: slope; coarse fragments; stoniness.	Severe: slope; stoniness.
LDF	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope; stoniness.	Severe: slope	Severe: slope; coarse fragments; stoniness.	Severe: slope; stoniness.
Leetonia: LeB	Severe: stoniness	Severe: stoniness	Severe: stoniness	Moderate: too sandy; stoniness; coarse fragments.	Severe: slope; coarse fragments; stoniness.	Severe: stoniness.
Meckesville:						
MeC	Moderate: slope; moderately slow permeability; coarse fragments.	Moderate: slope	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
MkB	Moderate: stoniness; moderately slow permeability; coarse fragments.	Moderate: stoniness.	Moderate: stoniness; coarse fragments.	Moderate: coarse fragments.	Severe: coarse fragments.	Moderate: coarse fragments; stoniness.
MkD	Severe: slope	Severe: slope	Moderate: slope; stoniness; coarse fragments.	Severe: slope	Severe: slope; coarse fragments.	Severe: slope.
Monongahela: MoB	Moderate: seasonal high water table; slow permeability.	Slight	Slight	Slight	Moderate: slope; seasonal high water table; slow permeability.	Slight.
Morrison:						
MrB	Slight	Slight	Slight	Slight	Moderate: slope	Moderate: too sandy.
MrC	Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: slope	Moderate: slope; too sandy.
MrD	Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
MsB	Moderate: stoniness.	Moderate: stoniness.	Moderate: stoniness.	Slight	Moderate: slope; stoniness.	Moderate: stoniness; too sandy.
MsD	Severe: slope	Severe: slope	Moderate: slope; stoniness.	Severe: slope	Severe: slope; stoniness.	Severe: slope; stoniness.
Murrill:						
MuB	Slight	Slight	Slight	Slight	Moderate: slope	Slight.
MuC	Moderate: slope	Moderate: slope	Slight	Moderate: slope	Severe: slope	Moderate: slope.

MuD	Severe: slope	Severe: slope	Moderate: slope	Severe: slope	Severe: slope	Severe: slope.
Newark: Ne	Moderate: flooding; seasonal high water table.	Severe: flooding	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: flooding; seasonal high water table.
Opequon:						
OpB3	Moderate: too clayey.	Severe: depth to bedrock.	Moderate: too clayey.	Moderate: too clayey.	Severe: depth to bedrock.	Severe: depth to bedrock.
OpC3	Moderate: slope; too clayey.	Severe: depth to bedrock.	Moderate: too clayey.	Moderate: slope; too clayey.	Severe: slope; depth to bedrock.	Severe: depth to bedrock.
OpD3	Severe: slope	Severe: slope; depth to bedrock.	Moderate: slope; too clayey.	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.
ORF	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope	Severe: slope	Severe: slope; depth to bedrock.	Severe: slope; depth to bedrock.
Philo:						
Ph	Moderate: flooding; seasonal high water table.	Severe: flooding	Slight	Moderate: flooding.	Moderate: flooding; seasonal high water table.	Moderate: flooding.
Po	Moderate: flooding; seasonal high water table.	Severe: flooding	Slight	Slight	Moderate: seasonal high water table.	Slight.
Purdy: Pu	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Raritan: RaB	Moderate: seasonal high water table; moderately slow permeability.	Slight	Slight	Moderate: seasonal high water table.	Moderate: slope; seasonal high water table; moderately slow permeability.	Slight.
Rubble land: Ru	Severe: stoniness	Severe: stoniness	Severe: stoniness	Severe: stoniness	Severe: stoniness	Severe: stoniness.
Tyler: Ty	Moderate: seasonal high water table; slow permeability.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Urban land: Ur. Too variable to rate; requires onsite investigation.						
Vanderlip:						
VaD	Severe: slope	Severe: slope	Moderate: slope; too sandy.	Severe: slope	Severe: slope	Severe: slope.
VrF. Rock outcrop part of VrF not rated.	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Weikert:						
WeB	Moderate: coarse fragments.	Moderate: depth to bedrock.	Moderate: coarse fragments.	Moderate: coarse fragments.	Severe: depth to bedrock; coarse fragments.	Moderate: depth to bedrock; coarse fragments.
WeC	Moderate: slope; coarse fragments.	Moderate: slope; depth to bedrock.	Moderate: coarse fragments.	Moderate: slope; coarse fragments.	Severe: slope; depth to bedrock; coarse fragments.	Moderate: slope; depth to bedrock; coarse fragments.
WeD	Severe: slope	Severe: slope	Moderate: slope; coarse fragments.	Severe: slope	Severe: slope; depth to bedrock; coarse fragments.	Severe: slope.
Wharton: WhB	Moderate: seasonal high water table; slow permeability.	Slight	Slight	Slight	Moderate: seasonal high water table; slow permeability.	Slight.

of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Golf fairways are used intensively and are subject to heavy foot traffic. Most of the vehicular traffic is confined to hard surface trails and roads. The best soils have good drainage, mild slopes, a surface free of rocks and stones, and a surface that is firm after rains but not dusty when dry.

Engineering Uses of the Soils [4]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils highly important in engineering are permeability, strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and soil slope. The properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil in which they are built, for the purpose of predicting performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 7, 8, and 9, which show, respectively, several estimated soil properties significant to engineering; interpretations for various engineering uses; and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 7 and 8, and it also can be used to make other useful maps.

This information, however, does not eliminate need for further investigations at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater than those shown in the tables, generally depths greater than 6 feet. Also, inspection of sites, especially the small ones, is needed because many delineated areas of a given soil mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have different meanings in soil science and in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering soil classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*3*), used by the SCS engineers, the Department of Defense, and others, and the AASHTO system (*1*), adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, GW-GM.

The AASHTO system is used to classify soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, or the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. The AASHTO classification for tested soils, with group index number in parentheses, is shown in table 9; the estimated classification, without group index numbers, is given in table 7 for all soils mapped in the survey area.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 7.

Depth to seasonal high water table is distance from the surface of the soil to the higher level that ground water reaches in the soil in most years.

[4] JOHN W. MICKLEY, civil engineer, Soil Conservation Service, assisted in the preparation of this section.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Soil texture is described in table 7 in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 2 percent sand. If the soil contains gravel or other particles coarser than sand, an appropriate modifier is added, as for example, "gravelly loamy sand." "Sand," "silt," "clay," and some of the other terms used in USDA textural classification are defined in the Glossary of this soil survey.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 7 do not take into account lateral seepage or such transient soil features as plowpans and surface crusts.

Available water capacity is the ability of soils to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Optimum moisture for compaction and maximum dry density are discussed in the introduction to the soil test data.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Corrosion potential or corrosivity, as used in table 7, pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. Rate of corrosion of uncoated steel is related to soil properties such as drainage, texture, total acidity, and electrical conductivity of the soil material. Ratings of soils for corrosivity for concrete are based mainly on soil texture and acidity. Installations that intersect soil boundaries or soil horizons are more susceptible to corrosion than installations entirely in one kind of soil or in one soil horizon. A corrosivity rating of *low* means that there is a low probability of soil-induced corrosion damage. A rating of *high* means that there is a high probability of damage, so that protective measures for steel and more resistant concrete should be used to avoid or minimize damage.

Engineering interpretations of soils

The estimated interpretations in table 8 are based on the engineering properties of soils shown in table 7, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Huntingdon County. In table 8, ratings are used to summarize suitability of the soils for all listed purposes other than for highway location, pond reservoirs and embankments, drainage of cropland and pasture, irrigation, terraces or diversions, waterways, winter grading and pipeline construction. For these particular uses, table 8 lists those soil features not to be overlooked in planning, installation, and maintenance.

Soil suitability is rated by the terms good, fair, and poor. *Good* means that soil properties generally are favorable for the rated use, or in other words, limitations are minor and easily overcome. *Fair* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Poor* means that soil properties are so unfavorable and so difficult to correct or overcome as to require major soil reclamation, special designs, or intensive maintenance.

Following are explanations of some of the columns in table 8.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as for preparing a seedbed; natural fertility of the material, or response of plants when fertilizer is applied; and absence of substances toxic to plants. Texture of the soil material and its content of stone fragments are characteristics that affect suitability, but also considered in the ratings is damage that will result at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 8 provide guidance about where to look for probable sources. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. The ratings do not take into account thickness of overburden, location of the water table, or other factors that affect mining of the materials, and neither do they indicate quality of the deposit.

Road fill is soil material used in embankments for roads. The suitability ratings reflect (1) the predicted performance of soil after it has been placed in an embankment that has been properly compacted and provided with adequate drainage and (2) the relative ease of excavating the material at borrow areas.

Soil properties that most affect highway and road location are load-supporting capacity and stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Pond embankments require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility.

TABLE 7.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit is made up of two or more kinds of soils. The soils in instructions for referring to other series as indicated.

Soil series and map symbol	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Albrights: AbB, AbC, AcB, AcD.	½–3	3½–8+	0–10	Silt loam	ML or CL	A–4	0–15
			10–24	Silt loam and loam	GM, GC, SM, SC, ML, or CL	A–4 or A–6	0–15
			24–45	Channery loam	ML, CL, SM, SC, GM, or GC	A–4 or A–6	5–30
			45–62	Very channery loam	ML, CL, SM, SC, GM, or GC	A–2, A–4, or A–6	5–40
Andover: AnB, AoB	0–½	5–8+	0–18	Cobbly loam	ML, CL, GM, SM, or SC	A–2 or A–4	0–20
			18–48	Cobbly clay loam	SM, CL, SC, or ML	A–2 or A–4	0–20
			48–60	Gravelly sandy clay loam.	SM, SC, GM, or GC	A–2 or A–4	5–25
Atkins: At	0–½	5+	0–8	Silt loam	ML or CL	A–4 or A–6	
			8–43	Silt loam and silty clay loam.	ML, CL, SM, or SC	A–4 or A–6	
			43–61	Sandy loam	ML, CL, SM, SC, GM, or GC	A–2, A–4, or A–6	0–10
Barbour: Ba, Bb	3+	5+	0–24	Fine sandy loam and sandy loam.	ML or SM	A–2 or A–4	
			24–60	Loamy sand and very gravelly loamy sand.	SM, GM, or GW-GM	A–1, A–2, or A–4	0–5
Basher	1½–3	5+	0–30	Silt loam	ML	A–4	
Mapped only with Philo soils.			30–60	Very gravelly sandy loam.	ML, SM, or GM	A–2 or A–4	0–5
Basher variant: Bc	1½–3	5+	0–55	Silt loam	ML or CL	A–4 or A–6	
			55–65	Fine sandy loam	ML, CL, SM, or SC	A–4 or A–6	
Bedington: BeB, BeC, BeD	6+	3½–6	0–9	Channery silt loam	ML	A–4	0–5
			9–36	Silty clay loam and silt loam.	ML, CL, SM, SC, GM, or GC	A–4 or A–6	0–5
			36–54	Shaly silty clay loam and very shaly silt loam.	GM, GC, SM, or SC	A–2 or A–4	0–5
			54	Shale bedrock.			
*Berks: BkB, BkC, BlD, BMF For Weikert part of BlD and BMF, see Weikert series.	6+	1½–3½	0–8	Shaly silt loam	ML, GM, or SM	A–2 or A–4	0–10
			8–20	Shaly silt loam	GM or SM	A–1, A–2, or A–4.	0–20
			20–34	Very shaly silt loam	GM or SM	A–1 or A–2	0–30
			34	Shale siltstone and thin bedded sandstone bedrock.			
Birdsboro: BnB	6+	5+	0–9	Gravelly loam	ML, CL, or SM	A–4 or A–6	0–5
			9–49	Silt loam, clay loam, and gravelly sandy clay loam.	ML, CL, SM, or GM	A–4 or A–6	0–10
			49–60	Very gravelly sandy loam.	ML, CL, SM, SC, GM, or GC	A–1, A–2, or A–4	0–15
Blairton: BoB, BoC	½–3	1½–3½	0–8	Silt loam	ML	A–4 or A–6	
			8–26	Silty clay loam and shaly silty clay loam.	ML, CL, CH, SM, or GM	A–4, A–6, or A–7	0–10
			26–31	Very shaly loam	SM or GM	A–2	0–15
			31	Weathered shale bedrock.			

significant to engineering

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the The symbol < means less than; > means more than]

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				In/hr	*In/in of soil*	*pH*	*Pct*	*Lbs/ft³*			
80–100	75–100	60–90	50–85	0.6–2.0	0.14–0.18	4.1–5.5			Low	High	High.
65–95	55–90	50–80	40–80	0.6–2.0	0.08–0.14	4.1–5.5	12–16	110–120	Low	High	High.
65–95	55–90	50–80	40–80	0.2–0.6	0.03–0.06	5.1–6.0	10–16	110–120	Low	High	Moderate.
45–85	40–80	35–60	25–60	0.2–2.0	0.03–0.06	5.1–6.0	10–16	114–124	Low	High	Moderate.
65–75	65–75	60–70	30–60	0.2–6.0	0.14–0.18	4.5–5.5			Low	High	High.
75–85	65–85	60–70	30–60	<0.2	0.08–0.12	4.5–5.5	12–17	118–125	Low	High	Moderate.
65–85	60–80	55–70	25–45	0.2–0.6	0.08–0.12	4.5–5.5	10–14	120–126	Low	High	Moderate.
90–100	90–100	85–100	60–96	0.6–2.0	0.16–0.20	4.5–5.5			Low	High	High.
85–100	80–100	65–85	40–85	0.2–2.0	0.10–0.14	4.5–5.5	12–18	105–118	Low	High	High.
60–100	60–100	50–70	15–60	2.0–6.0	0.06–0.10	4.5–5.5	8–14	108–125	Low	High	High.
85–100	85–100	70–100	30–75	0.6–2.0	0.12–0.16	4.5–5.5	12–16	108–120	Low	Low	High.
40–100	35–100	35–95	5–50	2.0–6.0+	0.03–0.08	4.5–5.5	10–16	112–124	Low	Low	High.
90–100	90–100	70–100	55–95	0.6–2.0	0.12–0.16	5.1–6.0	12–18	95–110	Low	Moderate	Moderate.
45–100	40–100	35–100	15–75	0.6–6.0	0.06–0.12	5.1–6.0	10–16	100–120	Low	Moderate	High.
100	95–100	90–100	70–90	0.6–6.0	0.18–0.26	6.1–7.3	15–20	90–110	Low	Low	Low.
90–100	85–100	50–95	40–90	0.6–2.0	0.14–0.20	6.1–7.3	13–18	105–120	Low	Moderate	Moderate.
70–90	65–85	60–80	55–75	0.6–2.0	0.12–0.16	4.5–7.3			Low	Moderate	High.
70–100	65–95	60–90	40–75	0.6–2.0	0.08–0.14	4.5–7.3	14–18	110–118	Low	Moderate	High.
55–90	30–80	30–70	25–50	2.0–6.0	0.05–0.10	4.5–5.5	12–18	114–120	Low	Moderate	High.
45–70	40–70	35–60	25–55	2.0–6.0	0.08–0.12	4.5–5.5			Low	Low	High.
40–70	35–60	25–60	20–45	0.6–6.0	0.04–0.06	4.5–5.5	14–19	110–116	Low	Low	High.
30–65	25–55	20–40	15–35	2.0–6.0	0.04–0.06	4.5–5.5	13–19	105–118	Low	Low	High.
75–100	70–100	60–100	40–80	2.0–6.0	0.10–0.14	4.5–5.5			Low	Moderate	High.
70–100	70–95	65–95	45–85	0.6–2.0	0.08–0.12	4.5–5.5	10–15	110–125	Low	Moderate	High.
50–95	40–80	30–60	15–65	2.0–6.0	0.05–0.10	4.5–5.5	5–10	125–130	Low	Moderate	High.
70–100	60–90	55–90	50–85	0.6–2.0	0.12–0.16	4.1–5.5			Low	Moderate	High.
55–90	45–80	40–80	35–75	0.2–0.6	0.06–0.10	4.1–5.5	14–18	110–117	Moderate	Moderate	High.
35–65	25–55	20–45	15–35	0.2–0.6	0.06–0.10	4.1–5.5	14–18	105–118	Low	Moderate	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbol	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Brinkerton: BrA, BrB	0–½	4–7	0–7	Silt loam	ML or CL	A–4, A–6, or A–7	0–10
			7–25	Silty clay loam	ML, CL, MH, or CH	A–4, A–6, or A–7	0–10
			25–41	Silty clay loam	ML, CH, CL, SM, or SC	A–4, A–6, or A–7	0–10
			41–60	Very shaly silt loam	GM or SM	A–1 or A–2	0–15
Buchanan: BuB, BuC, BuD, BxB, BxD.	½–3	5–8+	0–11	Gravelly loam and loam.	ML, CL, SM, or GM	A–4 or A–6	0–10
			11–49	Clay loam and gravelly sandy clay loam.	ML, CL, SM, or GM	A–4 or A–6	0–20
			49–60	Very gravelly loam	SM, GM, ML, or CL	A–2 or A–4	0–20
Calvin: CaB, CaC, CaD	6+	1½–3½	0–8	Shaly silt loam	SM or ML	A–4	0–15
			8–36	Shaly silt loam and very shaly silt loam.	GM or SM	A–1, A–2, or A–4	0–20
			36	Shale bedrock.			
Clarksburg: CbB	1½–3	5+	0–8	Silt loam	ML	A–4	----------
			8–27	Silty clay loam	ML or CL	A–4, A–6, or A–7	----------
			27–41	Silty clay loam	ML or CL	A–4, A–6, or A–7	0–10
			41–62	Very shaly silt loam	ML, CL, or GM	A–2, A–4, A–6, or A–7	0–20
Clymer: ClB, ClC, CvB, CvC	6+	3½–7	0–13	Channery loam	ML, CL, SM, SC, GM, or GC	A–2 or A–4	0–10
			13–36	Channery loam and channery sandy clay loam.	ML, CL, GC, SM, GM or SC	A–2 or A–4	5–10
			36–46	Very channery sandy loam.	GM, GC, SM, or SC	A–1 or A–2	10–25
			46	Sandy bedrock.			
Dekalb Mapped only with Hazleton soils.	6+	1½–3½	0–15	Channery sandy loam	ML, SM, or GM	A–2 or A–4	0–30
			15–23	Very channery sandy loam and channery loam.	ML, SM, or GM	A–1, A–2, or A–4	10–40
			23–35	Very flaggy loamy sand.	SM or GM	A–1, A–2, or A–4	10–50
			35	Sandstone bedrock.			
*Edom: EeB, EeC, EeD, EgB, EgC, EgD, EgF. For Opequon part of EeB, EeC, and EeD, see Opequon series; for Weikert part of EgB, EgC, EgD, and EgF, see Weikert series.	6+	3½–6	0–8	Silty clay loam	ML or CL	A–4 or A–6	0–5
			8–38	Silty clay and clay	ML, CL, MH, or CH	A–4, A–6, or A–7	0–10
			38–46	Very shaly silty clay loam.	GC, GM, SC, or SM	A–2	10–20
			46	Shaly limestone bedrock.			
Elliber: ElC, ElD	6+	4–8	0–46	Very cherty loam	GM, GC, GP, GM, GW-GM, SM, or SC	A–1, A–2, or A–4	5–15
			46–60	Very cherty sandy loam.	GM, GC, SM, or SC	A–1, A–2, or A–4	20–40
Ernest: ErB, ErC	1½–3	3½–5+	0–8	Silt loam	ML or CL	A–4 or A–6	0–15
			8–23	Silty clay loam	ML or CL	A–4 or A–6	0–15
			23–60	Shaly silty clay loam	ML, CL, SM, or GM	A–4 or A–6	5–25

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				In/hr	*In/in of soil*	*pH*	*Pct*	*Lbs/ft³*			
90–100	85–100	85–100	75–100	0.2–6.0	0.18–0.24	4.5–6.0			Low	High	High.
90–100	85–100	85–100	65–95	0.2–0.6	0.12–0.18	4.5–6.0	16–22	95–115	Moderate	High	High.
70–100	60–100	55–100	40–90	<0.2	0.06–0.10	4.5–6.0	12–17	110–120	Moderate	Moderate	High.
30–65	25–55	20–40	15–35	0.6–2.0	0.04–0.06	4.5–6.0	13–19	105–118	Low	Moderate	High.
65–100	60–95	55–80	35–70	0.6–6.0	0.12–0.18	4.1–5.5			Low	High	High.
65–100	60–95	55–80	35–70	0.6–2.0	0.08–0.14	4.1–5.5	12–16	114–120	Low	High	High.
45–80	40–75	35–70	25–55	<0.2	0.06–0.10	4.1–5.5	10–14	116–124	Low	High	High.
70–95	60–80	55–75	45–70	2.0–6.0	0.06–0.10	4.5–5.5	12–16	113–120	Low	Low	High.
35–70	25–60	15–45	15–40	2.0–6.0	0.02–0.06	4.5–5.5	12–15	116–124	Low	Low	High.
95–100	70–100	70–95	65–90	0.6–2.0	0.16–0.20	5.1–6.5			Low	Moderate	Moderate.
95–100	70–100	70–95	65–90	0.6–2.0	0.12–0.16	5.1–6.5	15–19	105–115	Moderate	Moderate	Moderate.
95–100	65–90	60–85	55–80	0.06–0.2	0.08–0.12	5.1–6.5	15–19	105–115	Moderate	Moderate	Moderate.
50–100	20–100	15–95	15–90	0.6–2.0	0.12–0.18	5.1–6.5	12–15	116–124	Low	Moderate	Moderate.
60–85	60–80	50–75	30–55	0.6–6.0	0.12–0.18	4.1–5.5			Low	Low	High.
60–85	60–80	50–75	30–55	0.6–6.0	0.10–0.14	4.0–5.5	12–16	115–125	Low	Moderate	High.
40–70	35–65	25–40	10–20	2.0–6.0	0.08–0.12	4.0–5.5	11–14	116–124	Low	Low	High.
50–85	40–75	35–65	15–55	2.0–6.0	0.06–0.10	4.1–5.5			Low	Low	High.
50–85	40–80	40–75	20–55	>6.0	0.06–0.10	4.1–5.5	10–15	110–120	Low	Low	High.
45–85	35–75	25–65	15–40	>6.0	0.03–0.06	4.1–5.5	9–13	115–125	Low	Low	High.
85–100	70–100	65–95	65–85	0.6–6.0	0.12–0.16	5.1–7.3			Low	High	Moderate.
70–95	65–90	60–85	50–85	0.6–2.0	0.08–0.12	5.1–7.3	18–25	90–110	Moderate	High	Moderate.
25–55	20–40	15–40	15–35	0.6–2.0	0.02–0.06	5.6–7.8	18–22	100–108	Low	High	Low.
30–60	20–55	15–45	10–40	2.0–6.0+	0.03–0.08	4.5–5.5			Low	Low	High.
30–55	30–55	25–45	15–40	2.0–6.0+	0.03–0.08	4.5–5.5	15–20	105–120	Low	Low	High.
75–100	70–100	70–95	60–95	0.6–6.0	0.12–0.18	4.5–5.5			Low	Moderate	High.
75–100	75–100	70–95	65–95	0.6–2.0	0.12–0.16	4.5–5.5	15–19	102–112	Moderate	High	High.
70–95	55–95	50–95	40–95	<0.2	0.08–0.12	4.5–5.5	12–17	114–120	Moderate	High	High.

TABLE 7.—*Estimated soil properties*

Soil series and map symbol	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Hagerstown: HaB, HcC3, HcD3, HeD. Rock outcrop part of HeD not rated.	6+	4–7	0–8	Silt loam	ML or CL	A–4 or A–6	0–5
			8–70	Silty clay loam, silty clay, and clay.	CL or CH	A–6 or A–7	0–15
			70	Limestone bedrock.			
*Hazleton: HhB, HhC, HhD, HsB, HTD, HTF. For Dekalb part of HsB, HTD, and HTF, see Dekalb series.	6+	3½–7	0–7	Channery loam	SM or GM	A–2 or A–4	0–40
			7–32	Channery loam	SM or GM	A–1, A–2, or A–4	0–30
			32–51	Very channery sandy loam.	SM or GM	A–1 or A–2	0–30
			51	Sandstone bedrock.			
Hublersburg: HuB, HuC, HuD, HxB, HxC, HxD.	6+	5–8	0–14	Cherty silt loam	ML or CL	A–4 or A–6	0–10
			14–74	Silty clay loam, cherty silty clay, silty clay, and clay.	ML, CL, or CH	A–4, A–6, or A–7	0–15
Klinesville: KlC, KlD	6+	1–1½	0–12	Shaly silt loam	GM or SM	A–2	0–10
			12–18	Very shaly loam	GW-GM, GM, GP, SM, SP, or SW-SM	A–1 or A–2	0–10
			18+	Shale bedrock.			
Laidig: LaB, LaC, LaD, LcD, LDF.	3+	5+	0–8	Gravelly loam	GM or SM	A–2 or A–4	0–10
			8–30	Channery loam	GM, GC, SM, or SC	A–2 or A–4	5–20
			30–78	Channery loam	GM, GC, SM, or SC	A–1, A–2, or A–4	5–20
Leetonia: LeB	6+	3½–4	0–12	Gravelly loamy sand	SM, GM, or ML	A–2 or A–4	0–10
			12–44	Gravelly loamy sand, channery loamy sand.	SM or GM	A–1 or A–2	0–30
			44	Sandstone bedrock.			
Meckesville: MeC, MkB, MkD	3–6	5–10	0–12	Gravelly silt loam and gravelly loam.	ML	A–4	0–15
			12–40	Gravelly clay loam	ML or CL	A–4 or A–6	0–15
			40–72	Gravelly clay loam	ML, CL, SM, or GM	A–4 or A–6	0–20
Monongahela: MoB	1½–3	5–10	0–10	Silt loam	ML	A–4	
			10–28	Silt loam and loam	ML or CL	A–4 or A–6	0–10
			28–48	Sandy clay loam	ML, CL, SM, or SC	A–4 or A–6	0–10
			48–60	Gravelly sandy loam	ML, CL, SM, or SC	A–4 or A–6	5–20
Morrison: MrB, MrC, MrD, MsB, MsD.	6+	6+	0–10	Sandy loam	SM, SC, ML, or CL	A–2 or A–4	0–5
			10–56	Cherty sandy loam, cherty sandy clay loam, and cherty clay loam.	SM, SC, ML, or CL	A–2 or A–4	0–10
			56–68	Cherty sandy loam	SM or SC	A–2	0–15
Murrill: MuB, MuC, MuD	6+	6+	0–8	Gravelly loam	ML or SM	A–4	0–15
			8–77	Gravelly clay loam and clay loam.	ML, CL, or SM	A–4 or A–6	0–15
Newark: Ne	½–1½	5+	0–38	Silt loam and silty clay loam.	ML or CL	A–4 or A–6	
			38–60	Fine sandy loam	ML or CL	A–4 or A–6	0–5

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				In/hr	*In/in of soil*	*pH*	*Pct*	*Lbs/ft³*			
90–100	90–100	80–100	75–95	2.0–6.0	0.16–0.20	5.6–7.3	16–24	100–110	Low	Moderate	Moderate.
85–100	80–100	75–100	70–95	0.6–2.0	0.10–0.14	5.6–7.3	16–24	100–110	Moderate	Moderate	Moderate.
45–80	45–75	35–65	20–40	2.0–6.0	0.08–0.12	4.5–5.5			Low	Low	High.
45–80	45–75	35–65	20–40	2.0–6.0	0.05–0.12	4.5–5.5	10–16	110–123	Low	Low	High.
35–80	35–60	25–55	10–30	2.0–6.0	0.05–0.12	4.5–5.5	10–14	118–125	Low	Low	High.
95–100	80–100	75–100	70–95	2.0–6.0	0.16–0.20	5.1–7.3			Low	Low	Low.
85–100	80–100	75–100	70–95	0.6–2.0	0.10–0.14	4.5–5.5	15–25	100–110	Moderate	Moderate	High.
30–70	25–55	20–50	15–35	2.0–6.0	0.08–0.12	4.5–5.5			Low	Low	High.
30–60	25–50	15–40	4–30	2.0–6.0	0.02–0.06	4.5–5.5	11–15	114–124	Low	Low	High.
55–75	50–75	40–55	20–45	0.6–6.0	0.08–0.12	4.1–5.5			Low	Low	High.
55–75	50–75	40–55	20–45	0.6–2.0	0.06–0.10	4.1–5.5	10–15	115–125	Low	Low	High.
50–75	40–70	35–55	15–40	0.2–0.6	0.06–0.10	4.1–5.5	10–14	120–128	Low	Low	High.
55–85	45–75	35–60	25–55	2.0–6.0	0.05–0.08	4.1–5.5			Low	Low	High.
45–80	30–60	25–50	15–25	2.0–6.0	0.02–0.06	4.1–5.5	8–10	120–128	Low	Low	High.
80–100	70–90	65–85	55–70	0.6–2.0	0.10–0.14	4.1–5.5			Low	Low	High.
80–100	70–90	65–85	55–70	0.6–2.0	0.08–0.14	4.1–5.5	12–15	116–122	Low	Moderate	High.
70–95	55–85	50–80	45–65	0.2–6.0	0.06–0.10	4.1–5.5	11–14	118–124	Low	Moderate	High.
90–100	75–100	70–100	65–90	0.6–2.0	0.18–0.24	4.5–5.5			Low	Moderate	High.
90–100	75–100	70–100	65–90	0.2–0.6	0.10–0.14	4.5–5.5	14–18	110–116	Moderate	High	High.
80–100	70–100	60–95	45–95	<0.2	0.08–0.12	4.5–5.5	12–16	115–122	Moderate	High	High.
75–100	60–100	60–95	40–95	0.2–.06	0.08–0.12	4.5–5.5	12–16	115–124	Moderate	High	High.
95–100	80–100	70–90	25–55	2.0–6.0	0.06–0.10	4.5–5.5			Low	Low	High.
80–100	65–95	25–90	25–55	2.0–6.0	0.03–0.05	5.1–6.0	10–15	118–125	Low	Low	High.
80–100	65–95	25–90	15–35	2.0–6.0	0.03–0.05	5.1–6.0	10–15	118–125	Low	Low	High.
75–95	70–90	60–85	40–75	0.6–2.0	0.08–0.12	4.5–5.5			Low	Moderate	High.
75–100	60–90	55–85	40–80	0.6–2.0	0.10–0.14	4.5–5.5	15–20	105–120	Low	Moderate	High.
95–100	90–100	90–100	70–90	0.6–2.0	0.14–0.18	5.6–7.3	13–17	105–110	Low	High	Moderate.
85–100	80–100	75–85	60–80	0.6–2.0	0.10–0.18	5.6–7.3	15–18	100–110	Low	High	Moderate.

TABLE 7.—*Estimated soil properties*

Soil series and map symbol	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Seasonal high water table	Bedrock			Unified	AASHTO	
	Ft	*Ft*	*In*				*Pct*
Opequon: OpB3, OpC3, OpD3, ORF.	6+	1–1½	0–6	Clay loam and silty clay loam.	ML, MH, or CL	A–6 or A–7	0–5
			6–18	Clay and channery clay.	CL, CH, or MH	A–6 or A–7	0–15
			18	Limestone bedrock.			
*Philo: Ph, Po For Basher part, see Basher series.	1½–3	5+	0–40	Silt loam and loam	ML	A–4	
Purdy: Pu	0–½	4–6	0–10	Silt loam	ML	A–4 or A–6	
			10–60	Silty clay loam and silty clay.	ML or CL	A–4, A–6, or A–7	
Raritan: RaB	1½–3	5+	0–21	Silt loam	ML or CL	A–4	
			21–43	Silty clay loam	ML or CL	A–4 or A–6	
			43–73	Very gravelly sandy loam.	CM, SC, ML, CL, GM, or GC	A–2, A–4, or A–6	0–15
Rubble land: Ru. Too variable to be estimated. Requires onsite investigation.							
Tyler: Ty	½–1½	5+	0–18	Silt loam and silty clay loam.	ML or CL	A–4 or A–6	
			18–66	Silty clay loam and clay loam.	ML or CL	A–4, A–6, or A–7	
Urban land: Ur. Too variable to be estimated. Requires onsite investigation.							
Vanderlip: VaD, VrF Rock outcrop part of VrF not rated.	6+	3½–20	0–36	Loamy sand	SM	A–2 or A–4	
			36–68	Gravelly loamy sand	SM or GM	A–2 or A–4	
Weikert: WeB, WeC, WeD	6	1–1½	0–12	Shaly silt loam	GM, ML, or SM	A–1, A–2, or A–4	0–10
			12–15	Very shaly silt loam	GM, GW-GM, SM, or SW-SM	A–1 or A–2	0–30
			15	Shale, siltstone and thin bedded sandstone bedrock.			
Wharton: WhB	1½–3	4+	0–10	Silt loam	ML or CL	A–4 or A–6	0–5
			10–48	Silty clay loam and shaly silty clay.	ML, CL, MH, or CH	A–4, A–6, or A–7	0–10
			48–61	Very shaly silt loam	GM or SM	A–1 or A–2	0–30

Presence of stones or organic material in a soil are among factors that are unfavorable.

Drainage of cropland and pasture is affected by such soil properties as permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Sprinkler irrigation of a soil is affected by such features as slope; susceptibility to stream overflow, water erosion or soil blowing; soil texture; content of stones; accumulations of salts and alkali; depth of root zone; rate of water intake at the surface; permeability of soil layers below the surface layer and in fragipans or other layers that restrict movement of water; amount of water held available to plants; and need for drainage, or depth to water table or bedrock.

Terraces and diversions are embankments, or ridges, constructed across the slope to intercept runoff and

significant to engineering—Continued

Percentage passing sieve—				Permeability	Available water capacity	Reaction	Optimum moisture for compaction	Maximum dry density	Shrink-swell potential	Corrosivity to—	
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
				In/hr	*In/hr of soil*	*pH*	*Pct*	*Lbs/ft* [a]			
85–100	80–100	80–100	75–90	0.6–2.0	0.14–0.18	5.6–7.3			Moderate	Moderate	Moderate.
80–100	60–100	55–100	55–95	0.6–2.0	0.12–0.16	5.6–7.3	15–25	95–105	Moderate	High	Moderate.
95–100	70–100	65–90	55–80	0.2–2.0	0.12–0.14	4.5–6.0	12–16	105–115	Low	Low	High.
95–100	90–100	90–100	90–100	0.2–0.6	0.18–0.24	4.5–5.5			Low	High	High.
95–100	90–100	85–100	75–95	0.06–0.2	0.12–0.18	4.5–5.5	14–20	100–115	Moderate	High	High.
100	85–100	80–100	70–95	0.6–2.0	0.16–0.20	4.5–6.0			Low	High	High.
100	75–100	70–100	60–95	0.2–0.6	0.10–0.14	4.5–6.0	15–17	109–114	Low	High	High.
50–95	35–80	30–75	15–70	0.6–6.0	0.06–0.10	4.5–6.0	11–14	118–122	Low	High	High.
95–100	90–100	90–100	85–100	0.6–2.0	0.12–0.18	4.5–5.5			Low	High	High.
95–100	90–100	85–100	75–90	<0.2	0.10–0.14	4.5–5.5	15–20	100–115	Moderate	High	High.
100	70–100	65–95	25–45	0.6–6.0	0.08–0.12	4.5–6.0			Low	Low	High.
65–100	55–100	50–90	20–40	6.0+	0.06–0.10	4.5–6.0	10–15	103–125	Low	Low	High.
30–70	25–65	25–60	20–55	2.0–6.0	0.06–0.12	4.5–5.5			Low	Low	High.
25–60	20–40	10–35	5–25	2.0–6.0	0.02–0.06	4.5–5.5	11–15	115–128	Low	Low	High.
95–100	80–100	75–95	70–95	0.6–2.0	0.14–0.18	4.5–5.5			Low	High	High.
95–100	65–100	60–95	55–95	<0.2	0.10–0.14	4.5–5.5	16–22	100–112	Moderate	High	High.
30–65	25–55	20–40	15–35	<0.2	0.04–0.06	4.5–5.5	14–18	105–118	Low	High	High.

seepage so that it soaks into the soil or flows slowly to a prepared outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Grassed waterways layout and construction are affected by such soil properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and the steepness of slopes. Other factors affecting waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil in road building when temperatures are below freezing.

TABLE 8.—*Soil interpretations*

[An asterisk in the first column indicates that at least one mapping unit is made of two or more kinds of soils. The soils in such for referring to other

Soil series and map symbols	Suitability as source of—			Soil features affecting—		
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds	
					Reservoir area	Embankment
Albrights: AbB, AbC, AcB, AcD.	Fair ---------- Poor on AcB and AcD; coarse fragments.	Unsuitable --	Fair: frost action potential; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; seepage over fragipan; bedrock below a depth of 3½ feet; erodible.	Surface stones on AcB and AcD; pervious layers in substratum in places; seasonal high water table at a depth of ½ to 3 feet.	Fair stability; surface stones on AcB and AcD; medium to low compressibility.
Andover: AnB, AoB --	Poor: coarse fragments; high water table at a depth of 0 to ½ foot.	Unsuitable --	Poor: high water table at a depth of 0 to ½ foot; frost action potential.	High water table at a depth of 0 to ½ foot; seepage; frost heaving potential.	Surface stones on AoB; pervious lenses in substratum in places; high water table at a depth of 0 to ½ foot.	Fair stability; surface stones on AoB; medium to low compressibility.
Atkins: At ----------	Poor: high water table at a depth of 0 to ½ foot.	Unsuitable --	Poor: high water table at a depth of 0 to ½ foot; frost action potential.	High water table at a depth of 0 to ½ foot; hazard of flooding.	Hazard of flooding; pervious layers in substratum; high water table at a depth of 0 to ½ foot.	Medium to low shear strength; stable with selective placement; low to medium compressibility.
Barbour: Ba, Bb -----	Good -------	Poor: too silty.	Fair: frost action potential.	Hazard of flooding.	Hazard of flooding; pervious layer in substratum.	Low to medium compressibility; stable with selective placement; high to medium permeability.
Basher ---------- Mapped only in complex with Philo soils.	Good -------	Unsuitable --	Fair: frost action potential.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Hazard of flooding; pervious layers in substratum.	Medium to low shear strength; stable with selective placement; high to medium susceptibility to piping.
Basher variant: Bc --	Good -------	Unsuitable --	Fair: frost action potential.	Hazard of flooding; seasonal high water table at a depth of 1½ to 3 feet; erodible.	Hazard of flooding; pervious substratum; seasonal high water table at a depth of 1½ to 3 feet.	Medium to low shear strength; fair stability; low to medium compressibility.
Bedington: BeB, BeC, BeD.	Poor: coarse fragments.	Unsuitable --	Fair: frost action potential.	Bedrock below a depth of 3½ feet; erodible.	Bedrock below a depth of 3½ feet; moderate permeability.	Medium shear strength; low to medium compressibility.
*Berks: BkB, BkC, BlD, BmF. For Weikert part of BlD and BmF, see Weikert series.	Poor: coarse fragments.	Poor: too silty.	Good ----------	Bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; moderate to moderately rapid permeability.	Low to medium compressibility; fair stability; bedrock at a depth of 1½ to 3½ feet.

See footnote at end of table.

for selected engineering uses

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions series as indicated]

Soil features affecting—Continued					
Drainage	Sprinkler irrigation	Terraces and diversions	Grassed waterways	Winter grading	Pipeline construction and shallow excavations [1]
Moderately slow permeability; seasonal high water table at a depth of ½ to 3 feet; seepage above fragipan.	Seasonal high water table at a depth of ½ to 3 feet; moderately slow permeability; surface stones on AcB and AcD.	Seepage above fragipan; surface stones on AcB and AcD; moderately slow permeability.	Seepage above fragipan; surface stones on AcB and AcD; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of ½ to 3 feet; high corrosion potential.
Slow permeability; high water table at a depth of 0 to ½ foot.	Slow permeability; high water table at a depth of 0 to ½ foot; surface stones on AoB.	High water table at a depth of 0 to ½ foot; surface stones on AoB; slow permeability.	High water table at a depth of 0 to ½ foot; surface stones on AoB.	High water table at a depth of 0 to ½ foot; forms large frozen clods.	High water table at a depth of 0 to ½ foot; high corrosion potential; surface stones on AoB.
Hazard of flooding; high water table at a depth of 0 to ½ foot; outlets difficult to obtain.	High water table at a depth of 0 to ½ foot; hazard of flooding.	Not needed	High water table at a depth of 0 to ½ foot; hazard of flooding.	High water table at a depth of 0 to ½ foot; forms large frozen clods.	High water table at a depth of 0 to ½ foot; hazard of flooding.
Not needed	Moderate available water capacity; hazard of flooding.	Not needed	Hazard of flooding	None	Hazard of flooding.
Hazard of flooding; seasonal high water table at a depth of 1½ to 3 feet; outlets difficult to obtain.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Not needed	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.
Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding; outlets difficult to obtain.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Not needed	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Hazard of flooding; seasonal high water table at a depth of 1½ to 3 feet.
Not needed	Moderate to high available water capacity; bedrock below a depth of 3½ feet.	Bedrock below a depth of 3½ feet.	Bedrock below a depth of 3½ feet.	None	Bedrock below a depth of 3½ feet; moderate corrosion potential.
Not needed; bedrock at a depth of 1½ to 3½ feet.	Very low to low available water capacity; bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; very low to low available water capacity.	None	Bedrock at a depth of 1½ to 3½ feet.

TABLE 8.—*Soil interpretations for*

Soil series and map symbols	Suitability as source of—			Soil features affecting—		
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds	
					Reservoir area	Embankment
Birdsboro: BnB	Poor: coarse fragments.	Poor	Fair: frost action potential.	None	Pervious substratum.	Medium to low shear strength; low to medium compressibility.
Blairton: BoB, BoC	Poor: coarse fragments.	Unsuitable	Fair: frost action potential; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; bedrock at a depth of 1½ to 3½ feet; frost heaving; erodible.	Bedrock at a depth of 1½ to 3½ feet; seasonal high water table at a depth of ½ to 3 feet.	Fair stability; low to medium compressibility; bedrock at a depth of 1½ to 3½ feet.
Brinkerton: BrA, BrB	Poor: high water table at a depth of 0 to ½ foot.	Unsuitable	Poor: high water table at a depth of 0 to ½ foot; frost action potential.	High water table at a depth of 0 to ½ foot; seepage, frost heaving; unstable.	High water table at a depth of 0 to ½ foot; pervious lenses in substratum in places.	Poor stability; low to medium shear strength; poor to fair compaction.
Buchanan: BuB, BuC, BuD, BxB, BxD.	Poor: coarse fragments.	Unsuitable	Fair: frost action potential; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; seepage above fragipan.	Seasonal high water table at a depth of ½ to 3 feet; surface stones on BxB and BxD; pervious layers in substratum in places.	Fair stability; surface stones on BxB and BxD; medium shear strength; low to medium compressibility.
Calvin: CaB, CaC, CaD.	Poor: coarse fragments.	Poor: too silty.	Good	Bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; moderately rapid permeability.	Medium to high susceptibility to piping; low to medium compressibility.
Clarksburg: CbB	Fair: coarse fragments.	Unsuitable	Poor: low shear strength.	Seasonal high water table at a depth of 1½ to 3½ feet; seepage above fragipan; fair stability; erodible.	Seasonal high water table at a depth of 1½ to 3 feet; slow permeability; pervious substratum.	Fair stability; medium to low shear strength; medium to high susceptibility to piping.
Clymer: ClB, ClC, CvB, CvC.	Poor: coarse fragments.	Unsuitable	Good	Bedrock below a depth of 3½ feet; surface stones on CvB CvC.	Moderate to moderately rapid permeability; bedrock below a depth of 3½ feet.	Medium shear strength; fair stability; low to medium compressibility.
Dekalb Mapped only in complex with Hazleton soils.	Poor: coarse fragments; surface stones.	Poor: too silty.	Good	Bedrock at a depth of 1½ to 3½ feet; surface stones.	Bedrock at a depth of 1½ to 3½ feet; rapid permeability.	Low to medium compressibility; surface stones; bedrock at a depth of 1½ to 3½ feet.

See footnote at end of table.

selected engineering uses—Continued

Soil features affecting—Continued					
Drainage	Sprinkler irrigation	Terraces and diversions	Grassed waterways	Winter grading	Pipeline construction and shallow excavations [1]
Not needed	None	Not needed	None	None	Moderate corrosion potential.
Bedrock at a depth of 1½ to 3½ feet; moderately slow permeability; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; bedrock at a depth of 1½ to 3½ feet; low to moderate available water capacity.	Seasonal high water table at a depth of ½ to 3 feet; bedrock at a depth of 1½ to 3½ feet; moderately slow permeability.	Seasonal high water table at a depth of ½ to 3 feet; bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table at a depth of ½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of ½ to 3 feet; bedrock at a depth of 1½ to 3½ feet.
Slow permeability; high water table at a depth of 0 to ½ foot.	Slow permeability; high water table at a depth of 0 to ½ foot.	High water table at a depth of 0 to ½ foot; slow permeability; outlets difficult to obtain.	High water table at a depth of 0 to ½ foot; slow permeability.	High water table at a depth of 0 to ½ foot; forms large frozen clods.	High water table at a depth of 0 to ½ foot; moderate to high corrosion potential.
Slow permeability; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; slow permeability; surface stones on BxB and BxD.	Slow permeability; seepage above fragipan; surface stones on BxB and BxD; seasonal high water table at a depth of ½ to 3 feet.	Seepage above fragipan; surface stones on BxB and BxD; seasonal high water table at a depth of ½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of ½ to 3 feet; high corrosion potential.
Not needed; bedrock at a depth of 1½ to 3½ feet.	Very low to low available water capacity; bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3½ feet; moderately rapid permeability.	None	Bedrock at a depth of 1½ to 3½ feet.
Low permeability; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of ½ to 3 feet; slow permeability.	Seepage above fragipan; slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Seepage above fragipan; seasonal high water table at a depth of 1½ to 3 feet; slow permeability.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; moderate corrosion potential.
Not needed	Moderate to moderately rapid permeability; bedrock below a depth of 3½ feet.	Bedrock below a depth of 3½ feet; moderate to moderately rapid permeability.	Bedrock below a depth of 3½ feet; stones on CvB and CvC.	None	Bedrock below a depth of 3½ feet; low to moderate corrosion potential.
Not needed; bedrock at a depth of 1½ to 3½ feet.	Very low to low available water capacity; bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 1½ to 3 feet; surface stones; rapid permeability.	Bedrock at a depth of 1½ to 3½ feet; rapid permeability; surface stones.	Surface stones	Bedrock at a depth of 1½ to 3½ feet; surface stones.

TABLE 8.—*Soil interpretations for*

Soil series and map symbols	Suitability as source of—			Soil features affecting—		
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds	
					Reservoir area	Embankment
*Edom: EeB, EeC, EeD, EgB, EgC, EgD, EgF. For Opequon part of EeB, EeC, and EeD, see Opequon series. For Weikert part of EgB, EgC, EgD, and EgF, see Weikert series.	Fair: coarse fragments.	Unsuitable	Poor: low strength.	Erodible; bedrock below depth of 3½ feet.	Moderate permeability; bedrock below a depth of 3½ feet.	Fair stability; low to medium shear strength; poor to fair compaction.
Elliber: ElC, ElD	Poor: coarse fragments.	Unsuitable for sand; fair for chert or angular gravel.	Good	Bedrock below a depth of 4 feet.	Moderately rapid permeability; bedrock below a depth of 4 feet.	High to medium permeability; low to medium compressibility.
Ernest: ErB, ErC	Fair: coarse fragments.	Unsuitable	Fair: frost action potential.	Seasonal high water table at a depth of 1½ to 3 feet; seepage above fragipan; poor stability; erodible.	Seasonal high water table at a depth of 1½ to 3 feet; pervious layers in substratum in places.	Poor stability; medium to low shear strength; medium to high susceptibility to piping.
Hagerstown: HaB, HcC3, HcD3, HeD. Rock outcrop part of HeD not rated.	Fair Poor on rocky phases; coarse fragments.	Unsuitable	Poor: low shear strength.	Rock outcrops on HeD; plastic subsoil; erodible; bedrock at a depth of 4 to 7 feet.	Moderate permeability; possible sinks and solution channels in limestone bedrock.	Fair stability; medium to low shear strength; poor to good compaction.
*Hazleton: HhB, HhC, HhD, HsB, HTD, HTF. For Dekalb part of HsB, HTD, and HTF, see Dekalb series.	Poor: coarse fragments.	Poor: too silty.	Good	Bedrock below a depth of 3½ feet.	Bedrock below a depth of 3½ feet; moderately rapid permeability; stones on HsB.	Low to medium compressibility; fair stability; medium to high susceptibility to piping.
Hublersburg: HuB, HuC, HuD, HxB, HxC, HxD.	Good Poor on cherty phases.	Unsuitable	Poor: low shear strength.	Bedrock below a depth of 5 feet; erodible; plastic subsoil.	Moderate permeability; bedrock below a depth of 5 feet; possible solution channels in underlying rock.	Medium to low shear strength; medium to high susceptibility to piping.
Klinesville: KlC, KlD	Poor: coarse fragments.	Poor: too silty.	Poor: thin layer.	Bedrock at a depth of 1 to 1½ feet.	Moderately rapid permeability; bedrock at a depth of 1 to 1½ feet.	Low to medium compressibility; fair stability; bedrock at a depth of 1 to 1½ feet.
Laidig: LaB, LaC, LaD, LcD, LDF.	Poor: coarse fragments.	Poor: too silty.	Good: fair on LcD and LDF.	Seepage above fragipan; surface stones on LcD and LDF.	Permeable lenses in substratum in places; surface stones on LcD and LDF.	Medium shear strength; fair stability; surface stones on LcD and LDF.

See footnote at end of table.

selected engineering uses—Continued

Soil features affecting—Continued					
Drainage	Sprinkler irrigation	Terraces and diversions	Grassed waterways	Winter grading	Pipeline construction and shallow excavations [1]
Not needed	Low intake rate; moderate available water capacity.	Erodible; bedrock below a depth of 3½ feet.	Erodible	Clayey textures in subsoils.	Bedrock below a depth of 3½ feet; high corrosion potential.
Not needed	Moderately rapid permeability; very low to low available water capacity.	Bedrock below a depth of 4 feet; moderately rapid permeability.	Moderately rapid permeability; very low to low available water capacity.	None	Bedrock below a depth of 4 feet.
Slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Erodible; seepage above fragipan; slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Erodible; surface seepage above fragipan; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet; high corrosion potential.
Not needed	Moderate to high available water capacity.	Erodible rock outcrops on HeD.	Erodible rock outcrops on HeD.	Clayey textures in subsoil.	Rock outcrops on HeD; moderate corrosion potential; bedrock at a depth of 4 to 7 feet.
Not needed	Low to moderate available water capacity; moderately rapid permeability; surface stones on HsB.	Moderately rapid permeability; surface stones on HsB.	Low to moderate available water capacity; surface stones on HsB.	None	Bedrock below a depth of 3½ feet.
Not needed	Moderate to high available water capacity.	Erodible	Erodible	Clayey textures in subsoil.	Moderate corrosion potential.
Not needed; bedrock at a depth of 1 to 1½ feet.	Very low to low available water capacity; bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet.
Moderately slow permeability; seepage above fragipan.	Moderately slow permeability; low to moderate available water capacity.	Moderately slow permeability; surface stones on stony phases.	Moderately slow permeability; surface stones on LcD and LDF; low to moderate available water capacity.	None	Surface stones on LcD and LDF.

TABLE 8.—*Soil interpretations for*

Soil series and map symbols	Suitability as source of—			Soil features affecting—		
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds	
					Reservoir area	Embankment
Leetonia: LeB	Poor: coarse fragments.	Poor: too silty.	Good	Bedrock at a depth of 3½ to 4 feet; surface stones.	Bedrock at a depth of 3½ to 4 feet; moderately rapid permeability; surface stones.	Low to medium compressibility; medium to high susceptibility to piping.
Meckesville: MeC, MkB, MkD	Poor: coarse fragments.	Unsuitable	Fair: frost action potential.	Seepage above fragipan; surface stones on MkB and MkD.	Permeable lenses in substratum in places; surface stones on MkB and MkD.	Medium to low shear strength, fair stability; surface stones on MkB and MkD; medium to high susceptibility to piping.
Monongahela: MoB	Fair: coarse fragments.	Unsuitable	Fair: frost action potential.	Seasonal high water table at a depth of 1½ to 3 feet; seepage above fragipan; frost heaving; erodible.	Permeable lenses in substratum in places; seasonal high water table at a depth of 1½ to 3 feet.	Fair stability; medium to low compressibility.
Morrison: MrB, MrC, MrD, MsB, MsD.	Fair Poor on MsB and MsD; coarse fragments.	Unsuitable	Good	Surface stones on MsB and MsD.	Moderately rapid permeability.	Good stability; medium to low compressibility.
Murrill: MuB, MuC, MuD.	Poor: coarse fragments.	Unsuitable	Poor: low shear strength.	Possible sinkholes.	Moderate permeability; pervious substratum; possible sinks and solution channels in limestone bedrock.	Fair stability; medium to low shear strength; medium to high susceptibility to piping.
Newark: Ne	Good	Unsuitable	Fair: seasonal high water table at a depth of ½ to 1½ feet; frost action potential.	Hazard of flooding; seasonal high water table at a depth of ½ to 1½ feet; frost heaving.	Hazard of flooding; pervious substratum; seasonal high water table at a depth of ½ to 1½ feet.	Poor stability; low to medium compressibility; medium to low shear strength.
Opequon: OpB3, OpC3, OpD3, ORF.	Poor: thin layer.	Unsuitable	Poor: low shear strength; thin layer.	Bedrock at a depth of 1 to 1½ feet; possible sinkholes.	Bedrock at a depth of 1 to 1½ feet; sinks and solution channels in limestone bedrock.	Low to medium shear strength; poor to fair compaction; bedrock at a depth of 1 to 1½ feet.
*Philo: Ph, Po For Basher part, see Basher series.	Good	Unsuitable	Fair: frost action potential; low shear strength.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding; frost heaving.	Hazard of flooding; pervious layers in substratum; seasonal high water table at a depth of 1½ to 3 feet.	Medium to low shear strength; stable with selective placement; high to medium susceptibility to piping.

See footnote at end of table.

selected engineering uses—Continued

Soil features affecting—Continued					
Drainage	Sprinkler irrigation	Terraces and diversions	Grassed waterways	Winter grading	Pipeline construction and shallow excavations [1]
Not needed	Very low to low available water capacity; bedrock at a depth of 3½ to 4 feet.	Surface stones; moderately rapid permeability.	Very low to low available water capacity; surface stones.	Surface stones	Bedrock at a depth of 3½ to 4 feet; surface stones.
Moderately slow permeability; seepage above fragipan.	Surface stones on MkB and MkD.	Moderately slow permeability; surface stones on MkB and MkD.	Moderately slow permeability; surface stones on MkB and MkD.	None	Moderate corrosion potential.
Slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet; slow permeability.	Seepage above fragipan; seasonal high water table at a depth of 1½ to 3 feet; slow permeability.	Seepage above fragipan; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; high corrosion potential.
Not needed	Low available water capacity.	Surface stones on MsB and MsD; moderately rapid permeability.	Surface stones on MsB and MsD; moderately rapid permeability.	None	Surface stones on MsB and MsD.
Not needed	None	None	None	None	Moderate corrosion potential.
Hazard of flooding; seasonal high water table at a depth of ½ to 1½ feet; outlets difficult to obtain.	Seasonal high water table at a depth of ½ to 1½ feet; moderate permeability; hazard of flooding.	Not needed	Seasonal high water table at a depth of ½ to 1½ feet; hazard of flooding.	Seasonal high water table at a depth of ½ to 1½ feet; forms large frozen clods.	Seasonal high water table at a depth of ½ to 1½ feet; hazard of flooding; high corrosion potential.
Not needed; bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet; low available water capacity.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet; clayey textures.	Bedrock at a depth of 1 to 1½ feet; high corrosion potential.
Hazard of flooding; seasonal high water table at a depth of 1½ to 3 feet; outlets difficult to obtain.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Not needed	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; hazard of flooding.

TABLE 8.—*Soil interpretations for*

Soil series and map symbols	Suitability as source of—			Soil features affecting—		
	Topsoil	Sand and gravel	Road fill	Highway and road location	Ponds	
					Reservoir area	Embankment
Purdy: Pu	Poor: high water table at a depth of 0 to ½ foot.	Unsuitable	Poor: high water table at a depth of 0 to ½ foot; low shear strength.	High water table at a depth of 0 to ½ foot; bedrock below a depth of 4 feet; frost heaving.	High water table at a depth of ½ to 1 foot; bedrock below a depth of 4 feet.	Poor stability; medium to low shear strength; medium to high susceptibility to piping.
Raritan: RaB	Fair: coarse fragments.	Unsuitable	Fair: frost action potential.	Seasonal high water table at a depth of 1½ to 3 feet; seepage above fragipan; erodible.	Seasonal high water table at a depth of 1½ to 3 feet; pervious layers in substratum in places.	Medium to low shear strength; fairly stable; medium to high susceptibility to piping.
Rubble land: Ru	Unsuitable	Unsuitable	Unsuitable	Stones	Stones	Stones
Tyler: Ty	Fair: thin layer; texture.	Unsuitable	Fair: frost action; seasonal high water table at ½ to 1½ feet.	Seasonal high water table at ½ to 1½ feet; poor stability; frost heaving.	Seasonal high water table at ½ to 1½ feet.	Poor stability; low to medium shear strength; medium to high susceptibility to piping.
Urban land: Ur. Too variable to estimate. Requires on-site investigation.						
Vanderlip: VaD, VrF — Rock outcrop part of VrF not rated.	Poor: texture.	Fair for sand; unsuitable for gravel: too silty.	Fair: slopes	Bedrock below a depth of 3½ feet.	Rapid permeability; pervious substratum; bedrock below a depth of 3½ feet.	Low to medium compressibility; good stability; medium to high susceptibility to piping.
Weikert: WeB, WeC, WeD.	Poor: coarse fragments.	Poor: too silty.	Poor: thin layer.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Low to medium compressibility; fair stability; bedrock at a depth of 1 to 1½ feet.
Wharton: WhB	Fair: coarse fragments.	Unsuitable	Poor: low shear strength.	Seasonal high water table at a depth of 1½ to 3 feet; poor stability; frost heaving.	Seasonal high water table at a depth of 1½ to 3 feet; bedrock below 4 feet.	Poor stability; erodible; low to medium shear strength; poor to fair compaction.

[1] Corrosion potential is rated for uncoated steel pipe.

Pipeline construction and other shallow excavations for sewerlines, phone and power transmission lines, basements, open ditches, and cemeteries are those that generally require digging or trenching to a depth of less than 6 feet. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding or a high water table.

Engineering test data

Table 9 contains engineering test data for some of the major soil series in Huntingdon County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The

selected engineering uses—Continued

Soil features affecting—Continued					
Drainage	Sprinkler irrigation	Terraces and diversions	Grassed waterways	Winter grading	Pipeline construction and shallow excavations [1]
Slow permeability; high water table at a depth of 0 to ½ foot; outlets difficult to obtain.	Slow permeability; high water table at a depth of 0 to ½ foot.	Not needed	High water table at a depth of 0 to ½ foot; slow permeability; outlets difficult to obtain.	High water table at a depth of 0 to ½ foot; forms large frozen clods; clayey textures in subsoil.	High water table at a depth of 0 to ½ foot; high corrosion potential.
Moderately slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet; moderately slow permeability.	Seepage above fragipan; seasonal high water table at a depth of 1½ to 3 feet.	Seasonal high water table at a depth of 1½ to 3 feet; seepage above fragipan; moderately slow permeability.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; high corrosion potential.
Stones	Stones	Stones	Stones	Stones	Stones.
Outlet problems; slow permeability; seasonal high water table at ½ to 1½ feet.	Slow permeability; seasonal high water table at ½ to 1½ feet.	Not needed	Slow permeability; seasonal high water table at ½ to 1½ feet; outlet problems.	Seasonal high water table at 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at ½ to 1½ feet; poor stability; high corrosion potential.
Not needed	Moderate available water capacity; rapid permeability.	Rapid permeability; sandy textures.	Rapid permeability; sandy textures.	None	Bedrock below a depth of 3½ feet.
Not needed	Bedrock at a depth of 1 to 1½ feet; very low available water capacity.	Bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Bedrock at a depth of 1 to 1½ feet; moderately rapid permeability.	Bedrock at a depth of 1 to 1½ feet.	Bedrock at a depth of 1 to 1½ feet.
Slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Erodible; slow permeability; seasonal high water table at a depth of 1½ to 3 feet.	Erodible; seasonal high water table at a depth of 1½ to 3 feet; slow permeability.	Seasonal high water table at a depth of 1½ to 3 feet; forms large frozen clods.	Seasonal high water table at a depth of 1½ to 3 feet; high corrosion potential.

mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density*. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is in-

TABLE 9.—*Engineering*

[Tests performed by Pennsylvania Department of Transportation,

Soil name and location	Parent material	Report No.	Depth	Moisture density [1]		Mechanical analysis [2]				
						Percentage passing sieve—				
				Maximum dry density	Optimum moisture	3 inches	2 inches	1½ inches	1 inch	¾ inch
			In	*Lbs/ft³*	*Pct*					
Basher silt loam:										
8.5 miles southeast on PA–994 along Roystown River, east side of Entriken Bridge.	Alluvium from acid red shale and sandstone.	10429	20–32	100.6	17.8	-------	-------	-------	-------	-------
		10430	32–44	110.8	13.3	-------	-------	-------	-------	-------
Edom silty clay loam:										
2.1 miles northeast of Mooresville on Route 31040, 165 feet southeast on private road, northeast side of road.	Residuum from calcareous shale bedrock.	19611	7–12	102.5	20.7	-------	-------	-------	-------	100
Hublersburg cherty silt loam:										
7.5 miles northeast of junction of PA–641 and PA–35 near Shade Gap on PA–35, west side of road.	Residuum from siliceous limestone bedrock.	37488	35–46	102.0	20.2	-------	-------	-------	100	98
		37489	95–101	104.8	18.7	-------	-------	100	97	93
Laidig extremely stony loam:										
On PA–26, 7 miles northwest of intersection with T–350 at McAlevey's Fort, about 400 feet northeast of PA–26 on Wipple Dam Park Road, southeast side of road.	Colluvium from sandstone and shale over shale bedrock.	21324	20–30	121.9	10.9	100	80	80	76	74
		21325	55–69	125.2	11.5	100	76	64	59	56
Morrison sandy loam:										
1.1 miles west of Huntingdon on Route 31069, south on farm road about 470 feet, east side of farm road.	Residuum from sandstone and dolomite bedrock.	16551	10–20	124.4	11.2	-------	100	95	92	92
		16552	48–63	120.9	13.2	-------	-------	-------	-------	100
Murrill gravelly loam:										
On PA–655, 5 miles northeast of U.S. Route 22 at Mill Creek, in field on west side of road.	Colluvium from sandstone and shale, generally over limestone bedrock.	21326	16–28	117.0	15.1	-------	-------	100	94	94
		21327	52–67	116.8	13.6	-------	-------	100	95	94
Opequon clay loam:										
2 miles northwest of Petersburg on T–506, 0.6 mile west of Rt. 31087	Residuum from thin bedded relatively pure limestone bedrock.	16549	0–3	95.3	21.5	-------	-------	-------	-------	-------
		16550	6–13	99.4	22.9	-------	100	90	86	86
Philo silt loam:										
Brady Township, 8 miles north of Fousetown on Rt. 31040, along Mill Creek.	Alluvium from brown shale and sandstone.	10435	9–26	115.0	12.7	-------	-------	-------	-------	-------

See footnotes at end of table.

test data

Materials Testing and Research, Harrisburg, Pennsylvania]

Mechanical analysis—Continued									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued					Percentage smaller than—							
⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [3]	Unified [4]
									Pct			
---	---	100	96	58	52	35	21	11	33	6	A–4(5)	ML.
---	---	100	99	18	12	7	5	2	[5] NP	NP	A–2–4(0)	SM.
98	93	86	80	74	70	59	48	42	44	17	A–7–6(11)	CL-ML.
95	93	91	89	86	80	64	49	43	44	15	A–7–6(11)	ML.
90	86	81	79	73	59	36	24	18	36	5	A–4(8)	ML.
70	65	59	53	39	35	19	12	8	21	2	A–4(1)	GM.
52	48	44	39	23	19	11	8	6	19	NP	A–1–b(0)	GM.
84	80	76	64	34	30	27	18	14	24	8	A–2–4(0)	SM.
97	93	89	69	53	47	41	32	26	24	6	A–4(4)	CL-ML.
91	89	86	78	55	52	44	33	27	33	14	A–6(6)	CL.
92	91	88	82	55	52	44	33	27	31	12	A–6(5)	CL.
100	99	98	88	81	76	61	34	22	50	13	A–7–5(11)	MH-ML.
85	85	85	84	83	79	73	61	53	54	23	A–7–5(16)	MH.
---	---	100	90	62	55	32	19	13	22	2	A–4(5)	ML.

TABLE 9.—*Engineering*

Soil name and location	Parent material	Report No.	Depth	Moisture density [1]		Mechanical analysis [2]				
				Maximum dry density	Optimum moisture	Percentage passing sieve—				
						3 inches	2 inches	1½ inches	1 inch	¾ inch
			In	*Lbs/ft³*	*Pct*					
Vanderlip loamy sand:										
Porter Township, on T-472, 0.3 mile northwest of Rt. 22, west side of road.	Residuum from calcareous sandstone bedrock.	19609	21–28	106.1	87.0	--------	--------	--------	--------	--------
		19610	58–68	103.8	12.9	--------	--------	--------	--------	--------

[1] Based on AASHTO Designation T 99, Method B(*1*).

[2] Mechanical analysis according to the AASHTO Designation T 88. Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHTO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is

creased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic. Liquid limit and plasticity index in table 9 are based on tests of soil samples.

Laboratory Data [5]

Laboratory soil characterization identifies properties useful in studying soil-forming processes, in interpreting land use limitations, in classifying pedons and soil series, and in understanding genetic concepts of soils. The factors influencing soil formation may vary independently; consequently, soils may vary, even within seemingly uniform environments. Detailed studies are helping in understanding these relationships, although there continue to be practical limitations in sampling activity. The soil characterization studies in Huntingdon County add to the information previously collected and are particularly applicable to the Ridge and Valley physiographic province of south-central Pennsylvania, about which continued characterization studies are in progress.

Twelve sites were sampled. They represent five soil series important in Huntingdon County and typical of Quartzipsamments, Hapludalfs, and Hapludults. Vanderlip pedons 31–1 and 31–2 are Quartzipsamments; Edom pedons 31–3, 31–4, 31–5, and 31–8 are Hapludalfs; and Morrison pedons 31–10 and 31–11 and Hublersburg pedons 31–12 and 31–13 are Hapludults. The detailed laboratory data and methodology are pub-

[5] Laboratory analyses and interpretations made at the Soil Characterization Laboratory at the Pennsylvania State University by R. L. CUNNINGHAM, R. P. MATELSKI, E. J. CIOLSZ, G. W. PETERSEN, and R. PENNOCK JR.

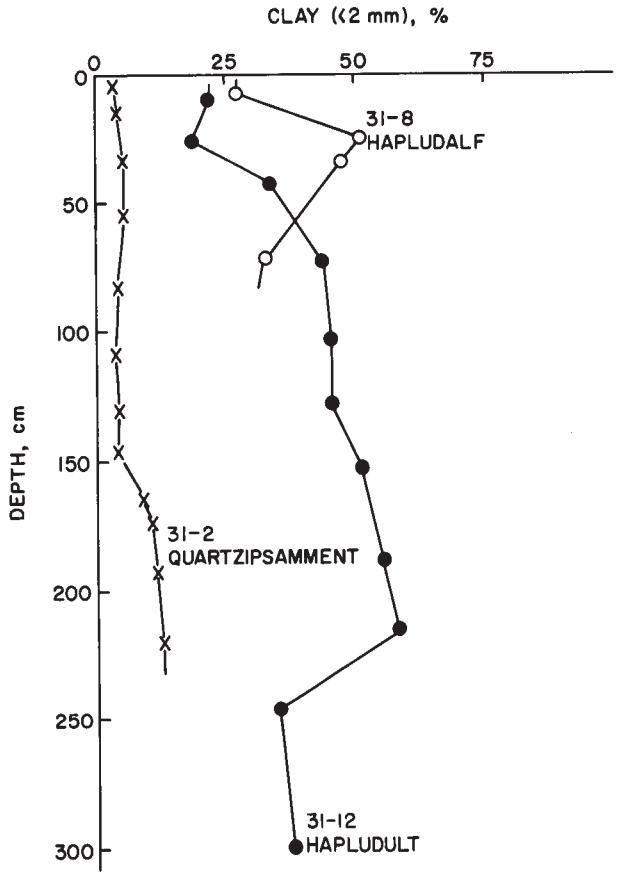

***Figure 11.*—Clay distribution in pedons of a Hapludalf, a Hapludult, and a Quartzipsamment.**

test data—Continued

Mechanical analysis—Continued									Liquid limit	Plasticity index	Classification	
Percentage passing sieve—Continued					Percentage smaller than—							
⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHTO [3]	Unified [4]
									Pct			
---	---	100	91	36	23	12	8	6	NP	NP	A-4(0)	SM.
---	---	100	87	20	12	6	5	4	NP	NP	A-2-4(0)	SM.

analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

[3] Based on AASHTO Designation M 145–49.

[4] Based on the Unified soil classification system (*3*).

[5] NP = Nonplastic.

lished as a part of the cumulative soil characterization studies of the Agronomy Department, the Pennsylvania State University (*9*). The following interpretive discussion pertains to those data and is generalized.

Clay content.—The amount of clay is an indicator of physical and chemical reactive properties of the soil. Clay contributes to soil plasticity, shrink-swell potential, and cation exchange capacity. Total water held in the soil increases with increasing clay content; however, water available to plants does not necessarily increase. Clay is a mobile component in soils and moves slowly downward with percolating water. The extent of this translocation often reveals the state or degree of soil development. Many soils have relatively low content of clay in the surface layer, highest content of clay between depths of 25 and 75 centimeters, and a lower content below a depth of 100 centimeters. The clay-enriched zone is designated as an argillic horizon, a key feature in studies of soil formation. For further information, refer to the section "Formation and Classification of the Soils."

Figure 11 shows the clay distribution in pedons representative of the three classification groups. Clay content doubles from the A horizon to the B horizon in the Hapludalf pedon. This distinct argillic horizon is in all the pedons sampled for this group. The Hapludult pedon has nearly the same content of clay (25 percent) in the surface layer as the Hapludalf, but the increase to 60 percent is more gradual and is at about 10 times the depth. These relationships are typical of the two groups in Huntingdon County. In general, sand increases and silt decreases with increasing depth in both pedons. The depth differences shown in figure 11 are also typical of a difference between the two groups. The Quartzipsamment pedon is low in content of clay throughout, but it has a slight increase in clay content below a depth of 160 centimeters. Subsamples analyzed from this pedon indicated that noticeable differences in color in the B horizon were associated with differences in clay content. Dark yellowish brown bands contained about 10 percent clay, whereas light yellowish brown bands contained about 2 percent clay.

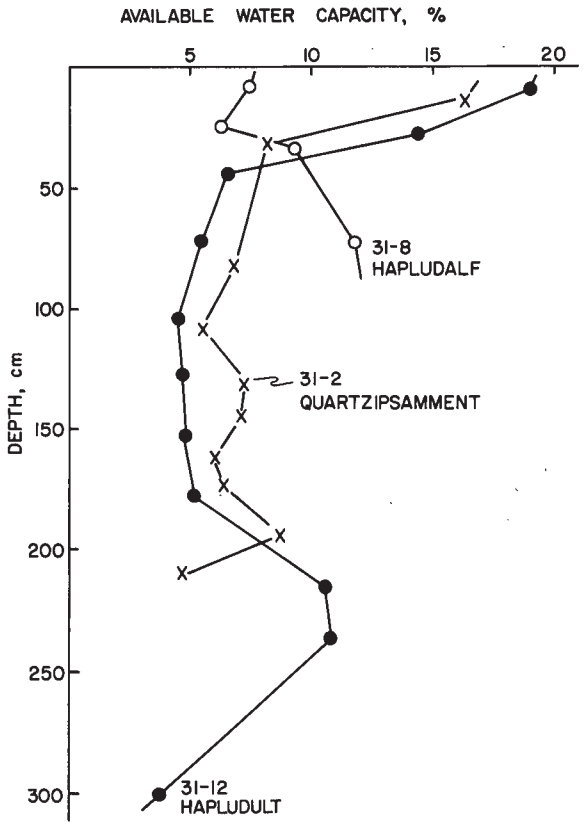

***Figure 12.*—Available water capacity in pedons of a Hapludalf, a Hapludult, and a Quartzipsamment.**

Available water capacity.—Available water capacity in soils refers to the storage of water that plants can

use between additions of precipitation. Total amounts held for roots are partly dependent upon soil depth. Figure 12 shows the available water capacity for three profiles in the survey area. The deep Hapludult pedon has the capability to store more water than the Hapludalf profile, and this is advantageous to deep rooting plants. The Hapludalf profile has lower water holding capacity in the surface layer than either the Hapludult or Quartzipsamment pedon, probably because of lower content, and a different kind, of organic matter.

The minimum available water in the Hapludalf profile corresponds to a clay maximum. Pedon 31–2, Quartzipsamment, is as much as 90 percent sand; however, to a depth of 200 centimeters it is capable of holding more water than pedon 31–12, Hapludult, that is less than 10 percent sand. This illustrates that available water capacity cannot always be inferred from clay or sand analyses. Coarse silt and fine sand tend to hold more available water than other particle sizes, and a high content of these particle-size groups generally indicates high available water storage potential.

Nutrients.—An indication of the nutrient-holding capacity is the laboratory-measured cation exchange capacity of the fine-earth material. The active mineral soil material is less than 0.002 millimeter in diameter, and trends in exchange capacity are shown by the trends in clay percentages. Organic matter also contributes to cation holding capacity, and the highest capacity is in the horizons that contain the most organic matter. Measured in milliequivalents per 100 grams of soil, the surface layer of the soils characterized has a capacity of about 15. Subsoil horizons of Hapludalfs and Hapludults show decreasing capacities that range from 10 to 15 milliequivalents per 100 grams. The Quartzipsamment pedon has a capacity of less than 3.5 milliequivalents per 100 grams for all parts of the B horizon.

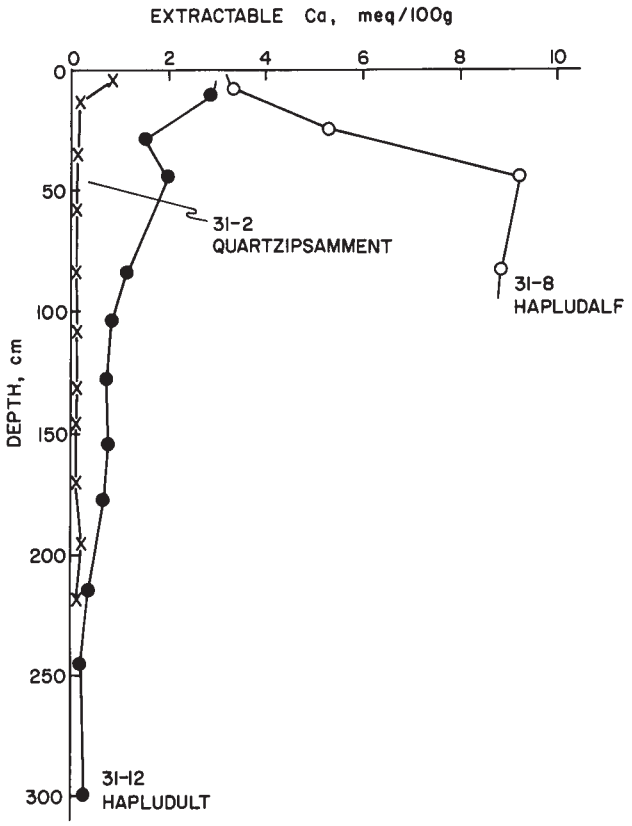

***Figure 13.*—Extractable calcium in pedons of a Hapludalf, a Hapludult, and a Quartzipsamment.**

Soils are acid or basic, depending upon the basic cation content of the exchange complex. When the cation exchange capacity of the clay and organic matter in a soil is dominated by hydrogen and aluminum ions, the soil is acid and the pH is low. Conversely, the pH is high and the soil is neutral to basic when the complex is dominated by basic ions, mainly calcium. The humid climate in Huntingdon County promotes precipitation and growth of vegetation that depletes the soil of soluble calcium ions. Figure 13 shows the changes in exchangeable calcium with depth for three groups. The amount of exchangeable calcium gives an indication of the chemistry of these soils. In comparing the subsoils, pedon 31–8 is higher in calcium than the other two. Even though all three pedons developed from material that as a rock contained considerable limestone, only pedon 31–8 now has much of that calcium left. Pedons 31–2 and 31–12 are strongly leached over a long time, and the soluble calcium ion has been lost from the soil. The Hapludalf pedon is underlain by limestone at a depth of about 100 centimeters and shows the influence of a fresh source of calcium ions although the surface is somewhat similar to that of the Hapludult pedon. To the depth analyzed, the Quartzipsamment pedon is depleted of the calcium that once cemented the sand grains into rock.

The reaction of pedons 31–2 and 31–12 is similar (pH 5); however, pedon 31–2 is low in extractable aluminum, which contributes to acidity, whereas the subsoil horizon of pedon 31–12 contains more than 6 milliequivalents of extractable aluminum per 100 grams of soil, and this far exceeds the amount of basic cations. The proportion of aluminum with respect to bases is important in addition to the total amounts, as the toxicity level for many plants is approached.

A low content of extractable magnesium indicates that these soils have not developed in material weathered from dolomitic limestone, nor have they received much magnesium fertilizer application. For the balanced nutrition of plants, additional magnesium is needed, even in the Hapludalfs.

The extractable sodium cation is very mobile, and because of the humid climate in Huntingdon County and the resulting leaching, there is less than 0.1 milliequivalent of sodium per 100 grams in all horizons analyzed. Potassium extracted is generally less than 0.2 milliequivalents per 100 grams, but as much as 0.5 milliequivalents per 100 grams in the surface layer. The sodium level is not detrimental to soil or plant growth, and potassium content is low for most plant growth.

Clay minerals.—Illite is the dominant clay in pedon 31–8 and in pedon 31–12 but there is an apparent weathering near the surface that produces vermiculite. Montmorillonite was identified in pedon 31–8 as making up as much as 30 percent of the clay; however, this is unusual for this group of soils in Huntingdon

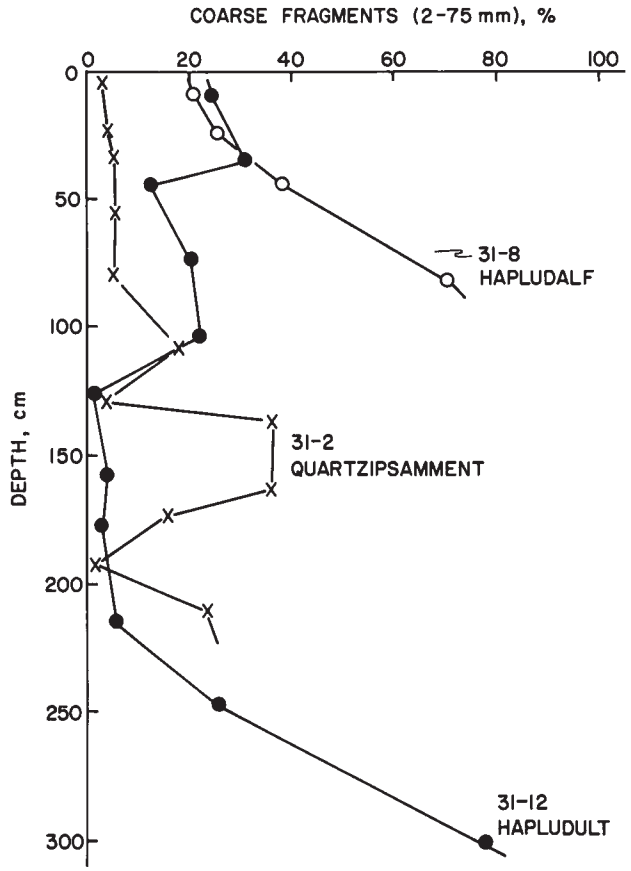

Figure 14.—**Coarse fragments by weight in pedons of a Hapludalf, a Hapludult, and a Quartzipsamment.**

County, as none of the other pedons analyzed contained more than 5 percent montmorillonite clay.

Kaolinite was not identified in the Hapludalf pedon; 10 to 25 percent of the clay in the Hapludult pedon is kaolinite, whereas 40 to 75 percent of the Quartzipsamment clay is kaolinite. In the Hapludult pedon the maximum is near the surface, and in the Quartzipsamment pedon the maximum is below a depth of 11 centimeters.

The maximum coefficient of linear extensibility, 0.05 in the B horizon of pedon 31–8, coincided with high clay content and the montmorillonite clay occurrence. Values must reach 0.06 before shrink-swell behavior is a concern for construction.

Coarse fragments.—Particles that have a diameter of more than 2 millimeters are not included in chemical, mineralogical, and some physical analyses and are called coarse fragments. Figure 14 shows the weight percentages of fragments in the total soil material at different depths.

The depth of soil and amounts of coarse fragments are closely related. The shallower the pedon, the more coarse fragments in the pedon. The surface layer of the Hapludalf and Hapludult profiles contain about 20 percent coarse fragments. Profile 31–2 contains small amounts of coarse fragments in the upper 80 centimeters. Soils that have large amounts of fragments are less desirable for most uses. Large amounts of fragments, such as the 65 percent occurring below a depth of 50 centimeters in the three profiles, dilute the effectiveness of the fine-earth fraction of the soil. For example, if a horizon is 50 percent fragments and the material less than 2 millimeters is 20 percent clay, then the clay content of the entire horizon is 10 percent. Similar calculations can be made for other physical and all chemical properties determined for the fine-earth material (particles less than 2 millimeters in diameter).

Surface fragments dissipate some of the energy of raindrops. Therefore soils that have moderate amounts of coarse fragments on the surface tend to resist erosion. Within the soil, percolation of water through soils is often greatest where there is the greatest amount of coarse fragments and other properties are similar.

Percolation rates.—Percolation testing of the Quartzipsamment pedon reflected the sandy and porous nature of this soil, as rates exceeding 11 centimeters (4 inches) per hour and a maximum of 61 centimeters (24 inches) per hour were recorded. Rates greater than 25 centimeters (10 inches) per hour indicate possible ground water contamination from septic tank effluent. Median rates for 31–8 and 31–12 pedons were less than 2.5 centimeters (1 inch) per hour. Of the remaining nine sites tested, three had median rates of less than 2.5 centimeters (1 inch) per hour, five had median rates between 2.5 and 75 centimeters (1 inch and 30 inches) per hour, and the other Quartzipsamment had rates exceeding 100 centimeters (40 inches) per hour.

Formation and Classification of the Soils

This section describes the factors and processes of soil formation, the processes of horizon differentiation, and the major soil horizons. It also explains the current system of soil classification.

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 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 genetically related 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 Huntingdon County formed in material derived from highly folded sedimentary rocks of sandstone, shale, and limestone.

Some soils formed in place in residuum directly over the original bedrock. Hagerstown, Hublersburg, and Opequon soils formed in material weathered from limestone. Soils such as the Hazleton, Dekalb, and Clymer soils formed in material derived from sandstone, and Berks, Bedington, and Calvin soils formed in material derived from shale. Calvin soils have red colors inherited from red shale.

Some soils formed in material that slipped or otherwise moved downhill to lower positions on the landscape. Clarksburg soils formed in material influenced by limestone; Laidig, Murrill, and Andover soils formed in material derived from sandstone and shale; and Albrights, Ernest, and Brinkerton soils formed in material derived from shale and siltstone. Albrights soils have reddish colors inherited from red shale.

Some soils formed in stream deposited material. These deposits may be either very old or of recent origin. The Monongahela, Tyler, and Birdsboro soils on terraces formed in old stream deposits. Soils on flood plains, such as Melvin, Atkins, and Basher soils formed in deposits of recent origin.

Plant and animal life

All living organisms affect soil formation. These include vegetation, animals, bacteria, fungi, and other micro-organisms. The vegetation strongly affects the organic-matter content, the soil color, and the amount of plant nutrients in the soil. Animals such as 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.

In Huntingdon County, most of the soils developed under forest stands mainly of oak, chestnut, maple, and hickory. 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. This color pattern is similar to that in profiles of the Hazleton and Laidig series. 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 plow depth.

Climate

The climate of Huntingdon 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. Many of the soils are acid and strongly leached.

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 relief of the county is dominated by steep slopes and narrow to moderately wide valley floors. The relief is influenced by underlying sloping bedrock and by erosion and other water-influenced geologic processes. The highest ridges in the county, such as in areas of the Hazleton and Leetonia soils, are over sandstone bedrock, which is highly resistant to weathering. Soils such as Hublersburg and Hagerstown soils, however, are in the moderately wide valleys that have undulating slopes over limestone bedrock, which is readily weathered. Moderately resistant bedrock and concentration of runoff over readily eroded soils create the highly dissected hills typical of the shale bedrock areas of the county. The accumulation of soil material by washing, creeping, slippage, and gravity at the base of steep slopes is typical of the foot slope relief of the Buchanan, Laidig, and Brinkerton soils.

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 Philo, Atkins, Newark, and Barbour 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 Weikert, 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.

Bedington, Laidig, Edom, and Murrill 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

As weathering proceeds and plants grow on a young soil, several processes are apparent that tend to cause layers, or horizons, to develop in the soil. Soils gain material when leaves and plant remains accumulate on the surface. This accumulation is easily seen in areas of Leetonia, Hazleton, and other soils that formed under forest and have not been plowed. Additions of organic matter, chemicals, and mineral material are also brought in from adjacent areas by animals, floodwaters, and wind, or they are transferred as a result of gravity.

There are losses of minerals from the soils when primary minerals decompose, and some of the products of weathering are leached from the soils in solution. This process is apparent in Hublersburg and Hagerstown soils, where calcium carbonate has been lost. There are also losses of minerals 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. Organic matter is 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 Bedington and Laidig soils. In these soils, clay has transferred from horizons higher in the profile and has accumulated in the B horizon.

Bases and plant nutrients are moved upward 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 colors of the parent material of a well drained Hagerstown soil, for example, are gradually replaced by the red, brown, and yellow colors 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 developed 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 A2 horizon of some soils in Huntingdon County is brownish because of oxidation of iron.

The B horizon lies 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 or prismatic 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 could have been modified by weathering, but it is relatively unaffected by the biological and physical changes or by many of the chemicals involved in the formation of the A and B horizons.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands, in developing rural areas, in engineering work, and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available (*11, 13*).

The current system of classification has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system the criteria used as a basis for classification are soil properties that are observable and measurable (*11*). The properties are chosen however, so that the soils of similar genesis, or mode of origin, are grouped. In table 10, the soil series of Huntingdon County are placed in six categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. The properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. The two exceptions to this are the Entisols and Histosols, which occur in many different climates. Each order is named with a word of three or four syllables ending in *sol* (Ent-i-sol).

SUBORDER.—Each order is subdivided into suborders that are based primarily on those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of water logging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is *Aquent* (*Aqu,* meaning water or wet, and *ent,* from Entisol).

GREAT GROUP.—Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated; those that have pans that interfere with growth of roots, movement of water, or both; and thick, dark-colored surface horizons. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and dark red and dark brown colors associated with basic rocks. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Haplaquents (*Hapl,* meaning simple horizons, *aqu* for wetness or water, and *ent,* from Entisols).

TABLE 10.—*Classification of the soils*

Series	Family	Subgroup	Order
Albrights	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Andover	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols.
Atkins	Fine-loamy, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Barbour	Coarse-loamy over sandy or sandy skeletal, mixed, mesic.	Fluventic Dystrochrepts	Inceptisols.
Basher	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Basher variant	Coarse-loamy, mixed, mesic	Fluventic Eutrochrepts	Inceptisols.
Bedington	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Birdsboro	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Blairton	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols.
Brinkerton	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Buchanan	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Calvin	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Clarksburg	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.
Clymer	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Dekalb	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Edom	Fine, illitic, mesic	Typic Hapludalfs	Alfisols.
Elliber	Loamy-skeletal, mixed, mesic	Typic Hapludults	Ultisols.
Ernest	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Hagerstown	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
Hazleton	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Hublersburg [1]	Clayey, illitic, mesic	Typic Hapludults	Ultisols.
Klinesville	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Laidig [2]	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Leetonia	Sandy-skeletal, siliceous mesic	Entic Haplorthods	Spodosols.
Meckesville	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Monongahela	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Morrison	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Murrill	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Newark	Fine-silty, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Opequon	Clayey, mixed, mesic	Lithic Hapludalfs	Alfisols.
Philo	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Purdy [3]	Clayey, mixed, mesic	Typic Ochraquults	Ultisols.
Raritan	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Tyler	Fine-silty, mixed, mesic	Aeric Fragiaquults	Ultisols.
Vanderlip	Mesic, coated	Typic Quartzipsamments	Entisols.
Weikert	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Wharton	Clayey, mixed mesic	Aquic Hapludults	Ultisols.

[1] Hublersburg silt loam in units HuB, HuC, and HuD has mixed mineralogy and is a less cherty taxadjunct of the Hublersburg series.
[2] Laidig soils contain a few more coarse fragments than is defined for the Laidig series.
[3] Purdy soils have a slightly thicker solum than is defined for the Purdy series.

SUBGROUP.—Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others called intergrades that have properties of the group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Haplaquents (a typical Haplaquent).

FAMILY.—Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (see table 10). An example is the fine-loamy, mixed, mesic family of Typic Hapludults.

General Nature of the County

In this section some general information is given about Huntingdon County. Included are some facts concerning the early history, water supply, geology, and climate.

Early History

The territory of Huntingdon County once included an area from Franklin County west to the Allegheny Mountains and north to the West Branch of the Susquehanna River. It was subsequently reduced by the formation of Centre, Clearfield, and Cambria Counties between 1800 and 1804, and again in 1846 by the formation of Blair County.

As early as 1754 a trading post was established at

what is now Alexandria, and by 1762 there were settlers along most of the large streams. Dr. William Smith purchased land in 1767 to lay out a town that he named Huntingdon.

During the 18th century, the major travel routes were Indian footpaths and the Allegheny River. Later, roads were built, and the Pennsylvania Canal was constructed. In 1850 the Pennsylvania Railroad was completed to Huntingdon. Over the years the early roads have been replaced with a network of paved primary and secondary roads to provide passage in the county.

Water Supply

The source of the water supply used by farms, individual homes, population centers, and industry depends mainly on proximity to the supply. Water users near or adjacent to the mountains generally use springs, and in places they use water stored in reservoirs fed by the springs. The water quality is good, and the supply is generally dependable except during extremely dry weather. Gravity flow can be used to transport the water from these sources, and a properly installed pipeline is relatively free of maintenance or problems.

Where mountain water is not available, the second major source of water is from wells, but some springs and a few cisterns are used. Wells in areas of limestone bedrock vary in depth and are commonly drilled into underground streams. Such wells generally yield large quantities of water. The water contains various amounts of dissolved calcium. Although this calcium coats cooking pots and pipelines, it generally does not affect the palatability of the water. Springs are not abundant in these areas, and they vary in dependability. A few springs are outlets for underground streams and provide large quantities of water. Limestone springs and wells are easily contaminated by sewage and other pollutants through sinkholes and solution channels in the fractured bedrock.

Wells in shale bedrock generally yield a low amount of water that often contains iron sulfide. Fixtures turn brown or black where this water stands or drips, and the pungent odor makes the water unpalatable to some people. Springs are more plentiful in the shale areas, and their dependability depends on the size of the watershed feeding them.

Geology[6]

Huntingdon County is in the Ridge and Valley Province of the Appalachian Highlands. The county is composed of a series of parallel, narrow ridges and valleys. The mountain ridges are 1,800 to 2,400 feet above sea level, and the highest elevation is at Big Flat in Jackson township in the northeastern part of Huntingdon County. The valley elevation ranges from 520 feet, where the Juniata River enters Mifflin County, to 1,400 feet. The general elevation is about 1,000 feet. The county lies within the drainage basin of the Juniata River, which flows across the county in a northwestern to southeastern direction. The Juniata River maintained its original course perpendicular to the mountains, forming water gaps as the mountains formed. Tributaries formed during more recent periods of uplift and are in valleys parallel to the mountains. Bedrock of Huntingdon County (*2, 4, 6, 14*) consists of Paleozoic sedimentary sandstone, limestone, shale, and siltstone ranging from the oldest Warrior and Pleasant Hill limestones of Cambrian age in Nittany Valley to the Conemaugh and Allegheny coal measures of Pennsylvanian age in the Broad Top area.

Steeply dipping, older rocks form the mountains and valleys along the eastern, northern, and western parts of the county. Generally, sandstone caps the ridges, limestone is under the valley bottoms, and shale and siltstone are under the mountainsides and lower hills. The rocks are less folded and become progressively older in a broad synclinal basin extending from the coal fields near the Bedford County line northeast to the vicinity of Ennisville. Within this basin are large areas underlain by sandstone; by red shale and siltstone; and by gray, brown, and black shale. These areas are less folded than the narrow bands of similar rocks forming the mountains in the eastern, northern, and western parts of the county.

This landscape provides the geologic setting for the development of soils in Huntingdon County. Most of the soils formed from sedimentary rocks. Glaciers farther north had little effect on soil formation. About 66 percent of the county is made up of soils that formed in place from the underlying parent bedrock in the uplands, 22 percent is soils that formed in loose colluvial deposits along the base of the mountains and valley walls formed by gravity and slope wash, and 6.3 percent is soils that formed on alluvial flood plains and terraces in material transported and deposited by streams (*7*). The rest is urban land, strip mines, iron ore pits, rock outcrop, and rubble.

Of the soils on uplands, about 50 percent is mainly Berks and Weikert soils, which formed in residual material weathered from gray, brown, or black shale and siltstone of Ordovician and Devonian age, and small areas of Klinesville and Calvin soils, which formed in red shale and siltstone of the Mauch Chunk, Catskill, and Juniata Formations. About 38 percent of the soils on uplands is mainly the Hazleton, Dekalb, Clymer, and Leetonia soils, which formed in material weathered from sandstone of the Bald Eagle, Tuscarora, Pocono, and Pottsville Formations; Vanderlip soils, which formed in the residuum from calcareous Oriskany sandstone; and Morrison soils, which formed in residuum from the older Gatesburg and Warrior Formations. The rest of the soils on uplands formed in residuum in areas of pure, cherty or argillaceous carbonate rocks.

Hagerstown soils are underlain by the Coburn, Loysburg, and Beckmantown limestones and dolomites, common to Nittany Valley. Hublersburg and Elliber soils are cherty and are generally underlain by the Keyser, Tonoloway, and McKenzie Formations. Edom soils formed in material weathered from the intermixed limestone and shale of the Wills Creek and McKenzie Formations. Soils formed in colluvial deposits along the base of the mountain and hill slopes in material derived from gray acid sandstone and shale include Laidig, Buchanan, and Andover soils. The Murrill soils formed in deposits containing limestone and some shale

[6] Prepared by LEON J. JOHNSON, soil mineralogist, Pennsylvania State University.

TABLE 11.—*Temperature and precipitation data*

[All data from Huntingdon. Period of record 1941–70]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Number of days with snow cover	Average depth of snow on days with snow cover
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F	°F	°F	°F	*Inches*	*Inches*	*Inches*		*Inches*
January	38.4	19.2	54	0	2.38	1.25	3.65	12	5
February	39.9	19.4	55	2	2.12	.90	3.32	10	4
March	49.7	25.9	71	11	3.53	1.71	5.19	5	4
April	63.0	36.6	83	24	3.39	1.76	5.37	(1)	0
May	73.9	45.5	89	32	3.90	1.68	6.78	0	0
June	82.3	54.8	93	42	3.59	1.15	6.24	0	0
July	86.0	58.7	95	48	4.11	2.26	6.74	0	0
August	84.0	57.1	95	44	3.67	1.75	5.54	0	0
September	77.8	49.9	91	35	2.80	.63	4.65	0	0
October	66.8	39.0	81	26	2.67	.83	4.49	(1)	0
November	52.7	30.3	68	17	3.23	1.82	5.41	1	3
December	40.0	21.2	54	4	2.61	.98	4.29	8	4
Year	62.9	38.1	[2]98	[3]−7	38.00	31.02	44.78	36	4

[1] Less than 0.5 day.
[2] Average annual maximum.
[3] Average annual minimum.

TABLE 12.—*Probabilities of last freezing temperatures in spring and first in fall* [1]

[All data from Huntingdon]

Probability	Dates for given probability and temperature				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	April 7	April 15	April 26	May 5	May 22
2 years in 10 later than	March 29	April 9	April 21	May 1	May 18
5 years in 10 later than	March 13	March 30	April 12	April 22	May 10
Fall:					
1 year in 10 earlier than	November 4	October 31	October 11	September 24	September 16
2 years in 10 earlier than	November 19	November 5	October 17	October 7	September 23
5 years in 10 earlier than	November 29	November 14	October 29	October 19	October 6

[1] Prepared by National Climatic Center, Asheville, N.C.

and sandstone. Meckesville, Albrights, and Brinkerton soils formed in colluvium derived from red shale, siltstone, and sandstone.

Soils of alluvial origin are associated with river and creek deposits along present and former streams. Monongahela, Tyler, Purdy, Raritan, and Birdsboro soils are on old terraces, which are former stream deposits, 50 feet to 300 feet above the flood plains of the present streams. The soils on terraces make up about 1.3 percent of the county. Along the present rivers and streams on flood plains, the Atkins, Philo, Newark, Barbour, and Basher soils make up 5.3 percent of the county.

Climate [7]

Huntingdon County is within the Ridge and Valley province in the south-central part of Pennsylvania. The climate is humid continental. Most weather systems that affect the area develop in the southern or central parts of the United States or in central Canada. These systems are caught up in the prevailing wind and are steered toward the northeastern United States. The main source of moisture is the Gulf of Mexico. The secondary source is the Atlantic Ocean. Cold Canadian airmasses are somewhat modified by the time they reach the Appalachian Mountains because of the long overland route. The mountain ranges to the west of Huntingdon remove moisture from the airmasses approaching from the west so that less moisture is available when the system reaches Huntingdon County.

Summers are warm. Daytime highs generally range from the eighties to the low nineties. Nighttime lows range from the mid fifties to the mid sixties. About 20 days each summer have temperatures of 90° F or higher. Temperatures are seldom below 40° during June through August. The record high of 105° was observed on August 4, 1930, and again July 4, 1966. Cloud cover is minimal during summer, and more than 60 percent of available possible sunshine is received. Prevailing winds are from the southwest in summer and average 8 to 10 miles per hour. Summer rainfall is adequate and is mainly in the form of thundershowers, which occur on an average of 22 days each summer.

The numerous ridges and narrow valleys throughout this area are one of the causes of persistent cloudiness during winter, when cold airmasses continually move into the area. During winter, prevailing winds are west to northwest and average 12 miles per hour. Daytime highs range from the upper twenties to low forties, and nighttime lows generally range between the mid teens and low twenties. Summerlike temperatures have been observed in the middle of winter, but such readings are quite rare. The highest reading in winter was 79° on January 26, 1950. Subzero temperatures are observed on an average of 4 days each winter. The lowest temperature recorded was −29° on January 14, 1912.

Climatological data for the county are summarized in tables 11 and 12.

The first measurable snowfall generally is late in November or early in December. Most snowstorms seldom exceed 10 inches, but on March 29, 1942, a record 26.0 inches fell. Snow cover generally does not persist for any great length of time except on north- or east-facing slopes, which are shaded from the low winter sun. An inch or more of snow cover is observed on an average of 37 days each winter, and 6 inches or more is observed on an average of 9 days. The longest period of snow cover of 1 inch or more was 68 days, from December 12, 1944, to February 16, 1945. Very little snow is observed after March.

Spring and fall are transition periods. Prevailing winds flow from the west, averaging 10 miles per hour. Late in April, temperatures of 70° or more are observed with increasing frequency, and the 70° temperatures continue through October. Extended periods of dry weather are rare but do occur late in summer and in fall. The longest dry period on record was 31 days, the entire month of October 1963. Fall is characterized by warm, dry weather and abundant sunshine.

The average growing season is 148 days, but it has varied from 110 days in 1932 to 175 days in 1968. The latest date on record of the last spring frost is June 8, 1932. The earliest date on record for the first fall frost is September 12, 1943.

The greatest monthly rainfall was 10.52 inches in

[7] Prepared by the National Climatic Center, Asheville, N.C.

May 1933, and the maximum 24-hour rainfall was 3.92 inches on October 16, 1954. A statistical analysis indicates that 5-inch, 24-hour rain can be expected on an average of once every 25 years. Thunderstorms, while predominantly a warm-season phenomenon, have been observed each month of the year. On the average, 10 days with thunder are observed in spring, 6 in fall, and 1 during winter.

Hurricanes do not directly affect this area, but tropical storms have caused heavy rains locally. Some damage from wind and hail during severe thunderstorms is commonly recorded somewhere in Huntingdon County each year. Since 1854, when records were first kept on tornadoes, none has been noted in Huntingdon County, but a few such storms have been noted in adjacent counties.

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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.

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 3
Low	3 to 6
Moderate	3 to 9
High	More than 9

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Erosion. The wearing away of the land surface by running 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 a bare surface.

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.

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.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravelly soil material. Material from 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks 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 from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

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).

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are very slow (less than 0.06 inch), slow (0.06 to 0.20 inch), moderately slow (0.2 to 0.6 inch), moderate (0.6 to 2.0 inches), moderately rapid (2.0 to 6.0 inches), rapid (6.0 to 20 inches), and very rapid (more than 20 inches).

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree 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		pH
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called groundwater runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

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.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

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.

Sinkhole. A depression in a landscape where limestone has been locally dissolved.

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature 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 other plant and animal life characteristics of the soil are largely confined to the solum.

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 that are separated from adjoining 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.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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.

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