SOIL SURVEY OF

Mercer County, New Jersey

United States Department of Agriculture
Soil Conservation Service
In cooperation with
New Jersey Agricultural Experiment Station

Issued January 1972

Major fieldwork for this soil survey was done in the period 1950–65. Soil names and descriptions were approved in 1967. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1965. This survey was made cooperatively by the Soil Conservation Service and the New Jersey Agricultural Experiment Station. It is part of the technical assistance furnished to the Mercer County Soil Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, U.S. Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All the soils of Mercer County are shown on the detailed map at the back of this survey. The map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. 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 "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol. It shows the page where each kind of soil is described and also the page for the woodland group in which the soil has been placed. It also gives the capability classification of the soil.

Interpretations not included in the text can be developed by using the soil map and information in the text to group the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over 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 in the soil descriptions and in the discussions of estimated yields and woodland suitability groups.

Foresters and others interested in woodland can refer to the section "Use of Soils as Commercial Woodland." In that section the soils of the county are placed in groups according to their suitability for trees, and management of each group is discussed.

Game managers, sportsmen, and others concerned with wildlife will find information about the main kinds of wildlife and their food and cover in the section "Use of Soils for Wildlife."

Community planners and others concerned with suburban developments can read about the soil characteristics that affect the choice of homesites, industrial sites, schools, and parks in the section "Soils in Community Developments."

Engineers and builders will find in the section "Engineering Uses of the Soils" tables that give engineering descriptions of the soils in the county; that name soil features affecting engineering practices and structures; and that rate the soils according to their suitability for several kinds of engineering work.

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

Newcomers in Mercer 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 section "General Nature of the County."

***Cover picture.*—Stripcropping on a moderately sloping Quakertown silt loam in the northern part of Hopewell Township.**

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE COLLEGE OF AGRICULTURE AND ENVIRONMENTAL SCIENCE AND THE NEW JERSEY AGRICULTURAL EXPERIMENT STATION OF RUTGERS UNIVERSITY, THE STATE UNIVERSITY OF NEW JERSEY

MERCER COUNTY is on the western edge of the central part of New Jersey (fig. 1). It lies along the Delaware River and comprises nearly 228 square miles, or about 145,900 acres of land. There are about 1,300 acres of inland water.

The population of Trenton in 1970 was 104,638. Trenton is the county seat and the capital city of New Jersey. The population of the county in 1970 was 303,968, and in 1966 it was estimated to be 300,400. Nearly 90 percent of the people live in urban neighborhoods, principally in those centered around Trenton and Princeton. Nearly two-thirds of the land in the county is still rural, in farms, wooded areas, stream bottoms, and public open spaces.

In recent years, Mercer County has become one of the nation's centers of research and development. More than 75 companies are carrying on research in programs that include space flight, nuclear physics, electronics, fuels, paper, paint, floor coverings, aircraft, plastics, steel products, pharmaceuticals, and many others.

Mercer County was the first county in the United States to develop an integrated master plan for open spaces. This plan provided for dovetailing Federal, State, county, and municipal programs with the objective of setting aside 15,000 acres, or about 10 percent of the total area, in permanent open spaces.

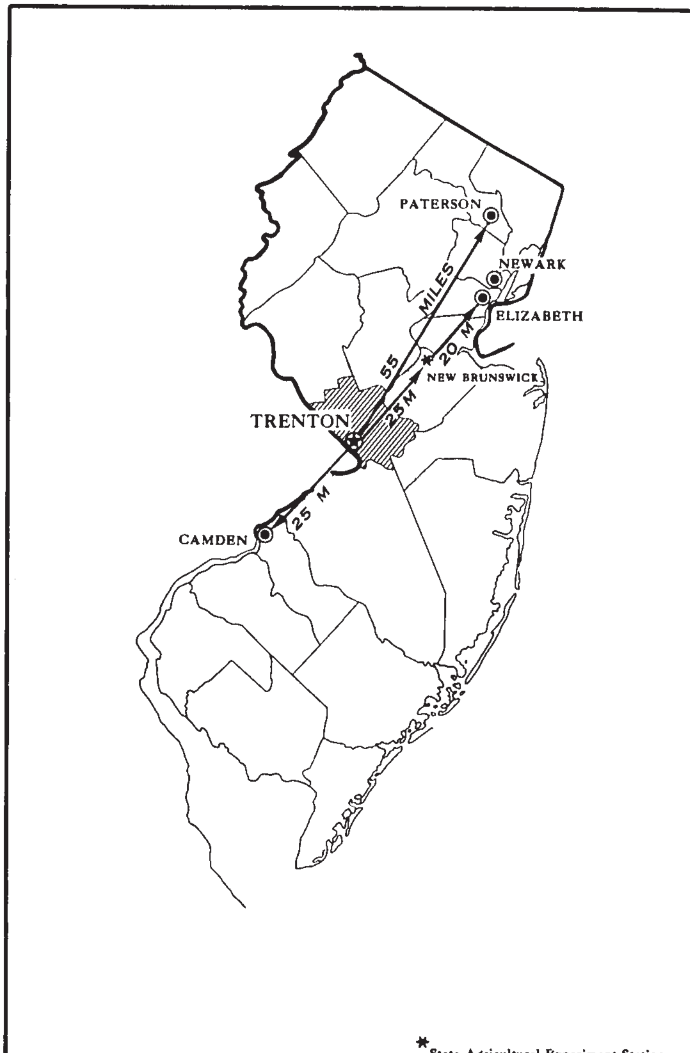

Figure 1.—**Location of Mercer County in New Jersey.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Mercer 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. As they traveled over the county, 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 other geographic feature near the place where a soil of that series was first observed and mapped. Bucks and Woodstown, 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 soil and in slope, stoniness, or some other characteristic. On basis of these differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Bucks silt loam, 2 to 6 percent slopes, is one of the several phases within the Bucks 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 the 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 soil of some other kind 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. Two such kinds of mapping units are shown on the soil map of Mercer County: 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. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Lenoir-Keyport silt loams 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. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Readington and Abbottstown silt loams, 2 to 6 percent slopes, is an example.

In most areas surveyed there are places where the soil material is so rocky, so shallow, or so severely eroded that it cannot be 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. Cut and fill land, rock substratum, is a land type in Mercer County.

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

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way as to be readily useful to different groups of users, among them farmers, managers of woodland, and engineers.

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, 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 present methods of use and management.

General Soil Map

The general soil map at the back of this publication shows, in color, the soil associations in Mercer County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing associations is useful to people who want a general idea of the soils of a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The 10 soil associations that were mapped in the county are shown on the colored map at the back of this publication and are described in the paragraphs that follow. The five associations in the northwestern end of the county are in the Northern Piedmont Lowland physiographic province (*3*)[1]. The other five associations are in the northern part of the Coastal Plain province.

Soils of the Northern Piedmont

In the part of the county that lies within the Northern Piedmont Lowland (*3*), the soils are dominantly silty and commonly are shaly or stony. Most of the soils are underlain by hard bedrock at a depth of 2 to 20 feet.

Ground water is generally scarce in the five soil associations of the Piedmont area. Ground water is stored

[1] Italicized numbers in parentheses refer to Literature Cited, page 106.

in fractured zones of the rocks, and in many places the supply is barely adequate for private wells.

1. *Neshaminy-Mount Lucas-Lehigh association*

Mainly deep, well-drained to somewhat poorly drained, moderately sloping to steep, stony soils that have a silty subsoil and overlie diabase; but partly moderately deep, nearly level, nonstony soils that overlie shale or siltstone

The three areas of association 1 consist of four ridges that rise about 200 feet above the neighboring plain. The largest area is Rocky Hill just north of Princeton. The Baldpate Mountains and Pennington Mountains form another area that extends from the Delaware River near Titusville to Marshalls Corner. The third area is a very small part of the Sourland Mountains, which touch a corner of the county northwest of Hopewell. The landscape in this association is rolling, and slopes range from gentle to steep. This association makes up about 7 percent of the county.

Neshaminy soils make up 39 percent of this association. They are sloping and steep soils of the diabase ridges. They are deep, well-drained, brownish soils, and some of them are very stony. Mount Lucas soils, also on diabase, make up 26 percent of the association. They are moderately well drained to somewhat poorly drained soils on concave slopes or flat uplands where drainageways are not well developed.

Lehigh soils are moderately deep, poorly drained, and slowly permeable. Their dark-gray color has been inherited from the gray parent shale that was baked by the intrusive diabase (*5*). They are nearly level or gently sloping soils on concave slopes at the base of ridges of Neshaminy soils. Lehigh soils comprise 10 percent of the association.

Other soils in association 1 are the well-drained, gravelly Legore soils of sloping to very steep uplands and the poorly drained, slowly permeable, silty or stony Watchung soils in alluvial materials at the base of slopes. These other soils make up 25 percent of the association.

Much of the association is stony. Scattered rock outcrops limit many uses of the soils. In general the well drained soils are permeable, but the moderately well drained, the somewhat poorly drained, and the poorly drained soils are slowly permeable and are spotted with seeps. The water table in the soils that are not well drained fluctuates widely from winter to summer.

Most of this association is woodland. Cleared areas are used to grow small grains, corn, hay, or pasture. Recently a few areas have been developed for individual homes or small housing subdivisions in which lots are of medium to large size. Ground water is stored in fracture zones in the rock and is barely adequate for private wells.

Seepage, wetness, slope, stoniness, and slow permeability limit the use of most soils in this association for disposal of sewage from septic tanks. There are restrictions, therefore, in developing areas for homesites or for commercial or industrial uses. Many areas are favorable for parks and picnicking and for natural preserves, and some are being used in those ways.

2. *Quakertown-Chalfont-Doylestown association*

Moderately deep to deep, well-drained to poorly drained, nearly level to moderately steep soils that have a silty subsoil; mainly over sandstone and argillite but partly over red shale and siltstone

Association 2 lies in two widely separated areas. The northern area adjoins and extends into Hunterdon County and in Mercer County reaches from Harbourton to a point north of Hopewell. The other area forms an irregularly shaped band from West Trenton northeastward to the Middlesex County line near Princeton. The landscape in general is gently undulating, and slopes range from gentle to steep. This association makes up 13 percent of the county.

Quakertown soils occupy high positions and the strongest slopes in the association. They are moderately deep and well drained, and they have a firm layer at a depth of 20 to 30 inches. They make up 38 percent of the association.

Chalfont soils are moderately deep and somewhat poorly drained. They have a firm or very firm layer at a depth of about 16 to 28 inches. They are nearly level or gently sloping, and as a rule they lie below the Quakertown and above the Doylestown soils. Chalfont soils make up 34 percent of the association.

Doylestown soils are deep and poorly drained. Some of them have a firm layer at a depth of about 18 inches. They are nearly level, and they occupy low positions. They make up 23 percent of the association.

Minor soils of three series make up 5 percent of association 2. Along with the Doylestown soils, and not separated from them on the detailed soil map, are areas of Reaville soils, wet variant. The soils of this wet variant are poorly drained and are shallow over shale. The other minor soils are Bucks soils, which are well drained, deep, and silty, and Lansdale soils, which are well drained, deep, and sandy.

In more than half of the association, the soils are somewhat poorly drained or poorly drained. These soils are slowly permeable, the depth to the water table in them fluctuates widely, and wetness limits their use. The well-drained soils, in general, are moderately slowly permeable.

Most of the somewhat poorly drained and poorly drained soils in this association are idle and are covered with trees. Small acreages are used for hay or pasture. The well-drained soils generally are cultivated. A few individual homes and a few small housing subdivisions, in which lots are medium to large, are being developed. Ground water is stored in fracture zones in the rock and in many places is barely adequate for private wells.

Most of the soils in this association have moderate to severe limitations for disposal of sewage from septic tanks because of a fluctuating high water table, slow or moderately slow permeability, or both. The Lansdale soils, however, are well drained and have only slight limitations for this use. Seepage of water into dug basements may be a hazard on most of the soils during wet seasons. These limitations affect developments for homesites and for commercial or industrial uses. Some areas in this association are favorable for recreation and for natural preserves.

3. Bucks-Penn-Readington association

Moderately deep and shallow, well drained and moderately well drained, gently undulating or gently sloping soils that have a silty subsoil; over red shale or siltstone.

The largest of the three areas in this association extends from Titusville on the Delaware River to Carnegie Lake in Princeton township near the Middlesex County line. This area is much wider in the middle than at either end. A much smaller area is in and around the town of Hopewell. The smallest area lies along the county line in the northwestern corner of the county and extends from the Delaware River eastward toward Harbourton. The association makes up 21 percent of the county.

Bucks soils, which make up 50 percent of this association, are well drained, deep, and moderately slowly permeable. Penn soils, which make up 18 percent of the association, are well drained, shallow, permeable, and slightly steeper than Bucks soils. Both the Bucks and the Penn soils are underlain by red shale. Readington and Abbottstown soils make up 15 percent of the association. They are somewhat similar to the Bucks soils, but Readington soils are moderately well drained and Abbottstown soils are somewhat poorly drained. These two soils are nearly level, and they are lower in the landscape than the Bucks and the Penn soils.

Minor soils that together make up 17 percent of the association are the Klinesville, Reaville, Reaville, wet variant, and Doylestown soils. Klinesville soils are shallow over shale. Reaville soils are shallow over shale and are somewhat poorly drained. Reaville soils, wet variant, are shallow over shale and are poorly drained. Doylestown soils are poorly drained and are underlain by shale or siltstone.

Most of the acreage in association 3 is used for crops, principally corn, small grains, and hay. The steep soils and the poorly drained soils are used mainly for pasture. Some of the acreage is used for housing developments. Ground water is stored in fracture zones of the rock. The amount in different places ranges from adequate to barely adequate for private wells.

Bucks soils have moderate or severe limitations for disposal of sewage from septic tanks. The Penn, Klinesville, and Reaville soils are shallow and have severe limitations for this use. The Readington, Abbottstown, and Doylestown soils range from moderately well drained to poorly drained, and artificial drainage is needed for most uses.

Many areas in association 3 are favorable for parks, playgrounds, picnic areas, or natural preserves.

4. Birdsboro-Tioga association

Deep, well-drained, nearly level soils that have a loamy subsoil; on stream terraces along the Delaware River

This soil association forms a narrow strip along the Delaware River that extends from a point near West Trenton northwestward to the Hunterdon County line. It makes up about 1 percent of the county. The soils commonly are nearly level or gently sloping.

Birdsboro soils make up 68 percent of this association. They are well-drained, deep, brownish, permeable loams that are underlain by gravel that is over bedrock. They occupy much higher positions in the landscape than the Tioga soils. Tioga soils, which make up 30 percent of the association, are well-drained, deep, permeable fine sandy loams.

Minor soils in this association are the sandy subsoil variants of Birdsboro soil; Bucks soils, which are deep and silty; and Penn soils, which are shallow over shale bedrock. These minor soils amount to 2 percent of the association.

Almost all the acreage of this soil association is used to grow crops. Vegetables are grown on the Tioga soil. The Birdsboro soils are used mainly for corn, small grains, hay, and pasture.

The major soils of this association have moderate or severe limitations for disposal of sewage from septic tanks. The underlying material is rapidly permeable, however, and there is a hazard of contaminating nearby streams and shallow wells. The Penn soils are shallow over bedrock and have severe limitations for use as septic fields. Only a few housing subdivisions have been developed in this association. There are a few scattered individual homes on large lots.

Areas of Tioga soils less than 80 feet above sea level are flooded occasionally, possibly once in 5 to 10 years. Areas more than 80 feet above sea level are flooded rarely, if ever.

5. Birdsboro-Rowland-Bowmansville association

Mainly deep, well-drained, nearly level to gently sloping soils that have a silty or loamy subsoil and occur on high stream terraces; but partly moderately well drained to poorly drained soils on flood plains

This soil association forms a narrow, irregular strip that extends from Lewisville eastward along County Route 583 to Carnegie Lake. It amounts to about 1 percent of the county.

The sandy subsoil variants of Birdsboro soils make up about 44 percent of this association. They are moderately coarse textured in all horizons. The Birdsboro loams, which are medium textured, make up about 32 percent. These major soils of the association are well drained. Their slopes are mostly nearly level or gentle.

Other major soils in this association are the Rowland, which are moderately well drained to somewhat poorly drained, and the Bowmansville, which are poorly draind. These soils are located along streams and are subject to flooding. They make up about 24 percent of the association.

Narrow strips of the soils that are in this association lie along streams in the other associations of the Piedmont section of the county.

The crops that are grown most extensively in this association are corn and small grains. The major soils are well suited to many kinds of vegetables. The Rowland and the Bowmansville soils are used mainly for pasture. Sod is grown commercially on a small scale.

The Birdsboro soils and their sandy subsoil variants have moderate or severe limitations for disposal of the effluent from septic tanks. The Rowland and the Bowmansville soils have severe limitations for septic systems because of frequent flooding and a high water table.

In a few places, the soils are favorable for use as wildlife preserves.

Soils of the Northern Coastal Plain

In the Northern Coastal Plain section of the county, the soils were formed in materials that were laid down in water. Thickness of the beds ranges from several feet to several hundred feet. The materials range in texture from sand to clay. In extensive areas they are dominantly silty.

Ground water normally is present in adequate amounts in the layers of coarse material that underlie most of the area.

6. *Matapeake-Mattapex-Bertie association*

Deep, well-drained to somewhat poorly drained, nearly level to gently sloping soils that have a loamy or silty subsoil

This association forms two widely separated areas. The smaller one lies in and around the town of Dutch Neck. The larger area extends from the locality south of West Trenton eastward to Lewisville. The association makes up about 16 percent of the county.

Matapeake soils, which are deep and well drained, make up 38 percent of this association. Mattapex and Bertie soils together make up 37 percent. Mattapex soils are deep and moderately well drained. Bertie soils are deep and somewhat poorly drained. Both have a high water table late in winter and during long wet spells.

Minor soils in this association are the Sassafras, which are well drained and moderately coarse textured; the Othello, which are poorly drained and medium textured; and the thin surface variant of Portsmouth soils, which are very poorly drained. These minor soils make up 25 percent of the association.

The Matapeake, Mattapex, and Bertie soils are fertile and are well suited to potatoes, corn, small grains, and the other common crops. The other soils are wet, and drainage is needed if they are used for crops. In many places they provide sites where ponds are dug below the level of the water table to supply water for irrigation or for other purposes.

Ground water is present in the porous beds that lie under the soils of this association. The supply generally is adequate for private wells.

Limitations of the Matapeake and the Sassafras soils are slight for disposal of sewage from septic tanks. Limitations of the Mattapex, Bertie, Othello, and Portsmouth soils are severe for septic fields because of the water table.

Between half and three-fourths of the acreage in this association is already in residential, light industrial, or commercial uses. The small area around Dutch Neck is used mainly for farming. Because of the high value of land and the demands for housing, not much of this association is used as parks, picnic areas, or natural preserves.

7. *Galestown-Evesboro association*

Deep, excessively drained, nearly level to gently sloping soils that are sandy throughout their depth

The soils in this association are sandy and were formed in material deposited by rivers and other streams. The association consists of two separate areas. One area, which is irregular in shape, lies just east of the Delaware River. Part of the city of Trenton and part of the town of Mercerville are in it. The other area is just west of the Millstone River and south of Stony Brook and Carnegie Lake. It includes the communities of Clarksville and Berrien City. These two areas make up about 8 percent of the county.

Galestown soils make up 40 percent of this association, and Evesboro soils make up 29 percent. Both are excessively drained and are sandy in all their horizons.

Minor soils in the association are gravelly solum variants of Birdsboro soils, Downer soils that have a gravelly clay loam substratum, and sandy loam subsoil variants of Evesboro soils, all of which are moderately well drained, well drained, or somewhat excessively drained; Klej soils, which are moderately well drained and somewhat poorly drained; and Plummer soils, which are poorly drained and are wet or very wet. These minor soils amount to 31 percent of the association.

Small areas of the soils that make up this association are scattered in other parts of the Coastal Plain section of the county and because of their small size are in other associations.

The soils that occupy most of the acreage in this association are droughty because they are sandy or gravelly. The Downer soil in this association, because of its gravelly clay loam substratum, has moderate available water capacity. It is less droughty and is better suited to crops than the Galestown, the Evesboro, or the gravelly Birdsboro soils. The crops grown most extensively in this association are corn, small grains, and a variety of vegetables. There are also small acreages of fruits and of flowers.

More than half of the acreage of this soil association is in urban, commercial, or industrial uses. In the association are parts of the city of Trenton and the town of Mercerville, the towns of White Horse, Yardville, and Groverville, and many suburban developments.

Limitations are slight for disposal of sewage from septic tanks in the Evesboro, Galestown, and gravelly Evesboro soils, and also in the sandy loam subsoil variants of Evesboro soils. Limitations of the Downer soils, gravelly clay loam substratum, are moderate for disposal of sewage because permeability in the substratum of these soils is moderately slow. Limitations of the Klej soils for disposal of sewage are moderate because the water table is moderately high part of the time. Limitations of the Plummer soils for this purpose are severe because of wetness.

Many areas in this association are favorable for parks, picnic areas, or natural preserves.

8. *Alluvial land-Fresh water marsh association*

Nearly level, wet or marshy soils along streams

This soil association consists of nearly level areas along streams in the Coastal Plain section. It amounts to about 6 percent of the county.

Alluvial land, very wet, makes up 27 percent of this association. Alluvial land, wet, makes up 19 percent, and Fresh water marsh makes up 29 percent.

Minor soils in this association are the Fallsington and the Othello soils, which are poorly drained, and the thin surface variant of Portsmouth soils, which is very poorly drained. These minor soils make up 25 percent of the association.

Fresh water marsh is covered with water and is not suited to farming. It is best suited to use as habitat for wildlife. Alluvial land, very wet, has water at or near the surface most of the time and is flooded several times each year. It is best suited to use as woodland or as wildlife habitat, and it also furnishes excellent sites for dug ponds. In Alluvial land, wet, the water table is near the surface in winter but is 1 foot to 2 feet lower in summer. This land is flooded at least once each year. Water can be removed in open ditches, and the drained areas of this land type are best suited to pasture. The minor soils of this association are wet, but they can be drained and used to produce crops.

Because of the flooding hazard and the high water table, the land types and soils in this association have severe or very severe limitations for use as building sites. A few areas are suited to development of parks or picnic areas.

9. Aura association

Deep, well-drained, gently sloping and sloping soils having a moderately firm subsoil that is gravelly in the lower part

This soil association consists of four irregularly shaped areas. One of the areas lies in and around the town of Robbinsville, about 3 miles from the Monmouth County line. Another area lies northwest of the first one and takes in the town of Mercerville. One of the others is north and one is south of U.S. Highway No. 1 near Clarksville. These four areas amount to about 1 percent of the county.

Aura soils make up about 86 percent of this association. They are deep and well drained, and they have a moderately firm lower subsoil. The rest of the association is Sassafras soils, which are well drained and moderately permeable, and Galestown soils, which are excessively drained, sandy, and rapidly permeable.

Most of the acreage of this association is cultivated, except in the Mercerville area, which is mainly urban. The principal crops are corn, small grains, and, in some places, small acreages of vegetables.

The Aura soils are a source of much gravel and subbase material for road building. Ground water is present in porous underground strata, and the amount generally is adequate for private wells.

Permeability of the Aura soils is moderate or moderately slow. Limitations for disposal of sewage from a septic system are moderate. Limitations of the Sassafras and Galestown soils are slight for disposal of sewage in individual systems.

The soils of this association are suited to recreational uses, but little or no acreage is available for such purposes.

10. Sassafras-Dragston association

Deep, well-drained to somewhat poorly drained, nearly level to sloping soils that have a loamy subsoil

Soil association 10 is the largest one in the county and makes up about 26 percent of the total acreage. It extends across the southeastern end of the county in an irregular and broken pattern from Crosswicks Creek on the west to the Millstone River on the east. There is also a small spot within association 7.

Sassafras soils make up 64 percent of this association. They are well drained, they have a surface layer of sandy loam and a slightly more clayey subsoil, and they are underlain by sand and gravel. Dragston soils, which were formed in similar materials but are somewhat poorly drained because of a high water table, make up 13 percent of the association.

Minor soils make up the other 23 percent of the association. Of these, the Matapeake soils are deep, well drained, and silty, and they are underlain by more sandy material. The Fort Mott and the Tinton soils have a thick, sandy surface layer and a slightly more clayey subsoil. In the Tinton soils, glauconite, a potash-bearing mineral that sometimes is called greensand, makes up an estimated 5 to 15 percent of the soil mass. Woodstown soils are moderately well drained, and Fallsington soils are poorly drained. Both are in low places and depressions. Soils that have a clayey subsoil are the Keyport, which are moderately well drained, the Lenoir, which are somewhat poorly drained, and the Elkton, which are poorly drained.

Most of the acreage of this soil association is used to grow crops. The soils are well suited to fruits, vegetables, corn, and small grains.

Fairly large acreages of soils in this association have been used for housing developments. Ground water is present in the porous underground strata, and the amount generally is adequate for private wells. Many borrow pits have been dug in the Sassafras soils to obtain materials for building roads.

Limitations of the Sassafras, Fort Mott, and Tinton soils are slight for disposal of sewage from septic tanks. Limitations of the Matapeake soils for this purpose range from slight to severe; beds of clay are in the substratum in many places. Deep drainage is needed to make the Dragston, Woodstown, and Fallsington soils usable as septic fields. Without drainage their limitations for this purpose range from moderate to severe. Limitations of the Keyport, Lenoir, and Elkton soils are severe for disposal of sewage because of slow permeability.

The soils of this association are suited to a large number of urban and related uses. Many sites are favorable for parks, golf courses, picnic areas, and natural preserves (fig. 2).

Descriptions of the Soils

In this section the soil series and the soil mapping units of Mercer County are described in alphabetical order. For the soils of each series, certain features such as permeability, available water capacity, and reaction are given. Also given are the major crops to which the soils are suited, some of the limitations or needs for management when the soils are farmed, and the degree of limitations for use as homesites and for disposal of sewage from septic tanks.

Each series contains a short nontechnical description of a typical soil profile and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. Ratings for the reaction of each horizon have been

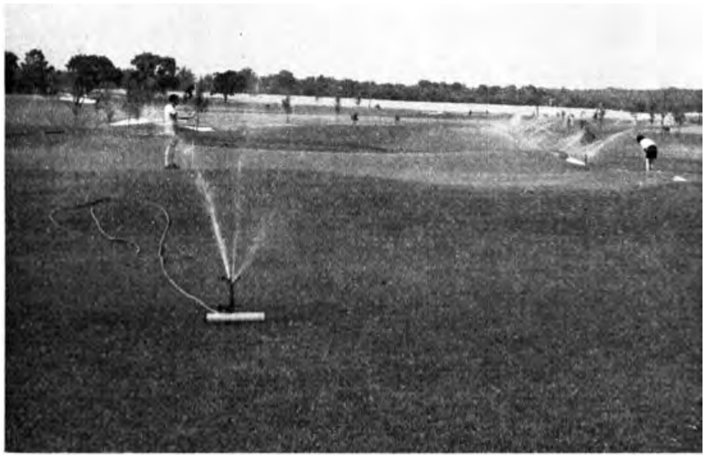

Figure 2.—**Golf course on soils in the Sassafras-Dragston soil association. In this area a moderately high water table is a limitation of the Dragston soils.**

omitted from those descriptions. All the soils in the county are acid unless lime has been applied. Soils in the Coastal Plain section range from strongly acid to extremely acid, and those in the Piedmont section range from slightly acid to strongly acid.

Each of the mapping units is described. Most of the mapping units consist of a single kind of soil. The profile described for each series is considered typical for all soils of the series. If the profile for a given mapping unit differs from this typical profile, the differences are stated in the description of the mapping unit, unless the differences are apparent in the name. Listed at the end of the description of each mapping unit are the capability unit and the woodland group in which that kind of soil has been placed.

Soil variant is a term that is used in many places in this section of the survey. A variant is a soil having properties sufficiently different from other known soils to justify a new series name but occupying a geographic area so limited that creation of a new series is not believed to be justified. Some of the other terms used in the descriptions of soils are defined in the Glossary at the back of this survey. Still others are given in the Soil Survey Manual (*12*). Descriptions of soil color are based on the Munsell color charts and are for the moist soil.

A list of the soils, their map symbols, capability classification, and woodland suitability grouping is given in the "Guide to Mapping Units" at the beginning of the map section. The approximate acreage and proportionate extent of each mapping unit are given in table 1. The location and distribution of each mapping unit are shown on the detailed soil map.

In using the map to locate soils, it is necessary to take into account changes that have occurred since the aerial photographs were made in 1963. In this county, highway construction has left borrow pits in fields and woodlands and has made fills in low, wet areas. Also, some areas that were fields when the aerial photographs were made are now covered by houses or by industrial or commercial buildings.

Abbottstown Series

The Abbottstown series consists of moderately deep and deep, somewhat poorly drained, nearly level to gently sloping soils on uplands. These soils were formed in a silty mantle that is underlain by bedrock of red shale or argillite. They are scattered throughout the Piedmont section of the county.

The plow layer of a typical Abbottstown soil is dark-brown silt loam about 7 inches thick. The subsoil is mainly yellowish-brown silt loam about 18 inches thick. The upper part of the subsoil has very faint mottles, and the lower part has prominent mottles that are light gray. The lower part of the subsoil grades to weathered shale and then, at a depth of about 40 inches, to hard bedrock.

Abbottstown soils have high available water capacity. Their permeability is moderately slow in the surface horizon and slow in the subsoil. Improvement of drainage is needed for most crops. If drained, the soils are suited

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

Soil	Area	Extent
	Acres	*Percent*
Alluvial land, wet	1, 438	1. 0
Alluvial land, very wet	1, 936	1. 3
Aura sandy loam, moderately firm, 2 to 5 percent slopes	815	. 6
Aura sandy loam, moderately firm, 5 to 10 percent slopes	225	. 2
Birdsboro loam, 0 to 6 percent slopes	239	. 2
Birdsboro loam, 2 to 6 percent slopes, eroded	118	. 1
Birdsboro loam, 6 to 12 percent slopes, eroded	157	. 1
Birdsboro silt loam, 0 to 2 percent slopes	147	. 1
Birdsboro silt loam, 2 to 6 percent slopes	747	. 5
Birdsboro soils, sandy subsoil variants, 0 to 2 percent slopes	208	. 1
Birdsboro soils, sandy subsoil variants, 2 to 6 percent slopes	855	. 6
Birdsboro soils, sandy subsoil variants, 6 to 12 percent slopes	234	. 2
Birdsboro soils, gravelly solum variants, 0 to 5 percent slopes	789	. 5
Bowmansville silt loam	1, 534	1. 1
Bucks silt loam, 0 to 2 percent slopes	1, 127	. 8
Bucks silt loam, 2 to 6 percent slopes	8, 676	5. 9
Bucks silt loam, 2 to 6 percent slopes, eroded	1, 460	1. 0
Bucks silt loam, 6 to 12 percent slopes	781	. 5
Bucks silt loam, 6 to 12 percent slopes, eroded	1, 649	1. 1
Chalfont silt loam, 0 to 2 percent slopes	649	. 4
Chalfont silt loam, 2 to 6 percent slopes	3, 373	2. 3
Chalfont silt loam, 2 to 6 percent slopes, eroded	916	. 6
Chalfont silt loam, 6 to 12 percent slopes, eroded	872	. 6
Chalfont very stony silt loam, 0 to 6 percent slopes	165	. 1
Cut and fill land, clayey substratum	175	. 1

See footnotes at end of table.

409-526—72——2

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

Soil	Area	Extent
	Acres	*Percent*
Cut and fill land, gravelly material	2, 463	1. 7
Cut and fill land, rock substratum	2, 743	1. 9
Cut and fill land, stratified substratum	3, 089	2. 1
Downer fine sandy loam, gravelly clay loam substratum	319	. 2
Doylestown silt loam and Reaville silt loam, wet variant, 0 to 2 percent slopes	1, 973	1. 4
Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes	1, 274	. 9
Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes, eroded	247	. 2
Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes	381	. 3
Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes, eroded	402	. 3
Dragston and Woodstown sandy loams, 0 to 4 percent slopes	5, 020	3. 5
Elkton silt loam	1, 527	1. 0
Evesboro loamy sand, 0 to 5 percent slopes	1, 733	1. 2
Evesboro soils, sandy loam subsoil variants, 0 to 5 percent slopes	408	. 3
Fallsington sandy loam	1, 225	. 8
Fresh water marsh	2, 066	1. 4
Fort Mott loamy sand, 0 to 5 percent slopes	1, 157	. 8
Fort Mott loamy sand, 5 to 10 percent slopes	229	. 2
Galestown loamy sand, 0 to 5 percent slopes	1, 398	1. 0
Galestown sandy loam, 0 to 6 percent slopes	355	. 3
Klej soils, sandy loam subsoil variants	1, 034	. 7
Klinesville shaly loam, 6 to 12 percent slopes	930	. 6
Klinesville shaly loam, 12 to 30 percent slopes	793	. 6
Lansdale sandy loam, 2 to 6 percent slopes	308	. 2
Lansdale channery loam, 6 to 12 percent slopes, eroded	208	. 1
Lansdale channery loam, 12 to 18 percent slopes, eroded	141	. 1
Lansdale very stony loam, 0 to 12 percent slopes	70	. 1
Lansdale very stony loam, 12 to 30 percent slopes	52	(1)
Lawrenceville and Mount Lucas silt loams, 0 to 2 percent slopes	353	. 2
Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes	1, 579	1. 1
Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, eroded	339	. 2
Lawrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded	296	. 2
Legore gravelly loam, 6 to 12 percent slopes	167	. 1
Legore gravelly loam, 12 to 18 percent slopes	357	. 2
Legore gravelly loam, 18 to 30 percent slopes	646	. 4
Lehigh silt loam, 0 to 6 percent slopes	355	. 2
Lehigh silt loam, 2 to 6 percent slopes, eroded	195	. 1
Lehigh silt loam, 6 to 12 percent slopes, eroded	334	. 2
Lenoir-Keyport silt loams	893	. 6
Made land, dredged river materials	193	. 1
Matapeake loam, 0 to 2 percent slopes	2, 524	1. 7
Matapeake loam, 2 to 5 percent slopes	5, 278	3. 6
Matapeake loam, 5 to 10 percent slopes, eroded	270	. 2
Mattapex and Bertie loams	7, 659	5. 2
Mount Lucas very stony silt loam, 0 to 6 percent slopes	1, 344	1. 0
Mount Lucas very stony silt loam, 6 to 12 percent slopes	83	. 1
Neshaminy silt loam, 0 to 6 percent slopes	1, 378	1. 0
Neshaminy silt loam, 6 to 12 percent slopes	214	. 1
Neshaminy silt loam, 6 to 12 percent slopes, eroded	221	. 2
Neshaminy very stony silt loam, 0 to 12 percent slopes	1, 501	1. 0
Neshaminy very stony silt loam, 12 to 30 percent slopes	429	. 3
Othello silt loam	8, 239	5. 6
Penn shaly silt loam, 0 to 6 percent slopes	2, 964	2. 0
Penn shaly silt loam, 6 to 12 percent slopes	1, 634	1. 1
Penn shaly silt loam, 12 to 18 percent slopes	624	. 4
Pits	249	. 2
Plummer sandy loam	937	. 6
Plummer sandy loam, very wet	1, 151	. 8
Portsmouth silt loam, thin surface variant	1, 296	. 9
Quakertown silt loam, 0 to 6 percent slopes	3, 540	2. 4
Quakertown silt loam, 2 to 6 percent slopes, eroded	521	. 4
Quakertown silt loam, 6 to 12 percent slopes	451	. 3
Quakertown silt loam, 6 to 12 percent slopes, eroded	751	. 5
Quakertown channery silt loam, 2 to 6 percent slopes	320	. 2
Quakertown channery silt loam, 6 to 12 percent slopes	150	. 1
Quakertown channery silt loam, 6 to 12 percent slopes, eroded	213	. 2
Quakertown channery silt loam, 12 to 18 percent slopes, eroded	271	. 2
Readington and Abbottstown silt loams, 0 to 2 percent slopes	651	. 5
Readington and Abbottstown silt loams, 2 to 6 percent slopes	2, 120	1. 5
Readington and Abbottstown silt loams, 2 to 6 percent slopes, eroded	969	. 7
Readington and Abbottstown silt loams, 6 to 12 percent slopes, eroded	146	. 1
Reaville silt loam, 0 to 2 percent slopes	397	. 3
Reaville silt loam, 2 to 6 percent slopes	1, 961	1. 3
Reaville silt loam, 2 to 6 percent slopes, eroded	493	. 3
Reaville silt loam, 6 to 12 percent slopes, eroded	445	. 3
Rowland silt loam	1, 594	1. 1
Sandy and silty land, strongly sloping	264	. 2
Sandy and silty land, steep	281	. 2
Sassafras sandy loam, 0 to 2 percent slopes	1, 415	1. 0
Sassafras sandy loam, 2 to 5 percent slopes	9, 799	6. 7
Sassafras sandy loam, gently undulating	4, 780	3. 3
Sassafras sandy loam, 5 to 10 percent slopes, eroded	2, 229	1. 5
Sassafras gravelly sandy loam, 2 to 5 percent slopes	1, 739	1. 2
Sassafras sandy clay loam, 5 to 10 percent slopes, severely eroded	340	. 2
Sassafras-Woodstown sandy loams, gently undulating	495	. 3
Tinton loamy sand, 2 to 5 percent slopes	742	. 5
Tioga fine sandy loam	409	. 3
Urban land, Galestown material	838	. 6
Urban land, Sassafras material	618	. 4
Very stony land, Mount Lucas and Neshaminy materials, 0 to 12 percent slopes	756	. 5
Very stony land, Neshaminy material, 12 to 30 percent slopes	102	. 1
Very stony land, Watchung material	1, 155	. 8
Watchung silt loam	191	. 1
Woodstown-Fallsington sandy loams, gently undulating	222	. 2
	[2] 145, 900	100. 0

[1] Less than 0.05 percent.
[2] The total does not include approximately 1,300 acres of water.

to the crops that are grown in the area. The reaction is moderately acid to strongly acid, except in fields that have been limed. Natural fertility is moderate.

Limitations of the Abbottstown soils are moderate for use as homesites and severe for septic fields.

Representative profile of an Abbottstown silt loam in an idle field three-fourths of a mile north of Marshalls Corner, on the east side of the road near the railroad overpass:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; fine and medium, granular structure; loose; abrupt, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/6) silt loam; faintly mottled near bottom of horizon; weak, thick, platy structure; friable; gradual, wavy boundary.

B2tg—11 to 21 inches, yellowish-brown (10YR 5/6) heavy silt loam; many light-gray (5Y 7/1) and strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable; discontinuous, nonshiny coatings on ped faces; gradual, wavy boundary.

B3g—21 to 25 inches, mottled light-gray (5Y 7/1) and yellowish-brown (10YR 5/4) heavy silt loam; very weak, thick, platy structure breaking to weak, fine, subangular blocky structure; firm; discontinuous, nonshiny coatings on ped faces; clear, wavy boundary.

C1g—25 to 33 inches, light brownish-gray (2.5Y 6/2) silt or silt loam; brownish-yellow (10YR 6/8) and reddish-brown (5YR 5/3) mottles; strong, medium, subangular blocky structure; firm; clear, wavy boundary.

IIC2g—33 to 40 inches, yellowish-red (5YR 4/6), weathered, shattered shale mixed with fine soil material; light-gray (2.5Y 7/2) mottles.

IIR—40 inches +, red shale bedrock.

The Ap horizon in most places is silt loam, but in some minor areas it is shaly silt loam.

In the Ap horizon, the hue is 10YR or 7.5YR, the value is 4 or 3, and the chroma is 3 or 2. In the B horizon, the hue of the matrix is 10YR, 7.5YR, or 5YR, the value is 5 or 4, and the chroma ranges from 6 to 4. Faint mottles are present between depths of 7 and 11 inches, and prominent light-gray (5Y 7/1) and strong-brown (7.5YR 5/6) mottles begin just below a depth of 11 inches.

The amount of shale fragments in all horizons ranges from 0 to 10 percent. In some places a very firm, brittle layer is in the lower part of the B horizon. The depth to bedrock ranges from 34 to 50 inches.

Abbottstown soils adjoin and grade to areas of Bucks, Penn, Reaville, and Readington soils. They have a mottled subsoil, which distinguishes them from Penn and Bucks soils. They are deeper than the Penn soils but are not quite so deep as the Bucks soils. They are also deeper than the Reaville soils. Gray mottling that is higher in the profile distinguishes them from Readington soils, which are better drained. The lower part of the subsoil of Abbottstown soils is less firm than that of Chalfont soils.

The Abbottstown soils in this county were mapped only in undifferentiated units of Readington and Abbottstown soils. These units are described under the Readington series.

Alluvial Land, Wet

Alluvial land, wet (Ad) is poorly drained and frequently flooded. The areas lie beside perennial streams in the Coastal Plain section of the county.

The surface layer ranges in texture from loam to sandy loam within short distances. It is dark brown to gray in most places, but it is black in some places where a large amount of organic matter has accumulated. The material under the surface layer ranges in texture from sandy loam to heavy sandy loam. Its main color ranges from very dark brown or dark reddish brown to light gray, and it is blotched or mottled with red or gray.

This land type is more sandy than the Rowland or the Bowmansville soils. It is mottled and has a surface layer much darker than that of the Galestown or Tioga soils.

Because of frequent overflows, variable texture, and wetness, this land type is rarely used for farm crops. Its best use is as pasture or woodland. Pastures can be improved by drainage to remove floodwaters rapidly. Sites on this land type are generally suited to dug ponds. (Capability unit Vw–27; woodland group 1w1)

Alluvial Land, Very Wet

Alluvial land, very wet (Ae) is very poorly drained and very frequently flooded. The areas lie beside perennial streams in the Coastal Plain section of the county.

The texture of the surface layer ranges from silt loam to fine sandy loam within short distances. The color of the surface layer ranges from dark reddish brown to black, and is black where a large amount of organic matter has accumulated. The subsurface layer is very dark gray mottled with brownish yellow and strong brown. The underlying material is normally sand or gravelly sand.

The dark-colored surface layer and the sandy or gravelly substratum distinguish this land type from the Bowmansville soils, which have a silty substratum.

This land type is saturated with water for nearly all of each year, but water does not stand on the surface. The land is best suited to use as woodland or as wildlife habitat. It can be used to a limited extent as pasture if it is drained. Some areas are suitable sites for dug ponds. Because of the very frequent floods, limitations of this land type are severe for use as homesites and as drainage fields for septic tanks. (Capability unit VIw–28; woodland group 1w1)

Aura Series

The Aura series consists of deep, well-drained soils that are commonly on upland divides and hilltops. These soils were formed in old, stratified, coarse sandy and gravelly sediments that appear to be remnants of larger and more continuous bodies. Weathering of these materials has been deep and complete. The chert, as well as the less resistant feldspars, has been softened.

The Aura soils lie in four different areas in the county. The largest area is in the Mercerville section. Another area is in the Extonville section, south of Robbinsville. Small areas are near Clarksville, north and south of U.S. Highway No. 1.

The plow layer of a typical Aura soil is very dark grayish-brown sandy loam and dark yellowish-brown gravelly sandy loam about 7 inches thick. This is underlain by a subsurface layer of strong-brown sandy loam about 4 inches thick. The upper part of the subsoil, beginning at a depth of about 11 inches, is reddish-brown to yellowish-red sandy loam. Below a depth of about 26 inches, the subsoil is red, firm gravelly sandy clay loam that extends to a depth of about 50 inches. The underlying material is gravelly sandy loam and coarse sand.

Permeability of the plow layer and the upper part of the subsoil of an Aura soil is moderate or moderately rapid. Permeability of the lower part of the subsoil generally is moderate to moderately slow, and that of the layer of sand and gravel beneath the firm subsoil is moderately rapid. Available water capacity is moderate. Natural fertility is moderate, and the reaction is strongly acid unless lime has been applied.

All areas of Aura soils in the county have been cleared of trees. These soils are well suited to fruits and vegetables. The Aura soils south of Robbinsville and those in the Clarksville area are cultivated. Those soils in the Mercerville area are used mainly for housing and commercial developments.

The subsoil and substratum of these soils are suitable for use in building roads. Much of the material is also suitable for earth embankments. Workable amounts of sand and gravel are present in many places. Many borrow pits have been excavated to obtain these materials.

The Aura soils provide stable foundations for houses and for low commercial buildings. Slow permeability in the subsoil is a moderate limitation for septic disposal systems, but deep trenches normally can be dug into more permeable strata.

Representative profile of Aura sandy loam, moderately firm, 2 to 5 percent slopes, under a stand of planted pine trees 30 to 40 years old:

O2—½ inch to 0, black (10YR 2/1) organic mat; soft and spongy; clear boundary.

Ap1—0 to 2 inches, very dark grayish-brown (10YR 3/2) sandy loam; much organic matter; massive; very friable; clear boundary.

Ap2—2 to 7 inches, dark yellowish-brown (10YR 4/4) gravelly sandy loam; massive, breaking to weak and moderate, medium subangular blocky structure; very friable; clear boundary.

A2—7 to 11 inches, strong-brown (7.5YR 5/6) sandy loam; very weak, thick, platy structure; friable; thin, indistinct clay coats; 5 to 8 percent gravel; diffuse boundary.

B1—11 to 16 inches, reddish-brown (5YR 5/4) to yellowish-red (5YR 5/6) sandy loam; very weak, medium and coarse, subangular blocky structure; friable; 5 to 8 percent gravel; diffuse boundary.

B21t—16 to 26 inches, yellowish-red (5YR 4/6) heavy sandy loam; weak, medium and coarse. subangular blocky structure; peds are more distinct in this horizon than in the B1 and appear redder; friable; 5 to 6 percent gravel; diffuse boundary.

B22t—26 to 50 inches, red (2.5YR 4/6 to 4/8) gravelly sandy clay loam; weak, medium, angular and subangular blocky structure; 40 to 45 percent gravel; firm; clay coats are distinct and quite thick; clear boundary.

C1—50 to 64 inches, yellowish-red (5YR 5/6) gravelly sandy loam; massive; friable; diffuse boundary.

C2—64 to 72 inches +, yellowish-red (5YR 5/8) coarse sand; some gravel; massive; friable.

The amount of gravel in the Ap horizon is variable. As an estimate, 90 percent of the gravel is quartz, and the rest is partly weathered chert, feldspar, flint, red shale, sandstone, and arkosic sandstone.

The combined thickness of the A and B horizons is 3 to 5 feet. The depth to the firm part of the B horizon ranges from 20 to 30 inches.

The texture of the B2 horizon is heavy sandy loam, sandy clay, sandy clay loam, or light sandy clay loam. The hue of this horizon ranges from 2.5YR to 7.5YR. The value is 4 or 5, and the chroma ranges from 4 to 8. This horizon is very hard when dry and generally is moderately firm when moist.

The material in the C horizons is unevenly weathered. It is yellowish red (5YR 5/6), strong brown (7.5YR 5/6), or reddish yellow (7.5YR 6/8). The C horizons generally are more sandy than the B horizons, but some layers or pockets of clayey material are present.

Aura soils adjoin areas of Sassafras, Woodstown, Mattapex, Othello, and Galestown soils. The firmer lower part of the subsoil and the excess of clay over silt in the lower part of the subsoil distinguish Aura soils from these adjoining soils. Aura soils do not have a mottled subsoil as do Mattapex, Woodstown, and Othello soils. The amount of clay in the subsoil is much greater in Aura soils than in Galestown soils.

The lower part of the subsoil of the Aura soils in this county is less firm than that of typical Aura soils. For that reason the Aura soils in this county have been named as moderately firm.

Aura sandy loam, moderately firm, 2 to 5 percent slopes (AfB).—This soil has the profile described as typical of the series. Pebbles, mostly quartz, generally are present in the surface layer, but in most places the amount of gravel is less than 15 percent. Some small areas of gravelly sandy loam, in which gravel makes up more than 15 percent of the surface layer, were included in the mapping. The sandy loam holds more moisture than the gravelly sandy loam.

In areas near Clarksville that were included with this soil in mapping, the subsoil is more red than that described in the representative profile, and the texture of the subsoil ranges from sandy clay to sandy loam in short horizontal distances. Firmness of the subsoil in these included areas varies with the texture, and the consistence ranges from very firm to friable.

Wheat and corn are the common crops on this Aura soil. Small acreages of vegetables are planted occasionally. The firm lower subsoil does not limit normal development of roots.

This soil tends to become compact if vegetables and fruits are grown continuously. When compaction occurs, the hazards of runoff and erosion become intense. Subsoiling is effective in reducing compaction and restoring normal aeration and permeability. Contour cultivation, cover crops, and rotations that include sod crops are also useful to help maintain porous soil. (Capability unit IIe-5; woodland group 3o1)

Aura sandy loam, moderately firm, 5 to 10 percent slopes (AfC).—This soil has a profile similar to the one described as representative of the series, but its surface soil is thinner. In most places several inches of the original surface layer have been removed by erosion. In some places part of the more sticky subsoil has been mixed into the present plow layer. Shallow gullies are common. The eroded spots hold less available water than the uneroded areas, and crops on eroded fields do not mature evenly. Because clayey material has been mixed into the plow layer, the eroded spots are harder to work than are the uneroded areas.

Included with this soil in mapping were areas near Clarksville in which the subsoil is more red than that described in the representative profile, and in which the texture of the subsoil ranges from sandy clay to sandy loam in short horizontal distances. Firmness of the subsoil in these included areas varies with the texture, and the consistence ranges from very firm to friable. Other inclusions in the areas mapped are small areas where the surface layer is gravelly sandy loam.

This mapping unit is sloping, and the risk of erosion is the dominant limitation in producing crops. Runoff is rapid. Filling of gullies is needed. One or more conservation practices, such as contour farming, cover crops, terraces, diversions, stripcropping, grassed waterways, and crop rotations that include sod crops, are likely to be needed to control erosion and to maintain porous soil. (Capability unit IIIe-5; woodland group 3o1)

Bertie Series

The Bertie series consists of deep, somewhat poorly drained, nearly level soils on flats and in circular depressions throughout the Coastal Plain section. These soils were formed mostly in a silty mantle that is underlain by sandy and gravelly material. The sand and gravel are generally underlain by clay at a depth of 3½ to 10 feet. Quartz pebbles are scattered over the surface in many places, and there are a few boulders larger than 10 inches in diameter.

The surface layer of a typical Bertie soil is dark-brown or dark grayish-brown loam about 12 inches thick. The subsoil, about 20 inches thick, is yellowish-brown silt loam that is distinctly mottled with light gray, grayish brown, and light brownish gray. Below the subsoil is mottled fine sandy loam.

In Bertie soils the water table rises into the subsoil in winter and limits use. If the soils are adequately drained, they are suited to potatoes, vegetables, and the other common farm crops. Permeability is moderately slow to a depth of 30 inches, moderate in places where the substratum is sandy and gravelly, and slow in the underlying clay. Available water capacity is high. Natural fertility is moderate, and the reaction is very strongly acid unless lime has been applied.

Limitations of these soils are severe for use as foundations or as drainage fields for septic systems. If the water table is lowered by deep drainage, the limitations for these and other commercial or residential uses are reduced.

Representative profile of Bertie loam in an idle field one-half mile east of Edgebrook along U.S. Highway No. 130 on north side of road:

Ap—0 to 12 inches, dark-brown (10YR 4/3) loam; moderate, coarse and medium, granular structure; friable; abundant roots; clear, smooth boundary.

B21g—12 to 16 inches, yellowish-brown (10YR 5/6) silt loam; common, coarse, distinct, grayish-brown (10YR 5/2) and light-gray (10YR 7/1) mottles; moderate, medium, subangular blocky structure; slightly firm to friable; very thin, discontinuous coatings on some ped faces; few, medium roots; gradual, wavy boundary.

B22tg—16 to 27 inches, yellowish-brown (10YR 5/6) heavy silt loam; light brownish-gray (10YR 6/2) mottles; weak, platy structure breaking to weak, medium, subangular blocky structure; slightly firm; thin, shiny coatings on some ped faces; clear, wavy boundary.

B23g—27 to 32 inches, yellowish-brown (10YR 5/6) silt loam; light-gray (10YR 6/1) and light brownish-gray mottles; weak, medium, subangular blocky structure; friable; very faint, shiny coatings on some ped faces; gradual, wavy boundary.

Cg—32 to 60 inches +, mottled, yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/6), and light-gray (10YR 6/1) fine sandy loam; mottles are evenly distributed; weak, medium, granular structure; friable.

The A horizon in most places is loam, but there are some areas of silt loam. The color of the Ap horizon is mostly dark brown (10YR 4/3), dark grayish brown (10YR 4/2), or very dark grayish brown (10YR 3/2).

The texture of the B horizon is heavy loam, silt loam, heavy silt loam, or silty clay loam. The hue of the B horizon ranges from 10YR to 7.5YR. The value is 4 or 5, and the chroma ranges from 4 to 6.

The texture of the C horizon ranges from loam to sand and gravel, and in most places there are layers of clay somewhere between depths of 3½ and 10 feet. The hue of the C horizon ranges from 10YR to 5YR, the value from 4 to 6, and the chroma from 1 to 6.

Bertie soils adjoin and grade to areas of Matapeake, Sassafras, Mattapex, Othello, Lenoir, and Elkton soils. Their mottled subsoil and low position distinguish them from the Matapeake and the Sassafras soils. Bertie soils are not so gray as the Othello soils, but they are more gray and more prominently mottled near the surface than the Mattapex soils. They are more silty and much less clayey in the surface layer and subsoil than the Lenoir or the Elkton soils.

Bertie soils in this county were mapped only in an undifferentiated group of Mattapex and Bertie loams. That mapping unit is described under the Mattapex series.

Birdsboro Series

The Birdsboro series consists of deep, well-drained, nearly level to moderately sloping soils. These soils are on stream terraces, above flood level, along major streams in the Piedmont section of the county. They were formed in deposits of silty alluvium that was derived from materials weathered mainly from shale and sandstone. This alluvium was laid down when the streams were higher than they are now or when their flow was much greater than it is now. In many areas the Birdsboro soils in this county differ from normal Birdsboro soils because they are underlain by bedrock at a depth of 3 to 6 feet.

The surface layer of a typical Birdsboro soil is dark grayish-brown silt loam about 10 inches thick. The next 5 inches is silt loam that is slightly more yellowish than the surface layer and that crumbles easily when it is handled. The subsoil, between depths of about 15 and 32 inches, is brown to dark-brown silt loam that is slightly more clayey than the surface layer. The underlying material is reddish-brown sandy loam mixed with fragments of shale, sandstone, and quartzose gravel.

The permeability of a Birdsboro soil is moderate to a depth of 32 to 36 inches and moderately rapid in the underlying more sandy material. The available water capacity is high. The natural fertility is moderate, and the reaction is medium acid to strongly acid unless lime has been applied.

Almost all the areas of these soils have been cleared and used for farming. They are suited to corn, small grains, and soybeans.

Limitations of these soils as drainage fields for septic systems range from moderate to severe and depend on the depth to rock.

Representative profile of Birdsboro silt loam in a cultivated field on the east side of Quaker Road about 1,000 feet south of Princeton Pike (County Route 582):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium and fine, granular structure; very friable; abundant, fine roots; abrupt, smooth boundary.

A2—10 to 15 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable to slightly firm; many, fine roots; organic stains in root and worm channels; clear, smooth boundary.

B2—15 to 22 inches, brown (7.5YR 5/4) silt loam; heavier than the horizon above; weak, medium and coarse, subangular blocky structure; slightly firm; few, fine roots; discontinuous, very thin, slightly redder coating on vertical ped faces; some organic stains in root and worm channels; some shale fragments; few quartz pebbles; gradual, wavy boundary.

B3—22 to 32 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; very few, coarse roots; few, discontinuous, very thin coatings on some ped faces; some shale fragments and quartz pebbles; gradual, wavy boundary.

IIC1—32 to 48 inches, reddish-brown (5YR 4/4) sandy loam; very weak, granular structure; peds break easily to single grains; very friable to loose.

IIC2—48 inches +, shattered, loose shale and flat sandstone fragments mixed with sandy loam.

The dominant textures of the A horizon are silt loam and loam. The B horizon is silt loam in which the amount of clay is slightly greater than in the surface layer.

The color hue is 10YR to 7.5YR in the A horizon, 7.5YR to 5YR in the B horizon, and 5YR to 2.5YR in the C horizon. The browner colors in these ranges are dominant in the southern part of the Piedmont section of the county, and the redder colors are dominant in the northern part. The color of the soil horizons depends greatly on the source of the parent alluvium. The alluvium derived from shale is generally reddish, and that derived from argillite is generally more brown.

Rounded pieces of quartzose gravel and flat fragments of shale are present in various amounts in the profile, but generally they are not abundant. The depth to bedrock is variable, and in most places is between 3½ and 6 feet.

Birdsboro soils adjoin and grade to areas of Bucks, Penn, Klinesville, Rowland, and Bowmansville soils. Birdsboro soils are on terraces just above the flood plains, and their substratum is much more sandy than that of the Bucks soils. They are much deeper than the Penn or the Klinesville soils. They do not have the mottling that is distinctive in the Rowland and the Bowmansville soils.

Birdsboro loam, 0 to 6 percent slopes, (BbB).—The profile of this soil is similar to the one described as representative of the series, except that the texture of the surface layer is loam. Included in mapping were a few small areas having a surface layer of sandy loam. Also included in mapping were a few small areas in which slopes are greater than 6 percent.

This soil warms moderately early in spring and is easy to till. It is suited to corn, soybeans, small grains, hay, and pasture. Cover crops and a rotation that includes a sod crop are useful in reducing water erosion and in maintaining porous soil. (Capability unit IIe–55; woodland group 2o1)

Birdsboro loam, 2 to 6 percent slopes, eroded (BbB2).—The profile of this soil is similar to the one that is described as representative of the series. The surface layer is loam, however, and erosion has thinned the original surface layer by several inches. In some places so much soil has been removed that some of the more clayey subsoil has been mixed into the plow layer. A few gullies are present in some fields. Included in mapping this soil were small areas where the surface layer is sandy loam. Also included were a few areas having slopes between 6 and 12 percent.

Erosion has reduced the content of organic matter in the surface layer. Cover crops and a rotation that includes a sod crop are useful in reducing water erosion and maintaining porous soil. Capability unit IIe–55; woodland group 2o1)

Birdsboro loam, 6 to 12 percent slopes, eroded (BbC2).—The profile of this soil is similar to the one described as representative of the series, but the surface layer is loam and is thinner than the one described. Erosion has removed part of the original surface layer, and gullies are common. In some places the depth to the gravelly substratum and the depth to the underlying shattered rock are somewhat less than in the profile described. Included in mapping were some areas having slopes greater than 12 percent.

Runoff is rapid on this Birdsboro soil. The hazard of erosion and the tendency to be droughty are greater and the maintenance of a good supply of organic matter is more difficult than on the less eroded and less sloping Birdsboro soils. Intensive conservation practices that include use of cover crops and sod crops will help conserve moisture and reduce the hazard of erosion. This soil is suited to general farm crops if erosion is controlled. (Capability unit IIIe–55; woodland group 2o1)

Birdsboro silt loam, 0 to 2 percent slopes (BdA).—This soil is suited to most of the crops grown in the area. Runoff and erosion are slight and can be controlled by ordinary good management. The areas are near streams that are a good source of water for irrigation. (Capability unit I–55; woodland group 2o1)

Birdsboro silt loam, 2 to 6 percent slopes (BdB).—Included in areas mapped as this soil were some areas in which slopes are between 6 and 12 percent. The hazard of erosion is greater than on Birdsboro silt loam, 0 to 2 percent slopes.

This soil is suited to most of the crops grown in the county. If the slope is near the upper limit of the range, there is a hazard of erosion, and simple conservation practices are needed. Capability unit IIe–55; woodland group 2o1)

Birdsboro Series, Sandy Subsoil Variants

The sandy subsoil variants of the Birdsboro series are well drained and nearly level to moderately sloping. These soils were formed on stream terraces, in deposits of sandy alluvium, along the Delaware River and major tributary streams in the Piedmont section of the county. They are only moderately deep to bedrock.

The Birdsboro soils, sandy subsoil variants, that are along the Delaware River are much higher than the present river and are some distance away from it. These facts suggest that the alluvium was laid down when the river was much higher or when its flow was greater than it is now. This high alluvium appears to be somewhat older than the slightly deeper, more reddish alluvium that is along the smaller streams.

Typically, the plow layer of a Birdsboro soil, sandy subsoil variant, is dark-brown fine sandy loam about 9 inches thick. The subsoil is brown fine sandy loam about 7 inches thick. The substratum is yellowish-brown fine sandy loam. Shale bedrock is at a depth of about 34 inches.

The permeability of the surface layer in these soils is moderately rapid, and that of the subsoil and the substratum is moderately rapid.

All areas of these soils have been cleared and used for farming. Recently small acreages have been used for housing developments and for single homes. Supplemental irrigation is likely to be needed to obtain good growth and good quality of crops in very dry seasons.

These soils provide stable foundations for houses and other small buildings. Limitations are severe for disposal of sewage in individual systems. The normal depth to bedrock is not enough to insure good percolation of the effluent from septic tanks and proper filtration to prevent contamination of ground water.

Representative profile of a Birdsboro fine sandy loam, sandy subsoil variant, in a cultivated field on the north side of State Route 219 (freeway), one-fourth of a mile east of Route 29 and of Scudders Falls Bridge:

Ap—0 to 9 inches, dark-brown (10YR 4/3) fine sandy loam; moderate, fine and medium, granular structure; friable; numerous, fine roots; abrupt, smooth boundary.

B—9 to 16 inches, brown (7.5YR 5/4) fine sandy loam; slightly heavier than material of the horizon above; platy structure breaking to moderate, medium, subangular blocky structure; friable; some coarse and medium roots; clay bridges evident; organic stains in wormholes and on some ped faces; diffuse, wavy boundary.

C—16 to 34 inches, yellowish-brown (10YR 5/4) fine sandy loam; massive; friable; many shale fragments in the lowest 4 inches; gradual, smooth boundary.

IIR—34 inches +, jointed shale bedrock.

In areas of these soils along the smaller streams, the Ap horizon is dark grayish-brown loam. The B horizon in those areas is sandy loam that ranges in color from reddish brown toward dark brown or brown.

In areas along the Delaware River, the Ap horizon is dark-brown sandy loam or fine sandy loam. There the B horizon is fine sandy loam, and its color ranges from brown to strong brown.

In all areas the texture of the C horizon ranges from fine sandy loam to loamy sand. In some places the color of the C horizon is variegated because the sand grains are of different colors.

Rounded quartzose pebbles and fragments of sandstone and of red shale are present in various amounts throughout the profile. In most places they are not abundant. The depth to bedrock ranges from 32 to 72 inches and is normally between 34 and 50 inches.

These sandy subsoil variants of Birdsboro soils adjoin and grade to areas of Bucks, Quakertown, Penn, Klinesville, Chalfont, Rowland, and Bowmansville soils. They are more sandy than the Bucks and the Quakertown soils, which are silty. Birdsboro soils, sandy subsoil variants, are normally deeper, more sandy, less shaly, and more brown than the Penn soils, which are shallow, and the Klinesville soils, which are very shallow. They are not mottled, and they differ in that way from the Chalfont, Rowland, and Bowmansville soils, which are mottled and silty.

Birdsboro soils, sandy subsoil variants, 0 to 2 percent slopes (BnA).—The surface layer of these soils is fine sandy loam or loam. The soils are used for corn, small grains, and soybeans. They can be used intensively if care is taken to obtain and preserve good soil structure and to maintain a good supply of organic matter. Runoff and erosion are slight and can be controlled by ordinary good management. (Capability unit I–56; woodland group 2o1)

Birdsboro soils, sandy subsoil variants, 2 to 6 percent slopes (BnB).—The surface layer of these soils is sandy loam or loam. Included in mapping were small areas in which slopes are between 6 and 12 percent. Other inclusions in mapping were small areas in which the surface layer has been thinned several inches by erosion. Shallow gullies are present in some fields. The hazard of erosion is greater on the soils of this mapping unit than on similar but less sloping soils.

These sandy subsoil variants of the Birdsboro soils are used to produce corn, small grains, and soybeans. On areas that have slopes in the upper part of the range, measures are needed to control runoff and to reduce the hazard of erosion. (Capability unit IIe–56; woodland group 2o1)

Birdsboro soils, sandy subsoil variants, 6 to 12 percent slopes (BnC).—Erosion has thinned the surface layer of the soils in this mapping unit by several inches. A few gullies are present in some fields.

Because these soils are sloping, the hazards of runoff and erosion affect and limit the methods that can be used to produce crops. Practices are needed to reduce runoff, control erosion, and maintain porous soil. Practices to obtain these results are contour farming, cover crops, terraces or diversions, stripcropping, grassed waterways, and rotations that include a sod crop.

If these soils are used as homesites, erosion is a hazard until a lawn is established. (Capability unit IIIe–56; woodland group 2o1)

Birdsboro Series, Gravelly Solum Variants

These variants of the Birdsboro series consist of deep, well-drained to somewhat excessively drained soils that were formed in deep, sandy and gravelly alluvium. These nearly level or gently sloping soils are on stream terraces in small areas along Assunpink Creek, east of Trenton, along the lower reaches of Stony Brook near Penns Neck, and along the Millstone River near Princeton Junction.

The plow layer in one of these gravelly solum variants of Birdsboro soils typically is dark-brown gravelly sandy loam about 7 inches thick. The subsoil, about 21 inches thick, is dark-brown gravelly sandy loam. The substratum is reddish-brown gravelly sandy loam to loose, dark-brown sand and gravelly sand.

The permeability of the surface layer and subsoil is moderately rapid, and that of the substratum is rapid. Natural fertility is moderately low.

All the areas of these soils have been cleared and used for farming. They are suited to general farm crops. Because these soils are gravelly, their available water capacity is moderately low, and high-value crops must be irrigated often to assure good growth and quality.

These soils provide stable foundations for houses or low commercial buildings. Sewage disposal systems in them work well, but the rapid permeability of the substratum is likely to allow the sewage to contaminate nearby wells and streams.

Representative profile of a Birdsboro gravelly sandy loam, gravelly solum variant, in an idle field along U.S. Highway No. 1 near Allied Warehouse:

Ap—0 to 7 inches, dark-brown (10YR 3/3) gravelly sandy loam; single grain; very friable; abundant roots; clear, smooth boundary.

B1—7 to 11 inches, dark-brown (7.5YR 4/4) light gravelly sandy loam; massive, breaking to very weak, fine and medium, subangular blocky structure; friable; many fine roots; gradual, smooth boundary.

B21—11 to 17 inches, dark-brown (7.5YR 4/4) light gravelly sandy loam; content of clay is greater than in the horizon above; very weak, medium, subangular blocky structure; friable; few, fine and coarse roots; clay bridges weakly expressed; gradual, wavy boundary.

B22—17 to 28 inches, dark-brown (7.5YR 4/4) light gravelly sandy loam; massive; friable; clay bridges very weakly expressed; gradual, wavy boundary.
C1—28 to 35 inches, reddish-brown (5YR 4/4) gravelly sandy loam; single grain; loose; clear, wavy boundary.
C2—35 to 39 inches, dark-brown (7.5YR 4/4) sand; single grain; loose; abrupt, wavy boundary.
C3—39 to 52 inches +, dark-brown (7.5YR 4/4) gravelly sand; single grain; loose.

The Ap horizon is dominantly sandy loam or gravelly sandy loam. The B horizon is sandy loam, gravelly sandy loam, or fragments, flint, chert, and red shale.

These gravelly solum variants of Birdsboro soils adjoin and grade to areas of Galestown and Klej soils. They are slightly more clayey and much more gravelly than the Galestown soils. They are not mottled as are the Klej soils.

Birdsboro soils, gravelly solum variants, 0 to 5 percent slopes (BoB).—The surface layer of these soils is gravelly sandy loam or sandy loam. Where the surface layer is sandy loam, the content of gravel in the entire soil profile amounts to less than 15 percent.

The fertility of soils in this mapping unit is moderately low, and the available water capacity is moderately low. Irrigation is needed for high-value crops. The soils are porous, and normal good management that includes the growing of cover crops generally will maintain good soil structure.

The soils of this mapping unit are commonly used to produce wheat, corn, and soybeans. The soils are not so well suited to hay and pasture as to these crops. (Capability unit IVs-7; woodland group 2o1)

Bowmansville Series

The Bowmansville series consists of moderately deep or deep, poorly drained, nearly level soils on flood plains. These soils were formed in recent deposits of silty alluvium. They lie along the major streams in the Piedmont section of the county.

The surface layer of a typical Bowmansville soil is dark-brown silt loam about 6 inches thick. This is underlain by a layer of dark-brown silt loam that is distinctly mottled with gray and yellowish red in the lower part. The next layer is dark reddish-brown and reddish-brown silt loam that is mottled with gray, yellowish red, and dark red. Shale bedrock is present at a depth of about 44 inches.

The permeability is moderate throughout the soil profile. The water table is high during wet seasons, and floods are very frequent. Because of the wetness and floods, the safest use of these soils is as pasture or woodland. Most of the areas have been cleared and are used as pasture, but some are being covered again with trees.

Because floods are very frequent, these soils are severely limited for use as homesites.

Representative profile of Bowmansville silt loam that is covered with young trees, on the flood plain of Stony Brook, north side of Titusville Road, three-fourths of a mile east of State Route 31:

Ap—0 to 6 inches, dark-brown (7.5YR 4/2) silt loam; medium and coarse, granular structure; friable; abundant, fine, medium, and coarse roots; abrupt, smooth boundary.
C1—6 to 11 inches, dark-brown (7.5YR 4/2) silt loam; very thick, platy structure breaking to moderate, medium and fine, subangular blocky structure; friable; abundant, medium and coarse roots; gradual, wavy boundary.
C2—11 to 18 inches, dark-brown (7.5YR 4/2) silt loam; few, fine, distinct, gray (N 5/0) and yellowish-red (5YR 4/6) mottles; moderate, medium, columnar structure breaking to moderate, medium, subangular blocky structure; friable; few, coarse and medium roots; gradual, wavy boundary.
C3—18 to 36 inches, dark reddish-gray (5YR 4/2) silt loam; common, medium, distinct, gray (N 5/0) and yellowish-red (5YR 4/6) mottles; thick, platy structure; friable; occasional, coarse roots in upper 3 inches of this horizon; few shale fragments; clear, wavy boundary.
C4—36 to 44 inches, reddish-brown (5YR 4/3) silt loam; common, medium, faint, dark-red (2.5YR 3/6) mottles; platy structure; many small shale fragments.
IIR—44 inches +, shale bedrock.

The hue of the A horizon ranges from 10YR to 5YR and depends on the age of the alluvium. The reddish color that is dominant in the northern part of the Piedmont section indicates material that was washed mainly from red shale and sandstone. The browner material in the southern part of the Piedmont section was washed from argillite rock.

The color of mottles in the C horizon ranges from gray and yellowish red to strong brown and yellowish brown. Fine fragments of red shale are present in the soil in some places, but the amount generally is not more than 15 percent.

Bowmansville soils adjoin and grade to areas of Penn, Klinesville, Rowland, and Birdsboro soils. Their C horizon is mottled and gray closer to the surface than that of the Rowland and the Birdsboro soils. The Bowmansville soils are much deeper over bedrock than the Penn soils and the Klinesville soils, which are shallow.

Bowmansville silt loam (0 to 2 percent slopes) (Bt).—Small areas having slopes slightly greater than 2 percent were included with this soil in mapping. Three other kinds of areas were also included. Some areas are not covered by recent deposits of alluvium, and in them the surface layer is much darker than the one described. In other areas the soil is underlain by silty clay at a depth of 2½ to 4 feet. A few small areas of poorly drained soil on low terraces were also included in areas mapped as this soil. These low terraces are flooded only rarely.

This Bowmansville soil is not suited to the usual crops, because of very frequent floods. If adequately drained it is moderately well suited to pasture. Because of the very frequent floods, it is severely limited for use as homesites and as septic fields. (Capability unit VIw-86; woodland group 1w1)

Bucks Series

The Bucks series consists of deep, well-drained, gently sloping and sloping soils. These soils are on broad uplands in the Piedmont section of the county. Their upper layers were formed in a silty mantle that is underlain by red shale or argillite. The material of the mantle in some places shows signs that it has been transported, and some authorities believe it to be loess, which is wind-blown material.

The plow layer of a typical Bucks soil is dark-brown silt loam about 8 inches thick. The next layer, about 5 inches thick, is dark yellowish-brown silt loam. The upper part of the subsoil, beginning at a depth of about 13 inches, is dark-brown heavy silt loam. The lower part of the subsoil, below a depth of about 27 inches, is strong-brown shaly silt loam. This layer grades to weathered rock and, at a depth of 40 to 60 inches, to hard bedrock.

Permeability of the surface layers and of the upper part of the subsoil is moderately slow or moderate. Permeability of the lower part of the subsoil is moderately slow. Available water capacity in the root zone is high. Roots penetrate deeply, and crops on these soils respond well to fertilization and other good management. The reaction throughout the profile is strongly acid unless lime has been applied.

Almost all areas of Bucks soils have been cleared and farmed.

Limitations of these soils are only slight for foundations of houses and of low commercial buildings. Limitations for disposal of sewage in small systems are moderate to severe.

Representative profile of a Bucks silt loam in a cultivated field on the east side of Reed Road, 0.2 mile south of Diverty Road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; very friable; abundant, fine roots; gradual, smooth boundary.

A2—8 to 13 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure breaking to weak, fine and medium, granular structure; friable; abundant, fine roots; gradual, wavy boundary.

B1—13 to 18 inches, dark-brown (7.5YR 4/4) heavy silt loam; moderate, medium and fine, subangular blocky structure; friable; many roots; gradual, wavy boundary.

B2t—18 to 27 inches, dark-brown (7.5YR 4/4) heavy silt loam; very weak, very thick, platy structure breaking to moderate, medium and fine, subangular blocky structure; friable; many coarse roots; very thin, shiny, slightly reddish, discontinuous coatings on some ped faces and root channels; few shale fragments; clear, wavy boundary.

B3—27 to 39 inches, strong-brown (7.5YR 5/6) shaly silt loam; 40 to 50 percent reddish-brown (5YR 4/4), softened fragments of shale; thick, platy structure; friable; abrupt, wavy boundary.

IIC—39 to 48 inches, reddish-brown (5YR 4/4) weathered bedrock; soil material between shale fragments and in cracks is silty clay loam; massive; very friable; 60 to 70 percent shale fragments.

IIR—48 inches +, weathered bedrock.

The hue of the Ap horizon is 10YR, and both the value and the chroma are 3 or 4. The hue of the A2 horizon and the B horizon ranges mostly from 7.5YR to 10YR and rarely to 5YR. The value in those horizons ranges from 4 to 5, and the chroma from 4 to 6. The hue of the IIC horizon ranges from 2.5YR to 10YR, the value from 3 to 4, and the chroma from 2 to 4.

Texture of the B horizons ranges from heavy silt loam to light shaly silty clay loam. Texture of the IIC horizon is shaly silt loam to shaly clay loam or shaly silty clay loam.

Fine or very fine shale fragments make up 1 to 10 percent of the silty mantle. Coarse shale fragments make up 40 to 60 percent of the shaly lower B horizon. The thickness of the silty mantle is commonly 24 to 36 inches, but ranges from 20 to 40 inches.

Areas of Bucks soils adjoin and grade into areas of Penn, Readington, and Reaville soils. Bucks soils are deeper and much more silty than Penn soils. They do not have the mottled subsoil that is characteristic of the Readington soils and the Reaville soils.

Bucks silt loam, 0 to 2 percent slopes (BuA).—The profile of this soil is the one described as representative of the series. The depth to the shaly lower subsoil is normally 24 to 36 inches. Included in the mapping were some areas in which the depth to the shaly lower subsoil is 20 to 24 inches.

Corn, small grains, and grasses are the crops commonly grown on this soil. Normal good management generally will maintain good soil structure.

Limitations of this soil are slight for foundations of houses and other low buildings and moderate to severe for disposal of sewage from septic tanks. (Capability unit I–55; woodland group 3o1)

Bucks silt loam, 2 to 6 percent slopes BuB).—This soil has a profile similar to the one described as representative of the series. Included in mapping were small, eroded areas in which some of the subsoil, which is slightly more sticky than the original surface soil, has been mixed into the plow layer.

Because of the slopes, the hazard of erosion is moderate. This soil is suited to most crops grown in the area, but some measures are needed to control runoff and erosion.

Limitations of this soil are slight for foundations of houses and other low buildings and moderate to severe for disposal of sewage from septic tanks. (Capability unit IIe–55; woodland group 3o1)

Bucks silt loam, 2 to 6 percent slopes, eroded (BuB2).—This soil has a profile similar to the one described as representative of the series, except that erosion has thinned the original surface layer by several inches. In some places part of the slightly more clayey subsoil has been mixed into the plow layer. Also as a result of erosion, the depth to the shaly lower subsoil is less than in the profile described as representative.

Runoff is more rapid on this soil than on the less eroded Bucks soils. Maintaining an adequate supply of organic matter is more difficult. Cover crops and sod crops can be grown to help reduce runoff and conserve moisture. If erosion is controlled, this soil is suited to the common farm crops. (Capability unit IIe–55; woodland group 3o1)

Bucks silt loam, 6 to 12 percent slopes (BuC).—Because of the slope, runoff on this soil is rapid. The hazard of erosion is greater and the amount of moisture available for crops is likely to be smaller than on the gentler sloping Bucks soils. Conservation measures are helpful to reduce runoff and erosion in cultivated fields. This soil is suited to corn and small grains if erosion is controlled. Grasses also grow well.

Erosion control measures are needed if this soil is used for homesites. (Capability unit IIIe–55; woodland group 3o1)

Bucks silt loam, 6 to 12 percent slopes, eroded (BuC2).—This soil has a profile similar to the one described as representative of the series, except that erosion has thinned the original surface layer by several inches. In some places material from the subsoil, which is slightly more sticky than the original surface layer, has been mixed into the plow layer. Gullies have been formed in some fields. The depth to the shaly lower subsoil ranges from 20 to 30 inches. Because of eroded spots and the variable depth, uneven amounts of moisture are held, and uneven maturing of crops is common.

Runoff is rapid, and this soil tends to be a little more droughty than the less eroded Bucks soils. Maintaining an adequate supply of organic matter is also more difficult. Intensive conservation practices, along with cover crops and sod crops, can be used to help conserve moisture, reduce the hazard of erosion, and increase the content of organic matter. If erosion is controlled, this soil is suited to the common farm crops. (Capability unit IIIe-55; woodland group 3o1)

Chalfont Series

The Chalfont series consists of moderately deep and deep, somewhat poorly drained, gently sloping and sloping soils on uplands. These soils were formed partly in silty sediments of variable thickness and partly in underlying materials that were weathered from argillite and from dense, massive sandstone of the Triassic Lockatong Formation. They are in the northern part of the county near the Hunterdon County line.

The plow layer of a typical Chalfont soil is dark grayish-brown silt loam about 10 inches thick. Next is a layer of yellowish-brown silt loam about 3 inches thick. The subsoil, beginning at a depth of about 13 inches, is mottled dark yellowish-brown, brown, gray, and strong-brown heavy silt loam. It is firm or very firm below a depth of about 18 inches. The substratum, between depths of about 34 and 43 inches, is firm, dark-brown silt loam. This layer is underlain by shattered argillite bedrock at a depth of about 43 inches.

Chalfont soils have a firm or very firm, slowly permeable lower subsoil. In some places water flows laterally over the slowly permeable layer. The available water capacity is high, but because roots do not penetrate the firm subsoil, only the water above the firm layer is available to plants.

The soils contain excess water in winter and spring. If drained, the nonstony soils are suited to corn, small grains, hay, and pasture. The Chalfont soils are moderately fertile. Their natural reaction, if lime has not been applied, is medium acid to strongly acid. Some areas are suitable for water impoundments.

Because of the high water table, Chalfont soils have severe limitations for septic fields.

Representative profile of Chalfont silt loam, 2 to 6 percent slopes, in an idle field about 2 miles west of Hopewell along Brook Road, one-half of a mile north of County Route 518:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium and fine, granular structure in upper 4 inches; strong, medium and thick, platy structure in lower 6 inches; friable; abundant, fine and medium roots; abrupt, smooth boundary.

A2—10 to 13 inches, yellowish-brown (10YR 5/4) silt loam, faintly mottled; moderate, medium and thick, platy structure breaking to moderate, medium and fine, subangular blocky structure; friable; few, medium roots; clear, wavy boundary.

B2t—13 to 18 inches, mottled dark yellowish-brown (10YR 4/4), brown (10YR 5/3), and strong-brown (7.5YR 5/6) heavy silt loam; moderate, medium and coarse, subangular blocky structure; firm; occasional, medium roots; discontinuous, shiny, slightly reddish coatings on all ped faces; clear, wavy boundary.

Bx—18 to 34 inches, strong-brown (7.5YR 5/6) silt loam; many, medium and coarse, distinct, grayish-brown (10YR 5/2), light brownish-gray (10YR 6/2), and light-gray (10YR 7/1) mottles; moderate, medium and thick, platy structure; very firm to friable; continuous, reddish-brown (5YR 4/3), shiny films on ped faces; clear, wavy boundary.

IICx—34 to 43 inches, dark-brown (10YR 4/3) silt loam; many, medium and coarse, distinct, gray (10YR 6/1) and strong-brown (7.5YR 5/6) mottles; weak, medium, platy structure; firm; 10 to 15 percent coarse fragments; clear, wavy boundary.

IIR—43 inches +, shattered argillite bedrock.

The A horizon is dominantly silt loam. A few areas are very stony, and minor inclusions in the mapping units are shaly or channery. Texture of the B horizons ranges from silt loam and shaly, channery, or stony silt loam to silty clay loam. The depth to the very firm part of the B horizon ranges from 16 to 28 inches. Depth to bedrock ranges from 3 to 5 feet.

Chalfont soils adjoin and grade to areas of Bucks, Quakertown, Readington, and Abbottstown soils. They are much more firm in the lower subsoil than Bucks soils and are more firm throughout the profile than Readington and Abbottstown soils. The mottled upper subsoil distinguishes them from Quakertown soils.

Chalfont silt loam, 0 to 2 percent slopes (CdA).—In most places the silt loam surface layer of this soil is thicker than that in the soil described as representative for the Chalfont series, because material has been washed from surrounding slopes. Included in the mapping were small areas where the surface layer is shaly silt loam or channery silt loam.

Wetness is the major limitation in using this soil, and the firm subsoil is another limitation. This soil is well suited to mixed hay and to pasture. It is only fairly well suited to corn and small grains. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Open ditches to improve drainage will increase growth of plants and reduce the difficulties of farmwork that are caused by wet soil. Diversion of water that flows from steeper slopes will help prevent that water from adding to the need for drainage of this nearly level soil. Figure 3 shows a farm pond constructed on this soil. (Capability unit IIIw-70; woodland group 3w1)

Chalfont silt loam, 2 to 6 percent slopes, (CdB).—Included in mapping this soil were small areas in which the surface layer is shaly silt loam or channery silt loam.

***Figure 3.*—A pond on Chalfont silt loam, 0 to 2 percent slopes. This soil provides many sites for ponds that can be used for recreation, wildlife, and livestock water.**

Where this soil is farmed, wetness is the main limitation. The firm subsoil is also a limitation. Legumes and grasses that tolerate wetness are well suited to this soil. They can be grown for hay and pasture. Open ditches and diversions generally are needed to remove excess surface water if corn and small grains are grown. (Capability unit IIIw–70; woodland group 3w1)

Chalfont silt loam, 2 to 6 percent slopes, eroded (CdB2).—The profile of this soil is similar to the one described as representative of the series, except that the plow layer has been thinned several inches by erosion. In some places part of the more clayey subsoil has been mixed into the plow layer. Shallow gullies are common. Included in mapping were small areas where the surface layer is shaly silt loam or channery silt loam.

This soil is suited to the same crops as the less eroded Chalfont soils. Because the original surface layer has been thinned, crops do not grow so well as on the less eroded soils. The difficulties of maintaining fertility and a good supply of organic matter are greater than on the less eroded Chalfont soils. Rapid runoff, the results of past erosion, and the risk of further erosion require careful management and some erosion control measures for cultivation without damage. Open ditches to improve drainage will reduce the difficulties of farm operation that are caused by wetness. (Capability unit IIIw–70; woodland group 3w1)

Chalfont silt loam, 6 to 12 percent slopes, eroded (CdC2).—The profile of this soil is similar to the one described as representative of the series, except that erosion has thinned the original surface layer. Small, more strongly sloping areas were included in mapping. Included also in mapping were small areas of shaly silt loam and channery silt loam.

Runoff and the hazard of erosion are severe on this soil, and rather intensive conservation measures must be used to control erosion. Some areas, mainly seepy spots, are excessively wet.

This soil is well suited to hay and pasture plants that are tolerant of wetness. Corn and small grains do moderately well if erosion is controlled. (Capability unit IIIe–70; woodland group 3w1)

Chalfont very stoney silt loam, 0 to 6 percent slopes (CeB).—This soil has a profile similar to the one described as typical of the series, except that many stones and smaller fragments of rock are scattered over the surface and throughout the profile. The amount of stones is enough to hinder farmwork. Included in mapping were small areas having slopes greater than 6 percent. Erosion is slight, and runoff is moderate.

This soil is too stony to be cultivated, and removal of the stones is expensive. If stones have not been removed, the soil is well suited to pasture or trees. (Capability unit VIs–75; woodland group 3w1)

Cut and Fill Land

Cut and fill land consists of soil materials that have been so mixed by excavation, filling, or other disturbance that the original soil horizons have been destroyed. Because the areas consist of variable materials, the mapping units have not been placed in capability units or woodland suitability groups. Four mapping units of Cut and fill land were defined and mapped.

Cut and fill land, clayey substratum (Cf).—This land type consists of areas in which the original soil material has been removed or soil material has been brought in as a fill. The depth to the clayey substratum ranges from 1 foot to 2 feet where a cut has been made and from 4 to 8 feet where the area has been filled. The texture of the fill material ranges from silt to gravelly sand. Slopes of this mapping unit range from 0 to 5 percent.

The clayey substratum of this land type is firm and slowly permeable. Water remains perched above the clayey layer for some time after a heavy rain. Most of the areas have been developed as residential, commercial, or industrial sites. Some areas have not been developed. Onsite inspection is needed to determine the limitations of a site for most uses. (Capability unit and woodland group not assigned)

Cut and fill land, gravelly material (Cg).—This land type consists of mixed gravelly and sandy materials. In some places the original soil was removed, and the underlying gravelly sand was exposed. In other places gravelly sand was brought in as fill material. Slopes range from 0 to 5 percent.

The permeability of the gravelly sand is rapid in most places unless compaction has occurred by the use of heavy equipment. Most sites are well drained or excessively drained, except those areas where thin deposits of gravelly sand were made over wet sites in which the water table is high.

Most areas of this land type have been developed for residential, commercial, or industrial uses. Onsite inspection is needed to determine the limitations for homesites and for septic fields. (Capability unit and woodland group not assigned)

Cut and fill land, rock substratum (Ct).—This land type consists of areas in which the original soil material was removed and the underlying bedrock was exposed and areas where soil material was brought in as fill and spread over the rock. Slopes range from 0 to 6 percent.

In areas where soil was removed, the rock substratum is now at the surface. Vegetation is sparse to absent. The permeability ranges from moderate to slow, depending on the density of the rock, the slope of the bedding planes, and the degree to which the rock has been shattered.

In filled areas the depth to rock ranges from 2 to 8 feet. The texture of the fill material ranges from sand to clay, or the material may be mostly stone. The permeability is variable.

Most of the areas of this land type have been developed for residential, commercial, or industrial uses. Onsite inspection is needed at all sites to determine the degree of limitation for any proposed use. (Capability unit and woodland group not assigned)

Cut and fill land, stratified substratum (Cu).—This land type consists of areas in which the original soil was removed and the underlying substratum, which is mostly sandy and stratified, was exposed; and areas in which sandy soil material was brought in as fill and deposited over the original soil. Slopes generally range from 0 to 5 percent, although small areas in which slopes are between 5 and 10 percent are also in this mapping unit.

In the cut areas the texture of the material exposed is dominantly sandy. There are some areas, however, that are clayey or silty. Small amounts of gravel are present in some places. The permeability of the sandy and gravelly material is moderate to rapid; that of the silty or clayey material is more slow. The materials in most places are well drained.

In the filled areas the range of texture is generally wide and the permeability is unpredictable.

Most areas of this land type have been developed for residential, commercial, or industrial uses. Onsite inspection is needed to determine the degree of limitation for any proposed use. (Capability unit and woodland group not assigned)

Downer Series

The Downer series consists of deep, well-drained, nearly level to gently sloping soils. These soils were formed in sandy surficial terrace deposits in the Coastal Plain section. The main areas in this county are about 2 miles east of Mercerville.

The surface layer of a typical Downer soil is dark-brown fine sandy loam about 17 inches thick. The next layer is dark-brown fine sandy loam and sandy loam. At a depth of about 41 inches, there are thick, stratified layers of gravelly clay loam. These layers are more red and much more firm than the horizons above them, and the sand and gravel are more strongly weathered than those in the upper layers of soil.

The permeability of Downer soils is moderate. The available water capacity is moderate. Natural fertility is moderate, and the reaction is very strongly acid or extremely acid if the soil has not been limed.

Almost all the areas of these soils have been cleared and used for farming. The soils are suited to most crops grown in the area, including fruits and vegetables. Crops that have high value normally are irrigated.

The Downer soils have only slight limitations for use as homesites. They have moderate limitations for use as septic fields.

Representative profile of Downer fine sandy loam, gravelly clay loam substratum, in a cultivated field along Hughes Drive 2 miles east of Mercerville power lines:

Ap1—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; weak, fine to medium, granular structure; very friable; abundant, fine roots; diffuse, wavy boundary.

Ap2—8 to 12 inches, dark-brown (7.5YR 4/4) fine sandy loam; massive breaking to single grain; very friable; many, fine roots; diffuse, wavy boundary.

A2—12 to 17 inches, dark-brown (7.5YR 4/4) fine sandy loam; very weak, medium, subangular blocky structure; very friable; few, fine and coarse roots; diffuse, wavy boundary.

B1—17 to 22 inches, dark-brown (7.5YR 4/4) fine sandy loam; massive breaking to very weak, subangular blocky structure; very friable; few roots; diffuse, wavy boundary.

B2t—22 to 32 inches, dark-brown (7.5YR 4/4) fine sandy loam; more than 3 percent increase in clay compared to the Ap horizon; massive, breaking to very weak, medium, subangular blocky structure; friable; very thin, very faint, reddish clay films; diffuse, wavy boundary.

C1—32 to 41 inches, dark-brown (7.5YR 4/4) heavy sandy loam; massive breaking to fine, medium and coarse, blocky structure; firm; clay films on gravel and on gravel impressions; 5 to 10 percent gravel; clear, wavy boundary.

IIC2—41 to 66 inches, yellowish-red (5YR 4/8), stratified gravelly clay loam; massive; very firm to firm; thick clay films on pebbles and in pebble cavities; 20 percent gravel; diffuse, wavy boundary.

The dominant texture of the A horizon of Downer soils in this county is fine sandy loam. An A horizon of loamy fine sand is much less common. The B2 horizon is fine sandy loam. The IIC2 horizon is gravelly clay loam, sandy clay, or gravelly sandy clay, and 10 to 30 percent of it is slightly weathered, rounded, quartzose gravel.

The hue of the A2 horizon and the B horizon is 7.5YR, the value is 4, and the chroma ranges from 6 to 4. The hue of the IIC2 horizon is 5YR, the value is 4 or 5, and the chroma is 8.

The depth to the IIC2 horizon ranges from 40 to 66 inches.

The Downer soils adjoin and grade to areas of Sassafras, Evesboro, Fort Mott, and Klej soils. The Downer soils are much less clayey in the upper 40 inches than the Sassafras soils. They are slightly more clayey in the upper part of the profile than the Fort Mott and the Evesboro soils, and the sand grains in the upper part of the profile are finer than in those soils. The Downer soils in this county have a buried clayey horizon that distinguishes them from Galestown soils and from the sandy subsoil variants of Evesboro soils. The Downer soils contain no glauconite as do the Tinton soils.

Downer fine sandy loam, gravelly clay loam substratum (0 to 5 percent slopes) (Df).—Some areas having slopes between 5 and 10 percent were included with this soil in mapping. The surface layer in most places is 12 to 13 inches thick, but in a few places it has been thinned by erosion to an average thickness of 9 inches. The erosion hazard is slight in the areas of gentle slopes and moderate in the upper part of the slope range.

This soil is suited to a wide variety of crops. Where the slope is near 5 percent, careful management is needed to control erosion. (Capability unit IIe-5; woodland group 3o1)

Doylestown Series

The Doylestown series consists of deep, poorly drained soils on uplands. These soils were formed in a mantle of silty material that was weathered from red shale or, possibly, was deposited by wind. They are underlain by red shale or siltstone of the Triassic Brunswick Formation. The areas are scattered throughout the Piedmont section of the county. The slopes of these soils range from 1 to 12 percent but are mostly less than 6 percent.

The surface layer of a typical Doylestown soil is very dark grayish-brown to dark grayish-brown silt loam about 11 inches thick. The subsoil, about 28 inches thick, is gray, slightly heavier silt loam that is distinctly mottled with dark gray, light gray, strong brown, and yellowish brown. The substratum is pale-brown and yellowish-brown silt loam, and it, too, is distinctly mottled.

The permeability of the surface layer and the subsoil is moderately slow or moderate. The permeability of the subsoil and substratum is slow. The available water capacity of these soils is high. Natural fertility is moderate, and the reaction is medium acid or strongly acid unless lime has been applied.

Excess water causes the main restrictions in managing the Doylestown soils. The working season is delayed considerably by wetness. Drainage is needed if these soils are used for corn, small grains, or hay. Grasses and legumes that tolerate wetness will produce best in the hayfields and pastures.

Limitations of these soils are severe for use as homesites and as septic fields.

Representative profile of a Doylestown silt loam having a slope of 1 percent, in a hayfield one-fourth of a mile east of Pennington Circle:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, granular structure; friable; abundant, fine and medium roots; abrupt, smooth boundary.

A2g—7 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; common, coarse, distinct, light-gray (7.5YR 7/1) and few, fine, distinct, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/4) mottles; weak, very thick, platy structure breaking to moderate, fine, subangular blocky structure; friable; many, medium and fine roots; gradual, wavy boundary.

B21tg—11 to 17 inches, gray (10YR 5/1) silt loam; content of clay is 3 to 6 percent greater than in the horizon just above; many, coarse, distinct, dark-gray (7.5YR 4/1) and strong-brown (7.5YR 5/8) mottles; moderate, fine, prismatic structure breaking to moderate, medium, subangular blocky structure; firm; slightly sticky; very thin, discontinuous, dull coatings on some ped faces; very few, medium roots; diffuse, wavy boundary.

B22g—17 to 28 inches, gray (10YR 6/1) silt loam; 2 to 4 percent less clay than in the horizon just above; many, coarse, distinct, light-gray (7.5YR 7/1) and strong-brown (7.5YR 5/8) mottles and few, fine, distinct, yellow (10YR 7/8) mottles; moderate, fine, prismatic structure breaking to thick, platy structure; slightly firm; nonsticky; dull, very discontinuous clay films on some ped faces; occasional roots; diffuse, wavy boundary.

B3g—28 to 39 inches, gray (10YR 6/1) silt loam; many, coarse, distinct, yellowish-brown (10YR 5/6) and few, medium, distinct, dark-gray (7.5YR 4/1) mottles; very weak, very thick, platy structure; firm; nonsticky; clear, wavy boundary.

C1—39 to 47 inches, pale-brown (10YR 6/3) silt loam; many, faint, medium, light yellowish-brown (10YR 6/4) and yellowish-brown (10YR 5/8) mottles; very weak, thick, platy structure; slightly firm; nonsticky; gradual, wavy boundary.

C2—47 to 58 inches +, yellowish-brown (10YR 5/4) silt loam; common, coarse, distinct, gray (10YR 6/1) mottles; very weak, very thick, platy structure; firm; nonsticky.

In the A horizon, the hue is 10YR, the value is 3 or 4, and the chroma is 1 or 2. The B horizons are silt loam or silty clay loam. They are gleyed and distinctly mottled. The hue of the mottles is centered in 10YR but ranges to 7.5YR. The value is 5 or 6, and the chroma is 2 or less.

The thickness of the silty mantle ranges from 24 to more than 40 inches. The amount of coarse fragments in the upper solum is less than 5 percent in most places. In the lowest horizon, coarse fragments in some places make up more than 15 percent.

Doylestown soils adjoin and grade to areas of Abbottstown, Reaville, and Chalfont soils and of Reaville soils, wet variant. They are more gray and much deeper over bedrock than the Reaville soils and much deeper over bedrock than the wet variant of Reaville soils. Doylestown soils are more gray than Chalfont soils, and their subsoil is not so firm.

All the acreage of Doylestown soils in this county was mapped in undifferentiated groups with Reaville soils, wet variant.

Doylestown silt loam and Reaville silt loam, wet variant, 0 to 2 percent slopes (DgA).—This mapping unit consists of about 90 percent Doylestown silt loam. The rest is mainly Reaville silt loam, wet variant, but there are a few small areas of other soils. Some small areas of stony soils, most of them in wooded areas or pastures, were included in mapping.

The soils of this mapping unit are nearly level. They lie in depressions, in drainageways, and on the lower part of slopes. They are poorly drained, they remain wet until late in spring, and they warm slowly.

Both of these soils are better suited to pasture and trees than to tilled crops. If they are used for crops, open ditches are needed to remove the excess water. Bedding is likely to be needed in some places to speed up surface drainage. Legumes and grasses that can tolerate wetness are the best plants for hay or pasture. (Capability unit IVw–80; woodland group 3w2)

Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes (DgB).—These soils are gently sloping and are not quite so wet as the nearly level Doylestown and wet Reaville soils. Some water enters them by seepage from higher areas. Wetness is the principal limitation, and the soils tend to remain wet until late in spring.

The soils of this mapping unit are well suited to pasture and trees. Tilled crops can be grown if adequate drainage is provided. Drainage can be obtained by the use of bedding, graded strips, and diversions. Grazing should be delayed in spring until the soils are dry enough to resist puddling. (Capability unit IVw–80; woodland group 3w2)

Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes, eroded (DgB2).—These two soils are gently sloping, and erosion has thinned the original surface layer of each of them by several inches. Shallow gullies are common.

Wetness is the principal limitation of these soils, and there is some risk of erosion when they are farmed. These soils are well suited to pasture and trees. Diversions and graded strips are useful to provide drainage and to reduce the hazard of erosion. (Capability unit IVw–80; woodland group 3w2)

Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes (DgC).—About 90 percent of this mapping unit is Doylestown silt loam. The rest is Reaville silt loam, wet variant, and other soils. The Reaville silt loam, wet variant, is underlain by bedrock of dense argillite that is slowly permeable.

Because of wetness and the hazard of erosion, these soils are well suited to pasture or trees. Surface drainage and diversion of surface water could increase the productivity for pasture. (Capability unit VIw–80; woodland group 3w2)

Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes eroded (DgC2).—The profile of each of the two soils in this mapping unit is similar to the one described as representative of its series, except that erosion has thinned the original surface layer. The hazard of erosion on them is greater than on the less sloping Doylestown and Reaville soils. The Reaville silt loam, wet variant, is underlain by argillite bedrock.

Because of wetness, past erosion, and the serious erosion hazard, the soils of this mapping unit are well suited to pasture or trees. Surface drainage and diversion of surface water can increase their productivity as pasture. (Capability unit VIw–80; woodland group 3w2)

Dragston Series

The Dragston series consists of deep, somewhat poorly drained, nearly level soils. These soils are in low places and in circular depressions throughout the Coastal Plain section of the county. They were formed in medium-textured and moderately fine textured, quartzose material that is underlain by beds of sand, loamy sand, and sandy loam. These underlying layers are deeply weathered. Gravel is present in them in some places.

The surface layer of a typical Dragston soil is dark grayish-brown sandy loam about 10 inches thick. The subsurface layer is yellowish-brown sandy loam about 3 inches thick. The subsoil is yellowish-brown, mottled sandy loam. Mottles in the subsoil are generally distinct or prominent, but in the surface and subsurface layers they are fewer and much less prominent. Below a depth of about 26 inches, there is yellowish-brown gravelly sandy loam that has a salt-and-pepper appearance.

The water table in the Dragston soils late in winter is moderately high, and the subsoil is saturated. The wet subsoil delays farmwork in spring and restricts the kinds of crops that can be grown. Permeability of these soils is moderate to a depth of about 30 inches. It is moderately rapid below that depth except in places where layers of material finer than sandy loam are present. Artificial drainage corrects most of the limitations that are caused by wet subsoil. Tile drains work well in most places.

The reaction of these soils is extremely acid or very strongly acid unless lime has been applied.

Most areas of Dragston soils have been cleared and used for farming. These soils, when adequately drained, are useful to produce vegetables and the common farm crops. If these soils are used as homesites, deep drainage is needed to lower the water table and to prevent seepage in basements and poor drainage in septic fields.

Representative profile of a Dragston sandy loam in an idle field on Grovers Mill Road approximately 1½ miles west-southwest of Clarksville:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, granular structure; very friable; gradual, smooth boundary.

A2—10 to 13 inches, yellowish-brown (10YR 5/6) sandy loam; few, fine, faint mottles; massive, breaking to coarse and medium, subangular blocky structure; slightly firm; many, fine and medium roots; considerable staining by organic matter from the Ap horizon; gradual, wavy boundary.

B21g—13 to 18 inches, yellowish-brown (10YR 5/6) sandy loam; common, fine and medium, distinct to prominent mottles of light gray (10YR 7/2) and strong brown (7.5YR 5/8); moderate, medium, subangular blocky structure; friable; few, medium and coarse roots; gradual, wavy boundary.

B2tg—18 to 26 inches, yellowish-brown (10YR 5/4) heavy sandy loam; many, coarse, prominent mottles of light gray (5YR 7/1), gray (5YR 6/1), and strong brown (7.5YR 5/6); moderate, coarse and medium, subangular blocky structure; slightly firm; weak clay bridges; diffuse, smooth boundary.

C—26 to 60 inches +, yellowish-brown (10YR 5/6) gravelly sandy loam; salt-and-pepper appearance; massive.

The hue in all horizons of the profile generally is 10YR, but in a few places it is 2.5Y. The value in the Ap horizon is 3 or 4; in deeper horizons it is 5 or 6. The chroma in the Ap horizon is 2; in the A2 horizon and the B horizon it is 4 to 6, and in the C horizon it ranges from 4 to 8.

The texture of the B horizon ranges from heavy sandy loam to light sandy clay loam. The C horizon generally is more sandy than the B horizon, but in some places there are minor layers in which much clay and silt are mixed with the sand.

Rounded pieces of quartzose gravel are present in varying amounts throughout the profile, but in most places the amount of gravel is small. The thickness of the solum is normally 26 to 30 inches, but it is more in some places and less in others.

Dragston soils adjoin and grade to areas of Sassafras, Woodstown, and Fallsington soils. Dragston soils have a mottled subsoil, and Sassafras soils do not. Dragston soils are not so gray as the Fallsington soils. They are more poorly drained than the Woodstown soils. The layer just under the plow layer is mottled in Dragston soils but not in Woodstown soils.

All the acreage of Dragston soils in this county was mapped in an undifferentiated group of Dragston and Woodstown sandy loams.

Dragston and Woodstown sandy loams, 0 to 4 percent slopes (DwB).—Representative profiles of the two soils in this mapping unit are described under their respective series. The Dragston soil is the more extensive of the two in this mapping unit, and some of the mapped areas are made up entirely of it. Other areas consist of both soils in an intricate pattern. The two soils were mapped in one undifferentiated group because they are much alike and are suited to the same uses. The Dragston soil occupies lower positions in the landscape and as a rule is less sloping than the Woodstown soil.

The two soils of this mapping unit are nearly level. In some places soil material that was eroded from nearby sloping soils has been deposited on them. In those places the surface layer is abnormally thick.

A moderately high water table causes difficulty in using these soils. It is higher in the Dragston soil than in the Woodstown. Drainage of both soils is needed for optimum use. The amount of organic matter in these soils is a little greater than that in similar but well-drained soils. If the soils are adequately drained, they are suited to vegetables and the common farm crops.

Deep drainage is needed, if these soils are used as homesites, to aid percolation in septic fields and to prevent seepage in basements. (Capability unit IIw–14; woodland group 2w1)

Elkton Series

The Elkton series consists of deep, poorly drained, nearly level soils. These soils are in low places and in bottoms of circular depressions in the Coastal Plain section of the county. Most of the areas are small. These soils were formed in beds of acid clay.

The plow layer of a typical Elkton soil is dark-gray silt loam about 6 inches thick. The subsoil is dark-gray silty clay and clay; except in the uppermost 4 inches, it is distinctly mottled with light gray and yellowish brown, The substratum, below a depth of about 25 inches, is gray, mottled silty clay.

The available water capacity of Elkton soils is moderate. The permeability is slow. Water stands on the surface late in winter and during wet weather. The soils dry slowly, and they remain for a long time too wet to be worked. They are generally so slowly permeable that underdrains are not effective. Open ditches and bedding are the best practices for getting rid of excess water.

The natural reaction of these soils is extremely acid to very strongly acid. If the soils have not been limed, a large amount of lime is needed to correct their acidity. The natural fertility is moderate.

Many areas of Elkton soils have been cleared and used for farming. If undrained, the soils are well suited to pasture or trees. Where adequately drained they are suited to the common farm crops, hay, and pasture.

Limitations are severe if these soils are used as homesites or as sites for commercial buildings. The permeability of the soils is slow, and septic systems do not function well. Seepage of water into basements can be expected after a heavy or a prolonged rain.

Representative profile of Elkton silt loam in a pasture near Highstown on the first road north of State Route 33 just west of New Jersey Turnpike:

Ap—0 to 6 inches, dark-gray (10YR 4/1) silt loam; moderate, medium, granular structure; friable; numerous, fine and medium roots; clear, smooth boundary.

B1g—6 to 10 inches, dark-gray (10YR 4/1) silty clay; common, faint mottles; weak, coarse, subangular blocky structure; firm when dry, sticky when wet; occasional clay coats in root channels; many roots; clear, smooth boundary.

B2tg—10 to 25 inches, dark-gray (10YR 4/1) clay; many, fine to medium, distinct, yellowish-brown (10YR 5/6) and light-gray (N 7/0) mottles; strong, medium and fine, subangular and angular blocky structure; firm when moist, plastic when wet; continuous clay films on all ped faces; few roots; gradual, smooth boundary.

Cg—25 to 40 inches +, gray (5YR 6/1) silty clay; many, fine and medium, prominent, strong-brown (7.5YR 5/8) mottles; massive; firm when moist, plastic when wet.

The A horizon of Elkton soils in this county is predominantly silt loam. Areas of loam are of minor extent. The hue of the A and B horizons is 10YR. The hue of the C horizon is 5Y or, in a few places, 2.5Y. The value in the A horizon is 4 or 5 and in the B horizon ranges from 4 to 7. The chroma of the matrix in all horizons is 1, and that of the mottles ranges from 1 to 8.

The B and C horizons generally are silty clay or clay, but in some places there are layers of more sandy material.

The Elkton soils adjoin and grade to areas of Othello, Dragston, Fallsington, and Lenoir soils. They are much more clayey than the Dragston or the Fallsington soils, which are sandy, and the Othello soils, which are silty. The surface layer of Elkton soils is dark gray, but that of the Lenoir soils is dark grayish brown.

Elkton silt loam (Ek).—This soil is nearly level. In some places layers of fine sand are interbedded in the clayey substratum. Included in mapping were small areas of Lenoir soils.

The permeability of this Elkton soil is slow; this is too slow to permit practical removal of water by underdrains. Open ditches are more effective than underdrains for removing excess water, and bedding is needed in some places.

Wetness and slow permeability make the limitations of this soil severe for use as homesites or as sites for commercial buildings. Drainage fields for septic tanks do not function well, and seepage of water into basements can be expected. (Capability unit IIIw–18; woodland group 2w1)

Evesboro Series

The Evesboro series consists of deep, loose, excessively drained, sandy soils on uplands. These soils were formed in thick deposits of medium and coarse, highly quartzose sand that is not glauconitic. These soils are gently or moderately sloping. The areas are scattered throughout the higher parts of the Coastal Plain section of the county.

The surface layer of a typical Evesboro soil is loamy sand about 18 inches thick. The upper few inches of this layer is very dark gray. The rest of the surface layer is dark yellowish brown. Beneath the surface layer is a subsoil of strong-brown, loose loamy sand that extends to a depth of about 36 inches. The substratum is brownish-yellow coarse sand.

The permeability of Evesboro soils is rapid to a depth of more than 5 feet. The available water capacity is low, the soils are droughty, and crops must be irrigated frequently. Natural fertility is low, and added fertilizer is leached out easily. The soils are subject to wind erosion if they are not protected.

Almost all of the areas of Evesboro soils have been cleared and used for farming.

Limitations of these soils are slight for building sites and for septic fields. Permeability of the substratum is rapid, and drainage from septic fields might contaminate nearby shallow wells.

Representative profile of an Evesboro loamy sand in a wooded area adjacent to the abandoned trolley track northeast of Hughes Drive:

A1—0 to 4 inches, very dark gray (10YR 3/1) loamy sand; single grain; loose; numerous roots; clear, wavy boundary.

A2—4 to 18 inches, dark yellowish-brown (10YR 4/4) loamy sand; single grain; loose; numerous roots; clear, wavy boundary.

B—18 to 36 inches, strong-brown (7.5YR 5/6) loamy sand; single grain; loose; occasional, coarse roots; gradual, wavy boundary.

C—36 to 60 inches, brownish-yellow (10YR 6/6) coarse sand; single grain; loose.

The A horizon in most places is loamy sand or sand. There are minor areas of gravelly sand and of sandy loam. The B horizon is loamy sand or sand.

In fields that have been cultivated, the hue of the Ap horizon is 10YR. That of the deeper horizons is 10YR or 7.5YR. The color value is 3 or 4 in the Ap horizon and 5 or 6 in the deeper horizons. The chroma is 2 or 3 in the Ap horizon and ranges from 4 to 6 in the deeper horizons.

Rounded quartz gravel makes up 5 to 20 percent of the surface layer and 5 to 10 percent of the deeper horizons.

Evesboro soils adjoin and grade to areas of Sassafras and Woodstown soils and of the sandy loam subsoil variants of Klej soils. Evesboro soils are much less clayey and much more sandy than the Sassafras or the Woodstown soils. They are not mottled, and so differ from the distinctly mottled Klej soils, sandy loam subsoil variants. Evesboro soils contain little or no glauconite, and so differ from the Tinton soils. They are slightly more sandy than the Galestown soils, and the difference in clay content between the surface layer and the subsoil is less than in the Galestown soils.

Evesboro loamy sand, 0 to 5 percent slopes (EvB).—The surface layer of this soil in most places is loamy sand, but small areas of gravelly sand and of sand were included in mapping. Also included were small areas that have slopes of 5 to 10 percent.

In some low places, such as shallow, saucerlike depressions that have no outlets, ground water rises into the subsoil. The soil in these small, saucerlike inclusions is mottled in about the same way as the Plummer soils. Spot drainage and smoothing of these low places would make them more uniform and would make farmwork easier.

This Evesboro soil is easy to till, but it is droughty and subject to wind erosion if not protected. It is suited to sweetpotatoes, small fruits, peaches, melons, and early lettuce. Frequent irrigation of most crops is needed to obtain good growth and quality. This soil is generally not suited to pasture or hay.

If this soil is used as homesites, the lawn grasses must be varieties that can resist drought and tolerate low fertility, and the lawns must be watered regularly. (Capability unit IVs–7; woodland group 3o2)

Evesboro Series, Sandy Loam Subsoil Variants

The Evesboro series, sandy loam subsoil variants, consists of deep, well-drained, nearly level or gently sloping, sandy soils. These soils were formed in sandy materials on terraces in the Coastal Plain section of the county. In this county they are in a small area near Maple Shade and Gropps Lake.

The surface layer of one of these soils typically is dark-brown loamy fine sand to a depth of 6 inches. The next 4 inches is brown fine sandy loam. Below a depth of 10 inches, the substratum is brown and strong-brown fine sandy loam and sandy loam to a depth of about 68 inches.

The permeability of these soils is moderately rapid to rapid. Excess water drains away rapidly, and the soils can be worked soon after a heavy rain. Available water capacity is moderately low. Natural fertility is low.

All but an extremely small acreage of these soils has been cleared for farming. Irrigation is needed if crops of high value are grown. The soils are too droughty to produce good growth of hay or pasture plants. The soils become warm early enough in spring for planting of early vegetables.

These soils provide stable foundations for homes and for low commercial buildings. Their limitations are slight for disposal of sewage from septic tanks.

Representative profile of an Evesboro loamy fine sand, sandy loam subsoil variants, one-fourth of a mile east of Kuser Road on White Horse-Hamilton Square Road:

O2—1½ inches to 0, leaves from last year and a mixture of older, rotted leaves.

A1—0 to 6 inches, dark-brown (10YR 4/3) loamy fine sand; weak, fine, granular structure; very friable; abundant, fine roots; diffuse, wavy boundary.

A2—6 to 10 inches, brown (7.5YR 5/4) fine sandy loam; very weak, thick, platy structure; friable; many, fine and medium roots; diffuse, wavy boundary.

C1—10 to 27 inches, brown (7.5YR 5/4) fine sandy loam; massive; friable; few, medium and coarse roots; diffuse, wavy boundary.

C2—27 to 44 inches, strong-brown (7.5YR 5/6) sandy loam; massive; friable; firm, reddish-brown (5YR 4/4) nodules 3/4 of an inch to 2 inches in diameter; few, medium and coarse roots; diffuse, wavy boundary.

C3—44 to 68 inches, strong-brown (7.5YR 5/6) sandy loam; massive; friable; very few, medium and coarse roots; clear, wavy boundary.

C4—68 to 73 inches, very gravelly sand; single grain; loose; abrupt, smooth boundary.

C5—73 to 100 inches +, strong-brown (7.5YR 5/6), stratified sandy loam; single grain; friable when removed.

The A1 horizon in nearly all areas is loamy fine sand. Fine sandy loam is much less common. The C horizon is dominantly fine sandy loam or sandy loam, but there are strata of coarser textured material. In the C horizon the hue is 7.5YR, the value is 5, and the chroma ranges from 4 to 8.

The Evesboro soils, sandy loam subsoil variants, adjoin and grade to areas of Sassafras and Evesboro soils and of Klej soils, sandy loam subsoil variants. These variants of Evesboro soils have a subsoil that is much less clayey than that of the Sassafras soils. They are slightly more silty than the typical Evesboro and the Galestown soils, and the sand in the upper part of the profile is finer than in those soils. The lower subsoil of these Evesboro soils is not mottled, but that of the Klej soils, sandy loam subsoil variants, is distinctly mottled.

Evesboro soils, sandy loam subsoil variants, 0 to 5 percent slopes (EwB).—The surface layer of these soils is either loamy fine sand or fine sandy loam. A few areas in which slopes are 5 to 10 percent were included in mapping.

The soils of this mapping unit are easy to till. Their available water capacity is moderately low. They are suited to sweetpotatoes, small fruits, melons, early lettuce, and small grains.

Limitations of the soils of this mapping unit are slight for building sites and for septic fields. (Capability unit IIs–6; woodland group 3o2)

Fallsington Series

The Fallsington series consists of deep, poorly drained, nearly level soils. These soils are in low places and circular depressions scattered throughout the Coastal Plain section of the county.

The plow layer of a typical Fallsington soil is dark-gray, faintly mottled sandy loam about 8 inches thick. The subsoil is light brownish-gray sandy loam that is more clayey than the surface layer and is prominently mottled with yellowish brown and strong brown. At a depth of about 19 inches, the subsoil is underlain by stratified layers of sand and gravel.

The Fallsington soils, unless they have been drained, are almost constantly wet. The water table is near the surface in winter, and in summer its depth ranges from 2½ to 5 feet. The permeability of these soils is moderate to a depth of about 25 inches and rapid below that depth.

Many areas of Fallsington soils have been cleared for farming. If drained, the soils are suited to the common farm crops and to pasture. Even where the soils are drained, wetness delays plowing and planting in spring.

Limitations of these soils for homesites and for septic fields are severe.

Representative profile of Fallsington sandy loam in an idle field three-fourths of a mile east-southeast of Robbinsville along County Route 526, west of Valsing Airport, near the center of a housing development:

Ap—0 to 8 inches, dark-gray (10YR 4/1) sandy loam; few, faint mottles; massive breaking to coarse, granular structure; very friable; abundant, fine and medium roots; abrupt, wavy boundary.

B21g—8 to 11 inches, light brownish-gray (2.5Y 6/2) sandy loam; many, medium, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) mottles; massive breaking to weak, medium, subangular blocky structure; friable; few, medium and fine roots; faint clay bridges; clear, wavy boundary.

B22tg—11 to 19 inches, light brownish-gray (2.5Y 6/2) heavy sandy loam; common, medium, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5Y 5/8) mottles; massive breaking to moderate, medium, subangular blocky structure; slightly firm; few, coarse roots; some organic stains in root channels; weak clay bridges; abrupt, wavy boundary.

C1—19 to 26 inches, olive-yellow (2.5Y 6/6) coarse sand; common, fine, faint, brownish-yellow (10YR 6/6) mottles; single grain; loose; 3 to 5 percent rounded quartz pebbles; abrupt, smooth boundary.

C2g—26 to 35 inches, mottled brownish-yellow (10YR 6/8) and light-gray (2.5Y 7/2) sand; single grain; loose.

C3—35 to 43 inches, strong-brown (7.5YR 5/6) fine sand; single grain; loose.

C4—43 to 56 inches +, strong-brown (7.5YR 5/6) coarse sand and gravel; single grain; loose.

The A horizon in most places is sandy loam. There are some small areas of loam. The thickness of the A horizon varies from place to place and depends on the amount of soil material that has been washed from higher areas and deposited. These deposits are normally lighter in color than the typical A horizon of a Fallsington soil. The hue of a typical A horizon is 2.5Y or 10YR. The value in the A horizon is 3 or 4; in the B and the C horizons, 5 or 6. The chroma of the matrix is 1 or 2; that of the mottles is 5 or 6.

The texture of the B horizon is sandy loam or light sandy clay loam. Small amounts of rounded quartz gravel are present in some places, mainly in the A horizon and the C horizon.

The depth to the loose underlying material ranges from 20 to 30 inches.

The Fallsington soils adjoin and grade to areas of Woodstown and Dragston soils and of the thin surface variant of Portsmouth soils. They are more gray than the Woodstown and the Dragston soils. Their surface layer is not so dark as that of the thin surface variant of Portsmouth soils. The Fallsington soils are slightly higher than the thin surface variant of Portsmouth soils and slightly lower than the Woodstown and the Dragston soils.

Fallsington sandy loam (Fd).—This soil is nearly level. Included in mapping were small areas of Portsmouth silt loam, thin surface variant, and of Dragston sandy loam. Other inclusions are areas in which there are layers of clay at a depth of 3 to 6 feet.

Because this Fallsington soil is nearly level, runoff is slow, and water stands on some areas. The water table can be lowered by means of tile drains or open ditches. When drained this soil is suited to the common farm crops and to pasture. (Capability unit IIIw–21; woodland group 2w1)

Fort Mott Series

The Fort Mott series consists of deep, well-drained and somewhat excessively drained soils that for the most part are gently sloping. These soils were formed in beds of medium and coarse, quartzose sand and loamy sand that are underlain by somewhat finer, deeply weathered materials. The areas are along major streams, above flood stage, in the Coastal Plain section of the county.

The surface layer of a typical Fort Mott soil is dark-brown loamy sand about 8 inches thick. The subsurface layer is about 15 inches of yellowish-brown loamy sand. The subsoil, about 17 inches thick, is strong-brown sandy loam that crumbles easily when it is removed. The underlying material is very friable to loose loamy sand.

The permeability of the two upper layers is rapid. The permeability of the subsoil is moderate, and that of the loose, more sandy, deeper layers is moderately rapid.

Most of the areas of Fort Mott soils have been cleared and farmed. The soils warm up early, and they are easy to work. The upper layers are loamy sand, but the subsoil contains enough clay to prevent rapid percolation of water and rapid leaching of fertilizers.

These soils provide stable foundations for homes and for low commercial buildings. Lawns should be planted with grasses that resist drought and tolerate low fertility, and they should be watered regularly. The limitations of these soils are slight for disposal of sewage from septic systems.

Representative profile of a Fort Mott loamy sand in a cultivated field on the east side of South Lane at the corner of South Lane and Hickory Corner Road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) loamy sand; weak, fine, granular structure; very friable; abundant, fine roots; gradual, smooth boundary.

A2—8 to 23 inches, yellowish-brown (10YR 5/6) loamy sand; single grain; loose; few roots; gradual, wavy boundary.

B2t—23 to 33 inches, strong-brown (7.5YR 5/8) heavy sandy loam; moderate, medium, subangular blocky structure; slightly firm; distinct clay bridges; very few roots; gradual, wavy boundary.

B3—33 to 40 inches, strong-brown (7.5YR 5/8) sandy loam; moderate, medium, subangular blocky structure; friable; occasional roots; gradual, wavy boundary.

C—40 to 60 inches +, strong-brown (7.5YR 5/8) loamy sand; single grain; very friable to loose.

The dominant textures of the A horizon are loamy sand and sand. There are minor areas of sandy loam. The texture of the B horizon ranges from sandy loam to light sandy clay loam. The C horizon consists of stratified layers. They are mostly loamy sand, but in some places there are also layers of sandy loam.

In the B and C horizons, the hue ranges from 7.5YR to 10YR, the value is 4 or 5, and the chroma ranges from 6 to 8.

The Fort Mott soils adjoin and grade to areas of Sassafras, Woodstown, Dragston, and Matapeake soils. Their A horizon is thicker (23 to 26 inches thick) than that of the Sassafras soils. They are not mottled as are the Woodstown and the Dragston soils. Fort Mott soils are more sandy and much less silty than the Matapeake soils. They are not glauconitic as are the Tinton soils.

Fort Mott loamy sand, 0 to 5 percent slopes (FrB).—This soil is suited to sweetpotatoes, small fruits, peaches, melons, and early lettuce. Frequent irrigation is needed for good growth and quality of the crops. This soil is subject to wind erosion unless it is adequately protected.

Limitations for septic fields are slight. (Capability unit IIIs–6; woodland group 3o2)

Fort Mott loamy sand, 5 to 10 percent slopes (FrC).—The hazard of erosion on this soil is greater than on the less sloping Fort Mott soil. Included with this soil in mapping were small areas in which erosion has removed part or all of the surface layer and as much as 3 inches of the subsurface layer.

If erosion is controlled, this soil is suited to sweetpotatoes, small fruits, peaches, melons, and early lettuce. Irrigation is needed for good growth and quality of the crops.

Limitations of this soil are moderate for septic fields. (Capability unit IIIe–6; woodland group 3o2)

Fresh Water Marsh

Fresh water marsh (Fm) is nearly level marshland in which the mineral soil is under water most of the time. It is mostly in the Coastal Plain section of the county, and it lies along the large streams and along the Delaware

River. The level of tidewater in the Delaware River and the depth of the stream channels control the degree of drainage that would be possible. The areas of marsh along the major tributary streams are flooded during or shortly after heavy rains. The marsh along the Delaware River is flooded only when the tide is extremely high.

Fresh water marsh consists of a mat of organic material, a few inches to a few feet thick, that is largely decomposed or partly decomposed fibers and roots. Under the organic material is mineral soil of mottled gray to brown silt loam, sandy loam, silty clay loam, or sandy clay loam.

The natural vegetation consists of water-tolerant plants. The areas of marsh are not used for production of crops. It is not practical, under present economic conditions, to reclaim them for such use. The areas probably are best suited as habitat for wildlife (fig. 4). (Capability unit VIIIw-29; woodland group not assigned)

Galestown Series

The Galestown series consists of deep, loose, excessively drained, sandy soils. These soils are on terraces along the streams, and they are nearly level or gently sloping. They were formed in old alluvium that consists of thick deposits of sand or loamy sand along the Delaware River, the lower reaches of Crosswicks Creek south of Trenton, the Millstone River in the eastern part of the county, and along Assunpink Creek.

The surface layer of a typical Galestown soil is loamy sand about 17 inches thick. The upper part of this layer is dark yellowish brown, and the lower part is yellowish brown. The subsoil, about 15 inches thick, is yellowish-red loamy sand. The substratum is yellowish-brown, light yellowish-brown, and strong-brown fine sand.

Figure 4.—**An area of Fresh water marsh into which an excessive amount of silt has been washed.**

The permeability of Galestown soils is rapid or moderately rapid to a depth of more than 5 feet. The available water capacity is low or moderately low. The soils are droughty and infertile. They are susceptible to wind erosion, especially in the early part of spring. Fertilizers are leached out rapidly.

All of the areas of Galestown soils have been cleared for farming. Because the available water capacity is low, crops must be irrigated often to insure good yields and quality. These soils are suited best to crops that mature early or can tolerate drought. They are suited to early lettuce, sweetpotatoes, melons, and small fruits.

These soils provide stable foundations for homes and for low commercial buildings. Their limitations are slight for disposal of sewage from septic tanks. Because the soils and the substratum are rapidly permeable, however, there is a risk that the effluent will contaminate nearby wells and streams.

Representative profile of a Galestown loamy sand in an idle field on the west side of Broad Street in White Horse:

Ap1—0 to 2 inches, dark grayish-brown (10YR 4/2) loamy sand; single grain; loose; abundant, fine and medium roots; abrupt, smooth boundary.

Ap2—2 to 7 inches, dark yellowish-brown (10YR 4/4) loamy sand; single grain; loose; abundant, fine and medium roots; abrupt, wavy boundary.

A2—7 to 17 inches, yellowish-brown (10YR 5/6) loamy sand; very weak, subangular blocky structure; very friable; few, coarse roots; clear, wavy boundary.

B2t—17 to 32 inches, yellowish-red (5YR 4/5) loamy sand; content of clay more than 3 percent greater than in the horizon above; massive breaking to weak, coarse, subangular blocky structure; very friable; clear, wavy boundary.

C—32 to 60 inches, variegated yellowish-brown (10YR 5/6), 40 percent light yellowish-brown (10YR 6/4), and 10 to 15 percent strong-brown (7.5YR 5/8) fine sand; single grain; loose.

The A horizon in most places is loamy sand or loamy fine sand. These are minor areas of sand and gravelly loamy sand. The B horizon is generally light sandy loam, loamy sand, or loamy fine sand. Clay flows are less evident in the Galestown soils of this county than in typical soils of the series. The C horizon is generally fine sand, sand, loamy sand, or loamy fine sand. A small amount of gravel is in the substratum in some places.

The hue of the Ap horizon is 10YR or 7.5YR. The value there is 4, and the chroma is 2 to 4. The hue of the B horizon is 7.5YR or 5YR, the value is 4 or 5, and the chroma ranges from 4 to 6. The hue of the C horizon is 10YR or 7.5YR, the value is 5 or 6, and the chroma ranges from 6 to 8.

Galestown soils adjoin and grade to areas of Evesboro, Sassafras, and Matapeake soils. They are less clayey than the Sassafras soils. Galestown soils are less clayey and much less silty than the Matapeake soils. They are very slightly more clayey than the Evesboro soils.

Galestown loamy sand, 0 to 5 percent slopes (GaB).—This soil has the profile that is described as representative of the series. The surface layer is normally loamy sand, but small areas of sandy loam and of gravelly loamy sand were included in mapping. In addition, a few areas of slopes from 5 to 10 percent were included. Other areas included in mapping consist of a soil of similar texture and color in which there is a small amount of the mineral called glauconite. These glauconitic inclusions are near North Crosswicks along Doctors Creek and Crosswicks Creek.

This Galestown soil is easy to till. Its available water capacity is low. It is suited to sweetpotatoes, small fruits, peaches, melons, and early lettuce. This soil is generally not suited to pasture or to hay crops. If a large area is exposed to the wind, protection from wind erosion is needed.

If areas of this soil are used as homesites, grasses that resist drought and tolerate low fertility should be planted in the lawns. Regular watering of lawns is needed. (Capability unit IVs-7; woodland group 3o2)

Galestown sandy loam, 0 to 6 percent slopes (GeB).—This soil has a thicker surface layer than the other Galestown soils in this county, and it is underlain by sandstone bedrock. The thickness of the entire surface layer is normally about 30 inches, but it ranges from 20 to 33 inches. The depth to sandstone bedrock is most commonly about 6 feet, but it ranges from 4 feet to more than 8 feet.

The permeability of this soil is moderately rapid to a depth of more than 4 feet. The available water capacity is moderately low.

This soil is used to grow fruit, corn, small grains, and soybeans. It is suited to vegetables, but irrigation is needed to grow them. Runoff and erosion are slight.

This soil provides stable foundations for homes or low commercial buildings. Limitations for disposal of sewage are slight if the depth to bedrock is 6 feet or more and moderate if the depth is less than 6 feet. (Capability unit IIs-6; woodland group 3o2)

Keyport Series

The Keyport series consists of deep, moderately well drained, nearly level or gently sloping soils. These soils were formed in beds of acid clay. They are scattered in small areas throughout the Coastal Plain section of the county.

The surface layer of a typical Keyport soil is dark-brown silt loam about 10 inches thick. The subsoil is about 24 inches thick. The upper part of it is yellowish-brown silty clay that is faintly mottled below a depth of 16 inches. The lower part of the subsoil is dark yellowish-brown silty clay loam that is distinctly mottled with shades of gray. The substratum is dark-gray silty clay loam that is mottled with dark brown.

The permeability of the surface layer is moderately slow; that of the subsoil is slow. The available water capacity is moderate. The Keyport soils are normally wet during winter and spring, but some of the areas can be used as hayland or pasture without artificial drainage.

Most of the areas of these soils have been cleared and used for farming. Because of wetness they are suited only to general crops, hay, and pasture.

Because the Keyport soils are moderately well drained and slowly permeable, their limitations are severe for use as drainage fields for septic systems.

Representative profile of a Keyport silt loam in a cultivated field, three-fourths of a mile east of Edgebrook and east of U.S. Highway No. 130:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, medium and fine, granular structure; very friable; abundant, fine roots; clear, smooth boundary.

A2—7 to 10 inches, dark-brown (10YR 4/3) silt loam; weak, very thick, platy structure breaking to moderate, medium, subangular blocky structure; firm; few, coarse roots; abrupt, smooth boundary.

B21t—10 to 16 inches, yellowish-brown (10YR 5/4) silty clay; very weak, medium, prismatic structure breaking to strong, medium, angular blocky structure; firm, slightly sticky; thin, complete clay films on all peds; very few, coarse roots; gradual, smooth boundary.

B22t—16 to 26 inches, yellowish-brown (10YR 5/4) silty clay; faint, strong-brown (7.5YR 5/6) and brownish-yellow (10YR 6/6) mottles; prismatic structure breaking to strong medium, angular and subangular blocky structure; firm when moist, sticky when wet; thick, complete clay films on peds; clear, smooth boundary.

B23tg—26 to 34 inches, dark yellowish-brown (10YR 4/4) silty clay loam; common, medium, distinct, gray (10YR 5/1) mottles; moderate, medium, angular and subangular blocky structure; firm when moist, sticky when wet; thin, complete clay coats on peds; gradual, smooth boundary.

Cg—34 to 60 inches, dark-gray (N 4/0) silty clay loam; dark yellowish-brown (10YR 4/4) mottles; massive; slightly sticky to sticky.

The A horizon in most places is silt loam. There are some areas of loam and of sandy loam. The texture of the B horizon and of the C horizon ranges from silty clay to silty clay loam. In some places there are thin lenses of fine sand interbedded in the layers of the C horizon.

The hue in all horizons is 10YR or 2.5Y. The value ranges from 2 to 4 in the Ap horizon and is 4 or 5 in the B and C horizons. The chroma is 2 or 3 in the Ap horizon, and it ranges from 4 to 6 in the B horizon and from 0 to 2 in the C horizon.

The Keyport soils adjoin and grade to areas of Matapeake, Mattapex, Othello, and Lenoir soils. The Keyport soils have a mottled subsoil, and the Matapeake soils do not. The Keyport soils are not so gray as the Othello soils. They are not so gray in the lower part of the subsoil as the Lenoir soils. The Keyport soils have more clay in all their horizons than the Mattapex soils, which are more silty.

Keyport soils in this county were mapped only in a complex of Lenoir-Keyport silt loams.

Klej Series, Sandy Loam Subsoil Variants

These variants of the Klej series are deep, friable, moderately well drained to somewhat poorly drained, nearly level soils. These soils were formed in relatively recent sandy materials on terraces along the Delaware River, the lower reaches of Crosswicks Creek south of Trenton, and the Millstone River in the eastern part of the county.

The surface layer of one of these variants typically is dark-brown sandy loam about 10 inches thick. The subsoil is strong-brown sandy loam about 23 inches thick. This layer has in it little or no more fine material than the surface layer. It is distinctly mottled below a depth of 16 inches. The underlying material, below a depth of 33 inches, is grayish-brown mottled sandy loam and yellowish-brown loamy sand.

The water table in these soils during winter is normally at a depth between 16 and 24 inches. In summer it is more than 4 feet deep. In areas that have been drained artificially, the water table is more than 2 feet deep most of the time, and it does not remain high for long periods. The permeability of these soils is moderately rapid, and drainage ditches or tile lines can be spaced at wide intervals.

In these soils the content of organic matter is low, and their productivity is low. The soils are easy to till. When artificially drained, they are suited to tomatoes, peppers, eggplant, and small fruits. Drainage of some areas is not needed if general farm crops are to be grown.

Because of the moderately high water table, these soils have moderate limitations for use as septic fields. Deep drainage is needed to lower the water table for such use. The soils are rapidly permeable, however, and if they are drained and then used for disposal of sewage, there is a hazard of contaminating nearby wells and streams.

Representative profile of a Klej soil, sandy loam subsoil variant, in an idle field at the southeast corner of the intersection of White Horse-Mercerville Road and Klockner Road:

Ap—0 to 10 inches, dark-brown (10YR 3/3) sandy loam; very weak, fine, granular structure; very friable; abundant, fine roots; abrupt, smooth boundary.

B1—10 to 16 inches, strong-brown (7.5YR 5/6) sandy loam; very weak, fine, subangular blocky structure; very friable; many, fine roots; clear, smooth boundary.

B2—16 to 33 inches, strong-brown (7.5YR 5/6) sandy loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; very weak, medium, subangular blocky structure breaking to weak, fine, granular structure; very friable; few roots; amount of clay no greater than in the horizon above; clear, smooth boundary.

C1g—33 to 40 inches, grayish-brown (10YR 5/2) sandy loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; very friable; gradual, smooth boundary.

C2—40 to 60 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; loose.

The A horizon in most places is sandy loam or fine sandy loam. There are a few areas of loam and of loamy sand. Small amounts of rounded quartzose gravel are in all the horizons.

The hue in the A horizon is 10YR. In the deeper horizons, the hue is 10YR or 7.5YR. The value is 3 or 4 in the A horizon and 5 or 6 in the deeper horizons. The chroma is 2 or 3 in the A horizon and ranges from 4 to 6 in the B horizon.

The soils in the somewhat poorly drained range of these variants have a surface layer that is slightly darker than the one in the representative profile that is described. These somewhat poorly drained soils generally have mottles more distinct than those described in the representative profile, and the depth to mottling in some places is less than 16 inches.

These variants of the Klej soils adjoin and grade to areas of Woodstown, Evesboro, Galestown, and Plummer soils. They are mottled below a depth of 16 to 30 inches, but the Evesboro and the Galestown soils are not. The surface layer of these variants of the Klej soils is not so dark as that of the Plummer soils. These variants are less clayey in all horizons than are the Woodstown soils.

Klej soils, sandy loam subsoil variants (0 to 3 percent slopes) (Km).—The surface layer in most areas of this mapping unit is sandy loam or loamy sand. In most of the areas, the soil is moderately well drained. Some areas of somewhat poorly drained soil that have a surface layer and subsoil of gravelly sandy loam were included in mapping. The surface layer of the somewhat poorly drained soil is slightly darker than that of this moderately well drained soil, and the depth to mottling is less than 16 inches. Other inclusions in this mapping unit are areas in which there is a layer of clay below a depth of 36 inches. These areas occur in erratic patterns, and they could not be shown separately at the scale of mapping.

The soils of this mapping unit are nearly level, and there is no risk of water erosion on them. There is, however, a risk of wind erosion. Maintenance of organic matter and control of the water table are important items in managing these soils.

The soils of this mapping unit have moderate limitations for use as homesites. Deep drainage permits disposal of sewage from septic tanks, but then there is a hazard of contaminating nearby wells and streams. (Capability unit IIIw-16; woodland group 3o2)

Klinesville Series

The Klinesville series consists of shallow, well-drained to excessively drained, sloping to moderately steep soils on uplands. These soils were formed in materials weathered from shale and sandstone of the Triassic Brunswick Formation. Their depth over bedrock is 20 inches or less. Slopes range from 6 percent to more than 30 percent. These soils are scattered in the Piedmont section of the county.

The plow layer of a typical Klinesville soil is reddish-brown shaly loam about 9 inches thick. Fragments of shale make up 50 percent or more of this layer. Beneath the plow layer is a weak-red mixture of weathered shale and soil material. This mixture grades to bedrock of red shale at a depth of about 11 inches or less.

Permeability of the Klinesville soils above the shale is moderately rapid. Available water capacity of the soil is very low.

The natural fertility of these soils is low. Crops respond fairly well to added fertilizers and lime, but the soils are not able to hold even moderate amounts of plant nutrients. These soils are suited to hay, pasture, and trees. The soils do not hold enough water to keep crops growing well, even during dry spells that are short.

Limitations of these soils are severe for foundations of homes with basements because of the shallow depth of bedrock. Limitations are severe for disposal of sewage from septic systems for the same reason. When rainfall is heavy, the soil above the bedrock becomes saturated, water flows along the surface of the bedrock, and seepage into basements can be expected.

Representative profile of a Klinesville shaly loam in an idle field 1 mile north of Centerville on the Stony Brook Association farm off Wargo Road:

Ap—0 to 9 inches, reddish-brown (5YR 4/3) shaly loam; 50 percent or more shale fragments; weak, medium and fine, granular structure grading toward very thick platy structure near the bottom of the horizon; structure largely masked by shale fragments; very friable; abundant, fine and coarse roots; gradual, smooth boundary.

C—9 to 11 inches, weak-red (10R 4/3) very shaly loam; massive; loose; few, coarse roots; 70 to 90 percent shale fragments.

R—11 inches +, shale bedrock, in place but fractured.

The A horizon in most places is shaly loam. Areas of shaly silt loam are of minor extent. The amount of shale in the solum is generally 50 percent or more.

The color value of the Ap horizon is 3 or 4, and the chroma is 3 or 4. The hue of the C horizon ranges from 10R through 2.5YR to 5YR, the value is 3 or 4, and the chroma is 3 or 4.

The Klinesville soils adjoin and grade to areas of Penn, Readington, Abbottstown, and Reaville soils. They are shallower over bedrock than the Penn soils. They are not mottled as are the Abbottstown, Readington, and Reaville soils. They are much shallower than the Abbottstown and the Readington soils and are somewhat shallower than the Reaville soils.

Klinesville shaly loam, 6 to 12 percent slopes (KsC).—This soil has the profile that is described as representative of the series. The depth to bedrock ranges to 20 inches but is typically 11 to 13 inches. Included in mapping were small areas of Penn soils and very small areas of Bucks soils.

The hazard of erosion on this Klinesville soil is severe. The low content of organic matter, droughtiness, shallow depth to bedrock, and moderate slopes limit the use of this soil to hay, pasture, or trees. (Capability unit IVe-66; woodland group 4d1)

Klinesville shaly loam, 12 to 30 percent slopes (KsE).—This soil has a profile similar to the one described as representative of the series. The depth to bedrock is generally less than 12 inches.

The hazard of erosion on this soil is greater than on the less sloping Klinesville soil. The moderately steep slopes, low available water capacity, low fertility, and severe erosion hazard limit the use of this soil to hay, pasture, trees, or wildlife habitat. (Capability unit VIe-66; woodland group 4d1)

Lansdale Series

The Lansdale series consists of deep, well-drained, gently sloping to moderately steep soils. These soils have been formed in materials weathered from yellowish-brown sandstone. They are on low ridges in the Piedmont section of the county.

The plow layer of a typical Lansdale soil is dark-brown sandy loam about 8 inches thick. The subsoil is about 41 inches thick. The upper part of the subsoil is yellowish-brown sandy loam and sandy clay loam. The lower part is yellow and reddish-yellow very channery sandy clay loam, and the boundary is gradual. The underlying material is channery sand.

The permeability of the surface soil and subsoil is moderately rapid; that of the underlying material is rapid. The available water capacity of these soils is moderate. Roots penetrate deeply.

Most areas of Lansdale soils are wooded. Only small areas have been cleared and cultivated. If crops are grown, they respond well to fertilizers. These soils are moderately well suited to corn, small grains, alfalfa hay, and pasture.

Limitations of the Lansdale soils for use as homesites and as septic fields depend on the slope and the amount of rock fragments. They are described separately for some of the mapping units.

Representative profile of a cultivated Lansdale sandy loam at Marshalls Corner on Woodstown Road, one-eighth of a mile north of Mine Road, top of ridge on east side of road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) sandy loam; fine and medium, granular structure; very friable; abundant, fine and medium roots; abrupt, smooth boundary.

B1—8 to 13 inches, yellowish-brown (10YR 5/6) sandy loam; very weak, medium, subangular blocky structure breaking easily to medium granular structure; very friable; numerous roots; weak clay bridges; diffuse, wavy boundary.

B21t—13 to 20 inches, yellowish-brown (10YR 5/6) heavy sandy loam; weak, medium and fine, subangular blocky structure; friable; numerous roots; distinct clay bridges; few, discontinuous, thick, shiny films on vertical ped faces; diffuse, wavy boundary.

B22t—20 to 28 inches, yellowish-brown (10YR 5/6) light sandy clay loam; moderate, medium and fine, subangular blocky structure; friable; some coarse roots; distinct clay bridges; discontinuous, thick, waxy films on vertical ped faces; gradual, wavy boundary.

B23t—28 to 39 inches, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6) channery sandy clay loam; massive; firm; occasional coarse roots; distinct clay bridges; discontinuous, thick, wavy, waxy films in stone cavities and on vertical ped faces; 30 to 50 percent weathered sandstone fragments; gradual lower boundary.

B3—39 to 49 inches, yellow (10YR 7/6) and reddish-yellow (7.5YR 6/8) very channery light sandy clay loam; massive; firm; distinct clay bridges; 50 to 60 percent weathered sandstone fragments; gradual lower boundary.

C—49 to 60 inches, very pale brown (10YR 7/4) channery sand; massive; friable; 50 to 60 percent weathered sandstone fragments.

The hue of the Ap horizon is 10YR. The texture of the Ap horizon is sandy loam or loam. Some gravel is present. The hue of the B horizon is 10YR or 7.5YR. The value in the B1 and the B2 horizons is 5 or 4, and the chroma ranges from 4 to 8. The texture of the entire B horizon ranges from sandy loam to sandy clay loam, and stone fragments make up 13 to 50 percent of the volume. The C horizon is channery sand, and the amount of fragments ranges up to 60 percent by volume. The depth to bedrock ranges generally from 3½ to 6 feet, but in a few places is as much as 8 feet.

The Lansdale soils adjoin and grade to areas of Bucks, Readington, Abbottstown, and Quakertown soils. They are more sandy in all parts of their profile than the Bucks soils, which are silty. They are well drained and are not mottled as are the Readington soils, which are moderately well drained, and the Abbottstown soils, which are somewhat poorly drained. Their lower subsoil is not so firm as that of the Quakertown soils. Lansdale soils are more sandy in all horizons than the Neshaminy soils, which are silty.

Lansdale sandy loam, 2 to 6 percent slopes (LaB).—This soil has the profile described as representative of the series. Included in mapping were small areas in which more than 15 percent of the surface layer is thin, flat sandstone fragments. Included also were eroded areas in which part of the subsoil has been mixed into the plow layer. In some of these eroded areas, there are a few shallow gullies.

Corn, small grains, hay, and pasture plants are the crops commonly grown on this soil. Runoff and erosion are slight and can be controlled by simple practices such as contour farming and the growing of cover crops.

Limitations of this soil for use as homesites are slight. Limitations for use as septic fields are moderate to severe. (Capability unit IIe-58; woodland group 3o1)

Lansdale channery loam, 6 to 12 percent slopes, eroded (LcC2).—The slopes of most areas of this soil are fairly long, but some areas are narrow ridgetops. Erosion has been severe enough that some of the subsoil has been mixed into the plow layer. Thin fragments of sandstone, up to 6 inches long, make up more than 15 percent, by volume, of the surface layer and the subsoil. These fragments interfere slightly with farmwork. Included in mapping this soil were small areas of sandy loam and small uneroded areas.

Although the stone fragments reduce somewhat the runoff and the hazard of erosion, rather intensive conservation measures are needed where the soil is farmed.

Sod crops and cover crops help to reduce the moderate hazard of erosion and to conserve moisture.

If erosion is controlled, this soil is suited to the crops that are commonly grown in the county. Limitations of this soil for homesites are moderate. Limitations for use as septic fields are moderate to severe. (Capability unit IIIe-58; woodland group 3o1)

Lansdale channery loam, 12 to 18 percent slopes, eroded (LcD2).—The profile of this soil is similar to the one described as representative of the series. The surface layer is thinner, however, and flat fragments of sandstone make up more than 15 percent of each horizon. The hazard of erosion is more severe on this soil than on the less sloping Lansdale soils.

The strong slopes, sandstone fragments, and erosion limit the use of this soil and make it less productive than the more gently sloping Lansdale channery loam. This soil is poorly suited to row crops. It is suited to cultivation only in a long rotation in which hay is grown for several years. If this soil is cultivated, the maximum measures to control erosion are needed. (Capability unit IVe-58; woodland group 3o1)

Lansdale very stony loam, 0 to 12 percent slopes (LdC).—The profile of this soil is similar to the one described as representative of the series, except that stones more than 10 inches in diameter occupy more than 3 percent of the surface and are present in all the horizons. Most areas of this soil are wooded, and in those areas there is a thin, dark layer of organic matter on the surface.

The stones on this soil are numerous enough to make tillage for the common farm crops impracticable. The soil can be used to produce hay and pasture plants. Reseeding to improve pastures is feasible. Work on the sloping areas should be done across the slope. Stones can be removed from some areas if more land is needed for crops. After stones have been removed, this soil is suited to the same crops and needs the same care as Lansdale channery loam, 6 to 12 percent slopes, eroded. (Capability unit VIs-61; woodland group 3o1)

Lansdale very stony loam, 12 to 30 percent slopes (LdE).—This soil has a profile similar to the one described as representative of the series, but the stones on it are enough to prevent practical cultivation.

Because of the stones and moderately steep slopes, this soil is suited only to trees. (Capability unit VIIs-61; woodland group 3r1)

Lawrenceville Series

The Lawrenceville series consists of deep, moderately well drained soils on uplands. These soils were formed in silty material. They occur mainly in bands between ridges of traprock and the highly metamorphosed shale that lies close to those ridges. Other areas are scattered throughout the Piedmont section of the county.

The plow layer of a typical Lawrenceville soil is dark-brown silt loam about 8 inches thick. The next layer is yellowish-brown silt loam about 5 inches thick. The upper part of the subsoil, between depths of about 13 and 23 inches, is strong-brown silt loam that is slightly more clayey than the two upper layers. The subsoil, between depths of about 23 and 30 inches, is silt loam that is firm and is faintly to distinctly mottled. The distinctness of mottling depends on the degree of wetness, that is, the natural drainage. Beginning at a depth of about 30 inches is a layer, called a pan, of firm to very firm silt loam that is slightly more clayey than the layers above.

The permeability of the upper horizons is moderate. That of the lower subsoil is moderately slow. The available water capacity of the Lawrenceville soils is high, but the firm pan layer at a depth of about 30 inches prevents many plants from getting all the water that the soil holds. Heaving by frost is severe. If these soils are not artificially drained, the subsoil is saturated for short periods by a perched water table. The wet subsoil delays farmwork in spring and restricts the kinds of crops that can be grown. If surface water is diverted and drains are installed, some of these limitations caused by wetness can be overcome.

Natural fertility of the Lawrenceville soils is moderate. The reaction is moderately acid or strongly acid except in fields that have been limed.

Most areas of these soils have been cleared and cultivated. The crops most commonly grown on them are corn, small grains, soybeans, and hay. Some small areas are idle and are being covered with trees.

Because of the perched water table late in winter and early in spring, these soils are severely limited for disposal of sewage in individual systems.

Representative profile of a Lawrenceville silt loam in an idle field, 1¼ miles west of Mount Rose on the south side of Crusher Road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium and fine, granular structure; friable; abundant, fine, medium, and coarse roots; abrupt, smooth boundary.

A2—8 to 13 inches, yellowish-brown (10YR 5/4) silt loam; weak, thick, platy structure breaking to fine, subangular blocky structure; friable; many, fine and medium roots; many worm and root channels have been coated and filled with material from the Ap horizon; clear, wavy boundary.

B21t—13 to 23 inches, strong-brown (7.5YR 5/6) silt loam; slightly heavier than the A2 horizon; moderate, coarse, subangular blocky structure; friable; many medium roots; material from the Ap horizon coats some ped faces and also coats and fills many worm and root channels; few, discontinuous, dull, very thin films on some ped faces; gradual, wavy boundary.

B22t—23 to 30 inches, strong-brown (7.5YR 5/6) silt loam; few, medium, faint to distinct, light reddish-brown (5YR 6/3) and strong-brown (7.5YR 5/6) mottles; weak, thick, platy structure breaking to moderate, medium, subangular blocky structure; firm; vary few, medium roots; discontinuous, thin, shiny films on some ped faces; few, strongly weathered fragments of diabase; diffuse, wavy boundary.

Bx1g—30 to 45 inches, strong-brown (7.5YR 5/6) silt loam; many, coarse, distinct, gray (10YR 6/1), light brownish-gray (10YR 6/2), and reddish-gray (5YR 5/2) mottles; weak, thick, platy structure breaking to moderate, medium, subangular blocky structure; upper part firm and not brittle; lower part brittle; few, discontinuous, shiny films on some ped faces; few pieces of weathered diabase; gradual, wavy boundary.

Bx2g—45 to 60 inches, dark-brown (10YR 4/3) silt loam; few, medium, faint and distinct, light-gray (10YR 6/1), light brownish-gray (10YR 6/2), and strong-brown (7.5YR 5/8) mottles; massive; very firm; few, discontinuous, shiny films on broken faces; many pieces of soft, weathered, metamorphosed shale; few large pieces of diabase.

In the Ap horizon the hue is 10YR, the value is 4, and the chroma is 3 or 2. In the B horizon above the pan, the hue is 7.5YR or 10YR, the value is generally 5 but ranges to 6, and the chroma ranges from 4 to 6.

In some places small amounts of shale fragments are in the A and B horizons. In some places, also, there are a few fragments of diabase.

The Lawrenceville soils adjoin and grade to areas of Neshaminy, Mount Lucas, Lehigh, Readington, and Abbottstown soils. They have a mottled subsoil and a firm lower subsoil, and the Neshaminy soils do not. Their lower subsoil is firmer than that of the Mount Lucas soils. The Lawrenceville soils are lighter brown than the Lehigh soils. They are browner and deeper over rock than either the Readington or the Abbottstown soils. Their lower subsoil is a firm fragipan and is firmer than that of the Readington or the Abbottstown soils.

The Lawrenceville soils in this county were mapped only with Mount Lucas soils in mapping units that are undifferentiated groups.

Lawrenceville and Mount Lucas silt loams, 0 to 2 percent slopes (LeA).—The soils in this mapping unit have the profiles described as representative for their respective series. The Lawrenceville soil makes up about 60 percent of the total acreage. The Lawrenceville soil is generally in slightly lower positions than the Mount Lucas soil.

A fluctuating water table causes difficulty in using both of these soils. Drainage of both soils is needed for optimum use.

Because of the water table, limitations of the soils in this mapping unit are severe for disposal of sewage in individual systems. (Capability unit IIw–71; woodland group 2w1)

Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes (LeB).—A given area mapped as this undifferentiated unit may consist entirely of Lawrenceville soil, of Mount Lucas soil, or of both soils in any proportion. Artificial drainage and diversion of surface water are needed for most uses of the soils in this mapping unit. Control of runoff is needed if farming is done on slopes in the upper part of the range.

Because of wetness, both of these soils are severely limited for disposal of sewage in individual systems. (Capability unit IIw–71; woodland group 2w1)

Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, eroded (LeB2).—A given area mapped as this unit may consist entirely of Lawrenceville soil, of Mount Lucas soil, or of both soils in any proportion. The soils have profiles similar to those described as representative of their respective series, except that erosion has thinned the original surface layer by several inches. In some places part of the more clayey subsoil has been mixed into the plow layer. Gullies are common. Maintaining a good supply of organic matter is more difficult than on the less eroded Lawrenceville and Mount Lucas soils.

The soils of this mapping unit are subject to erosion if they are used for row crops. Diversion of surface water helps to reduce erosion. Artificial drainage helps to lower the water table. (Capability unit IIw–71; woodland group 2w1)

Lawrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded (LeC2).—Areas mapped as this undifferentiated unit may contain only Lawrenceville soil, only Mount Lucas soil, or some of both soils in any proportion. Erosion has thinned the original surface layer of each of the soils in this mapping unit. Small uneroded areas were included in mapping.

These two soils are sloping. Runoff on them is rapid, and the hazard of erosion is severe unless careful control measures are applied. If these soils are used for hay or pasture, grasses or legumes that tolerate wetness should be planted. (Capability unit IIIe–71; woodland group 2w1)

Legore Series

The Legore series consists of deep, well-drained soils on uplands. These soils were formed in materials weathered from diabase. Their slopes are mostly moderately steep, but the range is from moderate to steep. Legore soils are in the Piedmont section of the county.

The plow layer of a typical Legore soil is dark-brown gravelly loam about 8 inches thick. Next is a layer of reddish-brown gravelly loam about 3 inches thick. The subsoil is about 16 inches thick. The upper part is dark-brown gravelly loam, and the lower part grades to reddish-brown gravelly light clay loam. The substratum is reddish-brown very gravelly loam. The depth to bedrock or rock fragments is about 45 inches. Fragments of diabase are in all layers of the soil.

Permeability of the plow layer and of the substratum is moderately rapid; that of the subsoil is moderate. Available water capacity is moderate. The reaction is moderately acid or strongly acid unless lime has been applied. Natural fertility is moderate. Roots penetrate deeply.

Limitations of the Legore soils for use as homesites and for disposal of sewage depend on the slope. They are given separately for each of the mapping units.

Representative profile of a Legore gravelly loam in a pasture on Pleasant Valley Road 1½ miles west of Ackors Corner:

Ap—0 to 8 inches, dark-brown (7.5YR 4/4) gravelly loam; weak, medium and fine, granular structure; very friable; abundant, fine and medium roots; more than 15 percent diabase fragments 2½ to 6 inches in diameter; clear, smooth boundary.

A2-B1—8 to 11 inches, reddish-brown (5YR 4/4) gravelly loam; structure largely masked by gravel, but appears to be very weak, fine, granular; very friable; abundant, fine and medium roots; 15 percent diabase fragments 2½ to 6 inches in diameter; clear, wavy boundary.

B21t—11 to 19 inches, dark-brown (7.5YR 4/4) gravelly heavy loam; blocky structure; friable; few, coarse roots; discontinuous, faint, slightly reddish coats on ped faces; 15 to 20 percent diabase rock fragments 2½ to 6 inches in diameter; clear, wavy boundary.

B22t—19 to 27 inches, reddish-brown (5YR 4/4) gravelly light clay loam; fine, subangular blocky structure; firm; very few, coarse roots; distinct, slightly redder films on ped faces; 20 to 25 percent diabase rock fragments 2½ to 6 inches in diameter; clear, wavy boundary.

C—27 to 45 inches +, reddish-brown (5YR 4/4) very gravelly loam; massive; very friable; 40 percent diabase fragments 2½ to 12 inches in diameter; the number of fragments increases with depth.

R—45 inches +, weathered diabase bedrock or fragments.

The hue of the Ap horizon is 10YR or 7.5YR. The hue of the B horizon and the C horizon is 5YR or 7.5YR. The value in all horizons is 4, and the chroma ranges from 4 to 6.

The texture of the B horizon ranges from gravelly loam to gravelly light clay loam.

Legore soils adjoin and grade to areas of Neshaminy and of Mount Lucas soils. They are shallower and have coarser texture than the Neshaminy soils. They are not mottled, as are the Mount Lucas soils.

Legore gravelly loam, 6 to 12 percent slopes (LgC).—This soil has the profile described as representative of the series. Because of moderate slopes and the resulting rapid runoff, this soil is somewhat droughty. Some erosion has occurred, and included in mapping were small areas in which some of the more clayey subsoil has been mixed into the plow layer. In a few included areas, erosion has exposed the subsoil. Conservation measures are needed to reduce the erosion hazard if the soil is cultivated.

If erosion is controlled, this soil is suited to corn and small grains. Deep-rooted grasses and legumes grow well.

Limitations of this soil are moderate for use as homesites and for disposal of sewage in individual systems. (Capability unit IIIe-58; woodland group 3o1)

Legore gravelly loam, 12 to 18 percent slopes (LgD).—Some erosion of this soil has occurred. Included in mapping were small areas in which the surface layer has been thinned and part of the more clayey subsoil has been mixed into it. In a few included areas, the subsoil has been exposed.

The use of this soil is limited by the moderately steep slope, rapid runoff, and severe erosion hazard. The soil is poorly suited to row crops. It can be cultivated occasionally in a long rotation that includes several years of hay, if intensive erosion control measures are applied.

Limitations of this soil are severe for use as homesites and for disposal of sewage in individual systems. (Capability unit IVe-58; woodland group 3o1)

Legore gravelly loam, 18 to 30 percent slopes (LgE).—The profile of this soil is similar to the one described as representative of the series, except that the surface layer is thinner. The moderately steep slopes, rapid runoff, and severe erosion hazard make this soil unsuited to field crops or pasture. It is suited to trees and should have perennial cover to protect it from erosion. Limitations of this soil for use as homesites and for disposal of sewage in individual systems are severe. (Capability unit VIe-58; woodland group 3r1)

Lehigh Series

The Lehigh series consists of moderately deep, moderately well drained and somewhat poorly drained soils on uplands. These soils were formed in materials weathered from metamorphosed shale and siltstone. Their slopes range from 1 to 12 percent. These soils are in the Piedmont section of the county, along the edges of diabase intrusions where heat and pressure altered the adjacent shale and siltstone.

The surface layer of a typical Lehigh soil is very dark grayish-brown silt loam about 11 inches thick. The subsoil is very dark grayish-brown and dark grayish-brown, mottled, firm to very firm silt loam and silty clay loam. The substratum, beginning at a depth of about 29 inches, is black shaly silty clay loam that is mottled with gray and yellowish brown. The substratum grades to weathered rock at a depth of about 34 inches.

Permeability of the surface layer is moderate; that of the firm subsoil is moderately slow. These soils dry out slowly in spring because a perched water table persists above the firm subsoil and water moves laterally above the firm subsoil.

Lehigh soils are best suited to hay or pasture. With surface drainage they are moderately well suited to corn and small grains. Most of the areas have been cleared and are used for pasture, but many areas are idle and are reverting to trees.

Because the water table is moderately high and the depth to bedrock is only 2 to 4 feet, limitations of these soils are severe for disposal of sewage in individual systems.

Representative profile of a Lehigh silt loam in an idle field one-fourth of a mile west of U.S. Route 206 on the south side of Cherry Valley Road:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium and fine, granular structure; friable; abundant roots; clear, wavy boundary.

A2—7 to 11 inches, very dark grayish-brown (10YR 3/2) silt loam; very weak, thick, platy structure breaking to weak, medium and fine, subangular blocky structure; friable; abundant roots; clear, wavy boundary.

B1—11 to 17 inches, very dark grayish-brown (10YR 3/2) silt loam; few, fine, distinct, strong-brown (7.5YR 5/8) mottles; very weak, very thick, platy structure breaking to moderate, medium, subangular blocky structure; firm; few, coarse roots; few, discontinuous, dull films on some ped faces; clear, wavy boundary.

B21t—17 to 21 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; common, medium and coarse, prominent, light-gray (10YR 7/1), dark-brown (10YR 4/3), and strong-brown (7.5YR 5/6) mottles; moderate to strong, subangular blocky structure; firm; discontinuous, slightly shiny films on ped faces; diffuse, wavy boundary.

B22t—21 to 29 inches, dark grayish-brown (10YR 4/2) light silty clay loam; common, medium, distinct to prominent, gray (10YR 5/1), dark yellowish-brown (10YR 4/4), and strong-brown (7.5YR 5/6) mottles; strong, medium and coarse, subangular blocky structure; very firm; few shale fragments; shiny films on all ped faces; diffuse, wavy boundary.

C—29 to 34 inches, black (10YR 2/1) shaly silty clay loam; common, fine, distinct, gray (10YR 5/1) and yellowish-brown (10YR 5/6) mottles; thick, platy structure, but structure is masked by shale fragments; very firm; amount of shale fragments increases with depth; gradual, irregular boundary.

R—34 inches +, gray, partly weathered metamorphosed shale.

The A horizon is dominantly silt loam, but there are minor areas of shaly silt loam and channery silt loam. The B horizon is heavy silt loam, shaly heavy silt loam, silty clay loam, or shaly silty clay loam. The amount of shale fragments and flat sandstone fragments in all the horizons ranges from 5 to 40 percent. The depth to bedrock ranges from 2 to 4 feet.

The depth to the firm layer is commonly 18 to 24 inches, but it ranges from 16 to 26 inches.

The hue of the B horizon is 10YR or 7.5YR. The color value in all the horizons generally is 2, 3, or 4, but it ranges in some places to 5. The chroma ranges from 1 to 3. Much of the grayish color has been inherited from the grayish parent material; not all of it is the result of restricted drainage.

Lehigh soils adjoin and grade to areas of Penn, Reaville, Neshaminy, and Mount Lucas soils. They are not so brown as the Mount Lucas soils, and they are not so red as the Reaville soils. Lehigh soils have a prominently mottled subsoil, which distinguishes them from the Penn and the Neshaminy soils.

Lehigh silt loam, 0 to 6 percent slopes (LhB).—This soil has the profile described as representative of the series. In most areas the range of slope is 2 to 6 percent. Small nearly level areas, in which the surface layer is thicker than the one described in the representative profile, were included in mapping. Also included were small areas of Lehigh soils having a surface layer of shaly silt loam or channery silt loam; a Penn soil with a surface layer of silt loam; and a Reaville silt loam.

This Lehigh soil is well suited to mixed hay and pasture. It is only fairly well suited to corn and small grains. Grasses and legumes that tolerate wetness should be planted for hay and pasture. The soil generally is wet in spring, and early plowing is difficult. Open ditches will improve the drainage and increase the opportunity for uniform tillage and other farmwork. (Capability unit IIIw-70; woodland group 3w1)

Lehigh silt loam, 2 to 6 percent slopes, eroded (LhB2).—The profile of this soil is similar to the one described as representative of the series, except that the surface layer has been thinned several inches by erosion. In some places part of the more clayey subsoil has been mixed into the plow layer. Shallow gullies are common. Included in mapping this soil were small areas where the surface layer is shaly silt loam, and small areas of Penn and of Reaville soils.

This Lehigh soil is well suited to mixed hay and pasture. It is only fairly well suited to corn and small grains. Maintaining a good supply of organic matter is more difficult than on the less eroded Lehigh soils. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Open ditches to improve surface drainage will improve the opportunity for uniform farmwork. Rapid runoff, the results of erosion, and the risk of further erosion require careful management and some erosion control measures if this soil is to be cultivated without damage. (Capability unit IIIw-70; woodland group 3w1)

Lehigh silt loam, 6 to 12 percent slopes, eroded (LhC2).—The original surface layer of this soil has been thinned several inches by erosion. In many places so much of the original surface soil has been removed that part of the more clayey subsoil has been mixed into the plow layer. Shallow gullies are common. Small areas having slopes between 12 and 18 percent were included in mapping.

Because this soil is sloping, the hazards of runoff and erosion are severe, and intensive conservation measures are needed to control erosion. This soil is well suited to hay and pasture plants that tolerate wetness. Corn and small grains can be grown if erosion is controlled. Diversion of surface water helps reduce the wetness and control erosion. (Capability unit IIIe-70; woodland group 3w1)

Lenoir Series

The Lenoir series consists of deep, somewhat poorly drained, nearly level or very gently sloping soils. These soils were formed in deposits of acid clay. They occur in small areas throughout the county.

The plow layer of a typical Lenoir soil is dark grayish-brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish-brown silty clay that is faintly mottled above a depth of about 14 inches and distinctly mottled below that depth. The lower part of the subsoil, which extends to a depth of about 34 inches, is grayish-brown silty clay that is prominently mottled with strong brown. The material under the subsoil is dense silty clay.

Lenoir soils are wet much of the time because water moves slowly through the dense subsoil and substratum. Their available water capacity is moderate. The soils become ponded during winter and early in spring, and often late in spring. Heaving by frost is severe. The natural fertility of these soils is moderate. Their reaction is extremely acid or very strongly acid unless lime has been applied.

Many areas of Lenoir soils have been cleared and used for farming. The kinds of crops that can be grown are limited by the slow permeability and by the poor aeration that exists after the soils have been wet for a long time.

Limitations of these soils are severe for use as drainage fields for septic tanks. Seepage of water into basements can be expected in spring and in other seasons after heavy or prolonged rains.

Representative profile of a Lenoir silt loam in an idle field three-fourths of a mile east of Edgebrook and of U.S. Highway No. 130:

AP—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; massive breaking to moderate, subangular blocky structure; friable; abundant, fine roots; abrupt, smooth boundary.

B21—7 to 16 inches, yellowish-brown (10YR 5/4) silty clay; faintly mottled in most places but distinctly mottled with brownish yellow (10YR 6/8) and yellowish brown (10YR 5/8) near the bottom of the horizon; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky structure; firm when moist, slightly sticky when wet; thin, complete clay films on vertical ped faces; very few, coarse roots; gradual, wavy boundary.

B22tg—16 to 34 inches, grayish-brown (2.5Y 5/2) silty clay; many, medium, prominent, strong-brown (7.5YR 5/6) mottles; weak, thick, platy structure breaking to strong, medium, subangular and angular blocky structure; firm when moist, slightly sticky when wet; thick, shiny, complete clay films on all ped faces; occasional, coarse roots in vertical partings; clear, wavy boundary.

Cg—34 to 48 inches +, mottled olive-gray (5Y 5/2) and yellowish-brown (10YR 5/8) silty clay; massive; slightly sticky when wet.

The A horizon of Lenoir soils in this county is dominantly silt loam. Areas of loam are minor. The texture of the B and C horizons is silty clay or clay.

The hue of the Ap horizon is 10YR; that of the B horizon is 10YR or 2.5Y, and that of the C horizon ranges from 5Y to 10YR. The color value is 3 or 4 in the Ap horizon and ranges from 5 to 7 in the B and the C horizons. The chroma is 2 in the Ap horizon; it ranges from 2 to 5 in the B horizon and is 1 or 2 in the C horizon.

Lenoir soils adjoin and grade to areas of Matapeake, Mattapex, Bertie, Othello, Keyport, and Elkton soils. They have a mottled subsoil, and the Matapeake soils do not. They are not so gray as the Othello and the Elkton soils. The lower part of the subsoil of Lenoir soils is more gray than the subsoil of Keyport soils. Lenoir soils are much more clayey in the subsoil than the Matapeake, Mattapex, and Bertie soils, all of which are silty.

All the acreage of Lenoir soils in this county was mapped in a complex of Lenoir-Keyport silt loams.

Lenoir-Keyport silt loams (0 to 5 percent slopes) (Lk).—The soils in this mapping unit occur in such an intricate pattern that the areas cannot be shown separately at the scale used for mapping. About 70 percent of the complex is Lenoir soil, 25 percent is Keyport soil, and the rest is other wet soils. The Lenoir soil lies in low places in the landscape and must be drained to permit optimum use for farming. The Keyport soil is higher than the Lenoir soil. Control of erosion is needed on the sloping areas. Removal of water that stands in the level areas is needed for optimum use of these two soils.

The two soils of this mapping unit are well suited to the common farm crops, pasture, or trees. These soils are hard to work because they dry out slowly. They are subject to severe frost action. (Capability unit IIIw-11; woodland group 2w1)

Made Land, Dredged River Materials

Made land, dredged river materials (Mf) consists of materials that were pumped from the channel of the Delaware River to the adjacent swampy areas. The dominant materials are large cobblestones, gravel, and coarse sand. The depth of the fill ranges from about 8 to 15 feet. Permeability of these materials is rapid, and the natural fertility is very low.

Sand and gravel are taken from some of the areas. The sandy and gravelly fill materials form a stable base for buildings. (Capability unit and woodland group not assigned)

Matapeake Series

The Matapeake series consists of deep, well-drained, nearly level to sloping soils. These soils were formed in a silty mantle that is underlain by sandy and gravelly materials of the Pensaukin Formation of the Coastal Plain. The areas are scattered throughout the Coastal Plain section of the county. Quartz gravel is scattered on the surface in many places, and there are a few boulders.

The surface layer of a typical Matapeake soil is dark-brown loam about 15 inches thick. The subsoil, about 26 inches thick, is strong brown. The upper part of the subsoil is loam and clay loam, and the lower part is sandy loam. The underlying material is dark-brown silty clay.

Permeability of the surface layer and of the subsoil is moderately slow. In the substratum permeability is slow where the material is fine textured. In places where the substratum is sandy, permeability of that material is moderately rapid. The available water capacity of these soils is high. Roots penetrate deeply. Crops on these soils respond well to fertilization.

Almost all the areas of Matapeake soils have been cleared and used for crops. Many crops of high value are grown under irrigation. These soils are well suited to potatoes (fig. 5), corn, small grains, and most of the other common farm crops. Where the underlying material is coarse, a few borrow pits have been dug to obtain sand and gravel. Where clay is fairly close to the surface, some clay pits were developed, but they were abandoned long ago.

These soils are well suited to use for housing and similar developments because they are mostly nearly level or gently sloping, and the costs of leveling are low.

Figure 5.—Potatoes grow well under irrigation on this Matapeake loam.

Limitations for septic fields are slight where the soils are underlain by sand and gravel but are severe where they are underlain by clay.

Representative profile of a Matapeake loam in a cultivated field on the north side of Yardville-Hamilton Square Road about one-fourth of a mile east of Klockner Road:

Ap—0 to 8 inches, dark-brown (10YR 4/3) loam; weak, very thick, platy structure breaking to weak, coarse and medium, subangular blocky structure; friable; abundant, fine roots; scattered quartz pebbles up to 2 inches in diameter; diffuse boundary.

A2—8 to 15 inches, dark-brown (10YR 4/3) loam; moderate and fine, subangular blocky structure; friable; abundant, fine roots; few quartz pebbles up to 2 inches in diameter; abrupt boundary.

B21—15 to 19 inches, strong-brown (7.5YR 5/6) heavy loam; moderate, coarse and medium, subangular blocky structure; slightly firm; clay bridges very evident; some discontinuous, thin, slightly shiny films in pebble cavities; few, coarse roots; few quartz pebbles 1 to 2 inches in diameter; clear boundary.

B22t—19 to 27 inches, strong-brown (7.5YR 5/6) light clay loam; moderate to strong, medium, subangular blocky structure; firm; clay bridges very evident; slightly reddish, discontinuous, dull films on most vertical ped faces; clear boundary.

B23—27 to 41 inches, strong-brown (7.5YR 5/6) heavy sandy loam; weak, medium, subangular blocky structure; friable; clay bridges very evident; thin clay films in pebble cavities; discontinuous, thin films on some vertical ped faces; less than 15 percent quartz gravel up to 3 inches in diameter; abrupt boundary.

IIC—41 to 60 inches, dark-brown (10YR 4/3) silty clay; abundant, gray and red mottles; massive; firm.

Total thickness of the A and B horizons generally is 2½ to 3½ feet, but the range is from 2 to 4 feet.

Loam is the dominant texture of the A horizon in this county. The upper B horizons are heavy loam, light clay loam, heavy silt loam, or light silty clay loam. The B23 horizon ranges to heavy sandy loam. Texture of the C horizon ranges from sand to silty clay.

Color of the Ap horizon ranges from dark brown (10YR 4/3) to dark grayish brown (10YR 4/2). In the A2 horizon, the range of color is from dark brown (10YR 4/3) to yellowish brown (10YR 5/6). Color of the B horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6). In the C horizon, the hue ranges from 7.5YR to 5Y; the chroma from 4 to 7; and the value from 3 to 8.

Matapeake soils adjoin and grade to areas of Sassafras, Mattapex, and Woodstown soils. The subsoil of the Matapeake soils is much more silty than that of the Sassafras soils. The Matapeake subsoil is not mottled, as is that of the Mattapex and the Woodstown soils. Matapeake soils also are near areas of Fallsington and Othello soils and the thin surface variant of Portsmouth soils. These three soils are in low places where the water table is high during most of the year. The Othello and the Fallsington soils have a gray surface layer and are strongly mottled. The Portsmouth variant has a dark surface layer and a gray subsoil.

Matapeake loam, 0 to 2 percent slopes (MoA).—This soil has the profile described as representative of the series. The average combined thickness of the plow layer and the subsurface layer is 15 inches. Included in mapping this soil were areas of Mattapex soils, which are only moderately well drained. These areas may need drainage if high-value crops or irrigated crops are to be grown. The hazard of erosion on this Matapeake soil is slight. This soil holds moisture and plant nutrients well. It is well suited to potatoes and to most of the common farm crops. (Capability unit I-4; woodland group 3o1)

Matapeake loam, 2 to 5 percent slopes (MoB).—This soil is gently sloping, and the hazard of erosion on it is greater than on the less sloping Matapeake soil. In a few places in cultivated fields, the original surface and subsurface layers have been thinned by erosion to a combined thickness of 10 inches.

Included in mapping this soil were low spots or shallow saucers, 100 to 300 feet across, that have no outlets. In these saucers, ground water rises into the subsoil. These areas are Mattapex or Bertie soils that are too small to be mapped separately. Spot drainage and smoothing of these pockets make the soils more workable and the growth of crops more uniform.

This Matapeake soil is suited to potatoes and to the other common farm crops. Because of the gentle slopes, care is needed to prevent erosion and loss of water through runoff. Around the saucers, the slopes generally are short and broken. The soil in the saucers tends to be sealed as soil is eroded from the sides and deposited on the bottoms.

This soil is desirable for housing developments and for most other uses. (Capability unit IIe-4; woodland group 3o1)

Matapeake loam, 5 to 10 percent slopes, eroded (MoC2).—The original surface layer of this soil has been thinned several inches by erosion. In some places, some of the more clayey subsoil has been mixed into the plow layer. There are a few gullies in some fields. Because some places are more eroded than others, the ability to hold moisture and plant nutrients is uneven, and crops tend to grow and mature unevenly. The preparation of a good seedbed is somewhat difficult. Because of the slope, the hazard of erosion is greater on this soil than on the less sloping Matapeake soils. Included in mapping this soil were small areas of less eroded but similarly sloping Matapeake soils.

Intensive measures are needed to control erosion on this Matapeake soil. If this soil is used as homesites, the slope must be considered in designing septic fields and in planning for control of erosion while a lawn is being established. (Capability unit IIIe-4; woodland group 3o1)

Mattapex Series

The Mattapex series consists of deep, moderately well drained, nearly level or gently sloping soils. These soils were formed in a silty mantle that is underlain by sandy and gravelly materials. Some of the areas are circular depressions. Quartz gravel is scattered over the surface, and there are a few boulders. These soils are scattered throughout the Coastal Plain section of the county.

The surface layer of a typical Mattapex soil is dark-brown and yellowish-brown loam about 13 inches thick. The subsoil, in the upper part, is yellowish-brown loam. The middle part of the subsoil is yellowish-brown, distinctly mottled silt loam. The lower part, which extends to a depth of about 33 inches, is yellowish-brown loam that is prominently mottled with light gray, light brownish gray, and strong brown. Below the subsoil there are beds of stratified sand and gravel, and, below them, beds of clayey material.

The subsoil of these soils in their natural state is saturated with water for short periods during winter. Normal farmwork is restricted slightly by wetness, but the restrictions can be reduced by artificial drainage.

Permeability of the surface layer and of the subsoil is moderately slow. Available water capacity is high. Heaving by frost is severe. The reaction is extremely acid or very strongly acid unless lime has been applied.

Most areas of Mattapex soils have been cleared and used for farming. If drained, these soils are well suited to potatoes, vegetables, and the other common farm crops. Some areas are cultivated to produce sod.

Limitations of these soils are moderate for use as homesites and severe for septic fields.

Representative profile of a Mattapex loam in a pasture along Klockner Road about 300 feet west of U.S. Highway No. 130:

Ap—0 to 10 inches, dark-brown (10YR 4/3) loam; weak, medium, subangular blocky structure breaking to weak, medium and fine, granular structure; very friable; abundant roots; clear, wavy boundary.

A2—10 to 13 inches, yellowish-brown (10YR 5/4) loam; weak, medium, thick, platy structure; friable; numerous, fine and medium roots; gradual, wavy boundary.

B21—13 to 19 inches, yellowish-brown (10YR 5/6) loam; weak, thick, platy structure breaking to weak, medium, subangular blocky structure; friable; distinct clay bridges between sand grains; few, medium roots; clear, smooth boundary.

B22tg—19 to 26 inches, yellowish-brown (10YR 5/4) heavy silt loam; many, medium and coarse, distinct, light-gray (10YR 7/1), light brownish-gray (10YR 6/2), and strong-brown (7.5YR 5/6) mottles; weak, thick, platy structure breaking to moderate, medium, subangular blocky structure; firm; distinct clay bridges between sand grains; few, thin, dull films on some ped faces; very few, coarse and medium roots; gradual, smooth boundary.

B23g—26 to 33 inches, yellowish-brown (10YR 5/4) loam; many, medium and coarse, prominent, strong-brown (7.5YR 5/6), light-gray (10YR 7/1), and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; friable; clear, smooth boundary.

IIC1g—33 to 41 inches, yellowish-brown (10YR 5/6) heavy sandy loam; common, medium, prominent, light-gray (10YR 7/1) and gray (7.5YR 5/1) mottles; weak, medium, subangular blocky structure; slightly firm; distinct clay bridges; abrupt, smooth boundary.

IIC2—41 to 60 inches, dark-brown (7.5YR 4/4) silty clay; light brownish-gray (10YR 6/2) mottles; massive; very firm.

The combined thickness of the A and B horizons is generally 2½ to 3½ feet, but the range is from 2 to 4 feet.

The A horizon in most areas in this county is loam. Areas of silt loam are less common. The B horizon is loam, heavy loam, heavy silt loam, or silty clay loam. Texture of the C horizon ranges from silty clay to coarse sand and gravel.

The color of the Ap horizon is dark grayish brown, very dark grayish brown, or dark brown (10YR 4/2, 3/2, or 4/3. The hue of the matrix in the B horizon is 10YR or 7.5YR. The value is 4 or 5, and the chroma ranges from 4 to 6. In the C horizon, the hue of the matrix is 7.5YR or 10YR, the value ranges from 2 to 6, and the chroma ranges from 4 to 8.

Mattapex soils adjoin and grade to areas of Matapeake, Bertie, Othello, Keyport, and Lenoir soils. Mattapex soils have a mottled subsoil, but Matapeake soils do not. They are not so gray as the Othello soils. Mattapex soils have mottling only in the lower part of the subsoil, but the Bertie soils have mottling also in the upper part of the subsoil. Mattapex soils are more silty and much less clayey in their entire profile than either the Keyport or the Lenoir soils.

All the acreage of Mattapex soils in this county was mapped in an undifferentiated unit of Mattapex and Bertie loams.

Mattapex and Bertie loams (0 to 5 percent slopes) (Mq).—The Mattapex soil is more extensive than the Bertie soil in this mapping unit. Some areas consist only of Mattapex loam. In other areas the two soils form such an intricate pattern that mapping them separately was impractical. The two soils are much alike, and their uses are similar. The Bertie soil occupies lower positions in the landscape and as a rule is less sloping than the Mattapex soil.

Wetness that is the result of a moderately high water table interferes with use of these soils. The Bertie soil is somewhat poorly drained, and the Mattapex soil is moderately well drained. Both soils can be farmed more easily and are better suited to crops after they are artificially drained. If adequately drained, they are suited to vegetables and the common farm crops.

Limitations of the soils in this mapping unit are severe for septic fields. (Capability unit IIIw-13; woodland group 3w1)

Mount Lucas Series

The Mount Lucas series consists of deep, moderately well drained to somewhat poorly drained soils. These soils were formed on upland flats or moderate slopes up to about 12 percent, in materials weathered from diabase. They are in the Piedmont section of the county.

The plow layer of a typical Mount Lucas soil is dark-brown silt loam about 8 inches thick. There are in it a few fragments of diabase stone. The upper part of the subsoil is slightly browner, heavier silt loam. The lower part of the subsoil is also silt loam, and it is distinctly mottled. As a rule, small amounts of stone fragments are scattered through the subsoil. The substratum, below a depth of about 43 inches, is dark-brown, gritty loam in which there are many fragments of diabase stone.

Permeability of the plow layer and of the subsoil is moderately slow. Permeability of the substratum is moderate. Available water capacity is high.

Most areas of Mount Lucas soils are wooded, but small areas have been cleared and are cultivated.

These soils dry out slowly in spring. They have a perched water table part of the time, and subsurface seepage from higher areas keeps the subsoil saturated during most of late winter. Wetness limits the crops that can be grown. If artificial drains are installed, many of these limitations can be overcome.

Representative profile of a Mount Lucas soil having a silt loam surface layer and a slope of 3 percent, in an idle field on the north side of Mount Rose-Centerville Road one-half of a mile west of Mount Rose:

Ap—0 to 8 inches, dark-brown (10YR 4/3) silt loam; moderate, medium and fine, granular structure; friable; abundant, fine, medium, and coarse roots; 2 to 4 percent diabase fragments up to 12 inches in length; abrupt, smooth boundary.

B1—8 to 14 inches, dark-brown (7.5YR 4/4) silt loam; 3 to 4 percent more clay than in the horizon above; weak to moderate, medium, subangular blocky structure; friable; few, medium roots; patches of thin, slightly rippled films on some ped faces; many worm and root channels filled or coated with material from the Ap horizon; many, strongly weathered diabase pebbles ½ inch to 1 inch in diameter; gradual, wavy boundary.

B21t—14 to 20 inches, dark-brown (7.5YR 4/4) heavy silt loam; moderate to strong, coarse and medium, subangular blocky structure; friable; very few, medium roots; discontinuous, patchy, ripply films on most ped faces; many, strongly weathered diabase pebbles ½ inch to 1 inch in diameter; gradual, wavy boundary.

B22t—20 to 26 inches, dark-brown (7.5YR 4/4) heavy silt loam; common, medium, distinct, light-gray (10YR 7/1), pale-brown (10YR 6/3), and strong-brown (7.5YR 5/6) mottles; firm; moderate or strong, coarse, subangular blocky structure; continuous, thick, ripply, shiny films on most ped faces; many, strongly weathered diabase pebbles ½ inch to 1 inch in diameter; 2 to 3 percent fragments of diabase up to 8 inches in length; clear, wavy boundary.

B3—26 to 43 inches, dark-brown (7.5YR 4/4) silt loam; common, medium, distinct, light-gray (10YR 7/1) and strong-brown (7.5YR 5/8) mottles; weak, coarse, platy structure; firm to friable; few, discontinuous, very patchy, thin, slightly rippled, shiny clay films on some ped faces; very weathered diabase pebbles ½ inch to 1 inch in diameter; 2 to 3 percent fragments of diabase up to 8 inches in length; diffuse, wavy boundary.

C—43 to 53 inches +, dark-brown (7.5YR 4/4) gritty loam; massive; friable; many, strongly weathered diabase pebbles ½ inch to 1 inch in diameter; 2 to 3 percent diabase fragments up to 8 inches in length.

The dominant texture of the A horizon is silt loam, and in most places this horizon is very stony. Areas of gravelly silt loam are of minor extent. The B horizon is silt loam or silty clay loam. The amount of angular fragments of diabase in the profile ranges from 2 or 3 percent to as much as 10 percent. The depth to bedrock ranges from 4½ to 10 feet.

The hue of the Ap horizon is 10YR. The value is 4 or 5, and the chroma is 2 or 3. The hue of the B horizon is 7.5YR or 5YR, the value is 4 or 5, and the chroma is 4 or 5.

The deep horizons tend to be a little less acid than the A and the upper B horizons.

Mount Lucas soils adjoin and grade to areas of Legore, Neshaminy, and Watchung soils. They have a mottled subsoil, but the Legore and the Neshaminy soils do not. Their A horizon is not so gray as that of the Watchung soils.

Mount Lucas very stony silt loam, 0 to 6 percent slopes (MvB).—Diabase stones more than 10 inches in diameter make up 2 to 5 percent of the various horizons in this soil and interfere with cultivation. This soil in wooded areas has on the surface a thin, black layer of organic matter.

Stones and wetness limit the use of this soil, and it is used mainly for hay and pasture plants that tolerate wetness. Reseeding with good grasses is feasible. Stones can be removed from some areas if land is needed for crops or for pasture. After stones are removed, this soil is suited to the same crops as Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, and can be given the management that is described for that mapping unit. (Capability unit VIs–75; woodland group 2w1)

Mount Lucas very stony silt loam, 6 to 12 percent slopes (MvC).—This soil is moderately sloping and too stony to be cultivated. It is suited to the same uses as the less sloping, very stony Mount Lucas soil, but more intensive practices are needed on it to control erosion. Some small areas of slopes steeper than 12 percent were included in mapping.

Stones, wetness, and moderate slopes limit the use of this soil. Removal of stones from some areas is practicable if land is needed for crops or for pasture. After stones are removed, this soil can be used and managed in the same way as Lawrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded. If hayfields or pastures are seeded, work should be done across the slope. (Capability unit VIs–75; woodland group 2w1)

Neshaminy Series

The Neshaminy series consists of deep, well-drained soils on uplands. These soils were formed in materials weathered from diabase rock. They are in the Piedmont section of the county. Their slopes range from 0 to 18 percent but are mostly between 6 and 12 percent.

The surface layer of a typical Neshaminy soil is dark-brown silt loam about 4 inches thick. The subsoil is more clayey and is mainly reddish-brown silty clay loam. It is about 37 inches thick. The substratum is dark yellowish-brown gritty loam that is gravelly or cobbly. The depth to bedrock is commonly 5 to 10 feet. Fragments of diabase are scattered through the soil profile and are most abundant in the deep layers. The fragments in some places make up more than 15 percent of the volume.

Permeability of the surface layer is moderate, and that of the subsoil is moderate or moderately slow. Permeability of the substratum is moderate to moderately rapid. Available water capacity in the root zone is moderately high. Roots penetrate deeply.

Small areas of Neshaminy soils have been cleared and cultivated, but most areas are wooded. The soils are suited to most of the common crops. They are moderately acid or strongly acid unless lime has been applied. Crops on them respond well to fertilization.

These soils provide stable foundations for homes and other low buildings. Limitations for disposal of sewage in individual systems are slight if the slope is less than 6 percent, but are moderate or severe on the more sloping soils and the very stony soils.

Representative profile of a Neshaminy silt loam having a slope of 3 percent, in a wooded area on the south side of Ackors Corner-Pleasant Valley Road, one-half mile west of County Route 579:

O1—½ inch to 0, matted leaf mold.

A1—0 to 1½ inches, dark-brown (10YR 3/3) silt loam; weak, very fine, granular structure; very friable; abundant, fine roots; clear, wavy boundary.

A2—1½ to 4 inches, dark-brown (7.5YR 4/4) silt loam; very weak, subangular blocky structure breaking to fine, granular structure; very friable; many, fine and medium roots; abrupt, smooth boundary; 3 to 4 inches thick.

B1—4 to 8 inches, yellowish-red (5YR 4/6) silt loam; weak, fine, subangular blocky structure; friable; many, fine and medium roots; gradual, wavy boundary.

B21t—8 to 16 inches, reddish-brown (5YR 4/4) light silty clay loam; weak to moderate, medium, subangular blocky structure; friable; some medium roots; discontinuous, slightly shiny films on ped faces; many, dark, fine, manganese stains; gradual, wavy boundary.

B22t—16 to 29 inches, reddish-brown (5YR 4/4) silty clay loam; moderate to strong, subangular blocky structure; firm; few, coarse and medium roots; thick, discontinuous, shiny films on ped faces; many, dark, fine, manganese stains; some very weathered diabase rock grit; gradual, wavy boundary.

B23t—29 to 41 inches, reddish-brown (5YR 4/4) gritty silty clay loam; massive breaking to moderate, medium and coarse, subangular blocky structure; firm; occasional, coarse roots; discontinuous, shiny films on ped faces; many, small (½ to 1 inch in diameter), weathered diabase rock fragments; clear, wavy boundary.

C—41 to 60 inches +, dark yellowish-brown (10YR 4/4) gritty loam; massive; friable; many, small, diabase rock fragments.

The A horizon is dominantly silt loam. Areas of loam are much less common. Angular gravel is present in most places, but the amount varies. The B2 horizon generally is heavy silt loam, light silty clay loam, or silty clay loam. In a few places, it is heavy loam or clay loam. Texture of the C horizon ranges from gritty loam to gravelly and cobbly loam or sandy loam.

The hue of the B horizon is mostly 5YR, but in a few places it is 7.5YR. The value is 4 or 5, and the chroma ranges from 4 to 6. The C horizon is unevenly weathered, and there the hue ranges from 10YR to 5YR, the value is 4, and the chroma is 4.

Neshaminy soils adjoin and grade to areas of Mount Lucas and Legore soils. They are finer textured and more silty than the Legore soils. They are not mottled as are the Mount Lucas soils.

Neshaminy silt loam, 0 to 6 percent slopes (NeB).—This soil has the profile described as representative for the series. In some places, the original surface layer of this soil has been thinned several inches by erosion. In some small areas, so much soil has been removed that part of the more sticky subsoil has been mixed into the plow layer. The plow layer in those areas is more clayey than the one in the uneroded soil. Included in mapping this soil were small areas in which fragments of diabase rock make up more than 15 percent of the layers in the soil profile.

This soil is suited to corn, small grains, soybeans, and grasses. Some measures to control runoff are needed, because of the erosion hazard, in areas where slopes are in the upper part of the range. (Capability unit IIe–55; woodland group 2o1)

Neshaminy silt loam, 6 to 12 percent slopes (NeC).—This sloping soil has rapid runoff, and it is likely to be more droughty than the gently sloping Neshaminy soil. Included in mapping were areas in which fragments of diabase rock make up more than 15 percent of the soil.

If erosion is controlled, this soil is suited to corn, small grains, and soybeans. Grasses grow well. Conservation measures are needed to reduce runoff and erosion in cultivated fields.

If this soil is used as homesites, the slope must be considered in designing septic fields and in planning erosion control measures to hold the soil while a lawn is being established. (Capability unit IIIe–55; woodland group 2o1)

Neshaminy silt loam, 6 to 12 percent slopes, eroded (NeC2).—The profile of this soil is similar to the one described as representative of the series, except that erosion has thinned the original surface layer by several inches. In some places, so much soil has been removed that part of the more clayey subsoil has been mixed into the plow layer. Gullies are common. Included in mapping were areas in which fragments of diabase stone make up more than 15 percent of the layers in the soil profile.

Runoff is rapid on this soil. It is difficult to maintain a good supply of organic matter. The soil has a tendency to be more droughty than the less eroded Neshaminy soils. Intensive conservation practices, including the growing of cover crops and of sod crops, can be used to check runoff and reduce the hazard of erosion. If erosion is controlled, this soil is suited to the common farm crops. (Capability unit IIIe–55; woodland group 2o1)

Neshaminy very stony silt loam, 0 to 12 percent slopes (NhC).—In this soil, diabase stones more than 10 inches in diameter make up 2 to 5 percent of the layers in the soil profile. A thin, black layer of organic matter is on the surface in wooded areas.

Stones limit the use of this soil for tilled crops, and the areas are used mainly for hay or pasture. Seeding of good grasses is feasible. Stones can be removed from some areas if more land is needed for crops or for improved pasture. After stones are removed, this soil is suited to the same crops and should have the same management as the other similarly sloping Neshaminy soils. (Capability unit VIs–61; woodland group 2o1)

Neshaminy very stony silt loam, 12 to 30 percent slopes (NhE).—This soil has many stones on the surface and in the soil layers. Its use is limited by the stones and the moderately steep slopes. These limitations make the soil suited only to trees. (Capability unit VIIs–61; woodland group 3r1)

Othello Series

The Othello series consists of deep, poorly drained soils. These soils were formed in a silty mantle that is underlain by sand and gravel. Most of the areas are in bottoms of depressions. The slopes are concave and are mostly nearly level, although some are nearly 3 percent. These soils are scattered in the Coastal Plain section of the county.

The surface layer of a typical Othello soil is dark grayish-brown silt loam about 11 inches thick. The subsoil is grayish-brown silty clay loam that is distinctly to prominently mottled with strong brown and yellowish-brown. The substratum, below a depth of about 26 inches, is mostly light-gray fine sandy loam.

The water table is within a foot of the surface in winter but drops below a depth of 3 feet in summer. Permeability of the surface layer and of the substratum is moderate. Permeability of the subsoil is moderately slow. Available water capacity is high. Heaving by frost is severe.

Othello soils are extremely acid or very strongly acid unless lime has been applied. Natural fertility is moderate. If they are adequately drained, these soils are suited to the common farm crops or to pasture. Their limitations are severe for use as homesites and for disposal of sewage from septic tanks.

Representative profile of Othello silt loam in a cultivated field one-fourth of a mile north of Robbinsville-Pages Corner Road, on west side of the road to U.S. Highway No. 130:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; upper part faintly mottled, lower part more distinctly mottled; massive breaking to weak, thick, platy structure; firm; abundant, fine roots; abrupt, smooth boundary.

B21g—11 to 17 inches, grayish-brown (2.5Y 5/2) light silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, thick, platy structure breaking to moderate, medium and coarse, subangular blocky structure; firm; distinct clay bridges; very thin, discontinuous, nonshiny films on ped faces; organic stains on some ped faces and in root channels; few, coarse roots; clear, wavy boundary.

B22tg—17 to 26 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, coarse, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) mottles; weak, very thick, platy structure breaking to moderate, medium, subangular blocky structure; slightly sticky when wet; discontinuous, slightly shiny films on ped faces; clear, wavy boundary.

IICg—26 to 42 inches +, light-gray (10YR 7/1) fine sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; massive; friable.

The A horizon is silt loam or loam. The B horizon in most places is silty clay loam, but in some places it is silt loam. Texture of the C horizon ranges from silt loam through loam and sandy loam to sand and gravel.

The color hue in all horizons of the profile is 2.5Y or 10YR. The value of the matrix of the Ap horizon is 4 or 5; in the B horizon it is 5 or 6; and in C horizon it is 6 or 7. Chroma of the matrix is 1 or 2 in the Ap horizon. In the B and C horizon the chroma ranges generally from 1 to 4, but in the lower part of the C horizon in a few places it is as high as 6.

Othello soils adjoin and grade to areas of Portsmouth soil, thin surface variant, and of Mattapex, Bertie, Lenoir, and Elkton soils. Their surface layer is not so dark as that of the Portsmouth soil, thin surface variant. Their subsoil is more gray than that of the Mattapex and the Bertie soils. Othello soils are more silty and less clayey than either the Lenoir or the Elkton soils.

Othello silt loam (0 to 3 percent slopes) (Ot).—This is the only Othello soil mapped in the county. Included in mapping were small areas of Mattapex loam and Bertie loam. Also included were some areas in which beds of clay are present at a depth of 40 inches or more.

Because this soil is nearly level, runoff is slow and water stands on some areas. Tile drains or open ditches can be installed to lower the water table. Surface drainage of some areas is needed. Limitations of this soil are severe for use as homesites and as septic fields. (Capability unit IIIw–20; woodland group 3w1)

Penn Series

The Penn series consists of shallow and moderately deep, well-drained soils on uplands. These soils were formed in materials weathered from red shale and siltstone of the Triassic Brunswick Formation. The depth to bedrock is 40 inches or less. Slopes range from 2 to 18 percent. These soils are scattered in the Piedmont section of the county.

The plow layer of a typical Penn soil is dark reddish-brown shaly silt loam about 8 inches thick. The subsoil is reddish-brown heavier shaly silt loam about 6 inches thick. Beneath it is the substratum, which is reddish-brown shaly loam. The substratum grades to shale bedrock at a depth of about 23 inches.

Permeability of the surface layer, subsoil, and substratum is moderate or moderately slow. Available water capacity is moderately low.

Most crops that are common in the area can be grown on Penn soils with moderate success, but crops are not likely to get enough water for the best growth during dry years. Crops on these soils respond well to lime and fertilizers, but the soils cannot hold large amounts of plant nutrients.

Limitations of these soils are moderate for foundations of houses with basements because of the depth to bedrock. During a long rainy period, the shaly layer, about 10 inches thick, just above the bedrock is likely to become saturated. Water then flows laterally along the surface of the bedrock, and seepage into basements can be expected. Foundation drains are helpful to reduce the risk of water seeping into basements. Because of the shallow depth to bedrock, limitations are severe for disposal of sewage in individual systems.

Representative profile of a Penn shaly silt loam having a slope of 3 percent, in a cultivated field beside Scotch Road, 200 feet north of Woolsey Brook and Harts Corner, north of County Route 456:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) shaly silt loam; weak, medium and fine, granular structure; very friable; abundant, fine roots; abrupt, wavy boundary.

Bt—8 to 14 inches, reddish-brown (5YR 4/3) shaly silt loam; clay content greater than in the horizon above; very weak, very thick, platy structure breaking to weak, medium, subangular blocky structure; friable; some coarse and medium roots; very discontinuous, dull, slightly redder films on some ped faces; diffuse, wavy boundary.

C—14 to 23 inches, reddish-brown (2.5YR 4/4) shaly loam; structure masked by abundant shale fragments; friable; few roots; diffuse, wavy boundary.

R—23 inches +, fractured shale bedrock.

The dominant texture of the A horizon is shaly silt loam. Areas of silt loam are very minor. The B horizon is heavy shaly silt loam or heavy silt loam. The amount of shale fragments in all the horizons ranges generally from 15 to 30 percent, but in some places it is 5 to 15 percent.

The color hue in all the horizons is 5YR or 2.5YR. The value in the B and C horizons is 4 or 3. The chroma in those horizons is 3 or 4. The depth to bedrock ranges from 14 to 40 inches.

Penn soils adjoin and grade to areas of Bucks, Abbottstown, Readington, Reaville, and Klinesville soils. They are more shallow and more shaly than the Bucks soils. They are deeper over bedrock and less shaly than the Klinesville soils. They are not mottled as are the Reaville, the Abbottstown, and the Readington soils, and they are more shaly than the Abbottstown or the Readington soils.

Penn shaly silt loam, 0 to 6 percent slopes (PeB).—This soil has the profile described as representative of the series. The depth of this soil over bedrock is typically 20 to 28 inches. Included in mapping were small, nearly level areas in which soil material that was eroded from adjoining slopes has been deposited on the surface. In these areas, the surface layer is thicker than the one described in the representative profile, and the depth to bedrock is more than 28 inches. Also included in mapping were small areas of a Bucks silt loam and of a Klinesville shaly loam. Shallow gullies are common.

Corn, small grains, and grasses are the crops most commonly grown on this Penn soil. Alfalfa grows moderately well.

Good management and intensive conservation measures are needed on this soil to conserve water and to control erosion. Growing grasses and legumes from time to time helps to improve soil structure and to maintain a good supply of organic matter. (Capability unit IIe–65; woodland group 3o1)

Penn shaly silt loam, 6 to 12 percent slopes (PeC).—As a result of erosion, the depth of this soil over shale bedrock is only 15 to 22 inches. Runoff is more rapid, the hazard of erosion is greater, and the risk of drought is greater than on the more gently sloping Penn soil. Gullies are common.

The severe erosion hazard, shallowness, and extremely low content of organic matter limit the use of this soil. This soil is poorly suited to row crops and should be cultivated only rarely in a long rotation that includes several years of hay and in which the maximum erosion control measures are applied. (Capability unit IVe–65; woodland group 4d1)

Penn shaly silt loam, 12 to 18 percent slopes (PeD).—The plow layer of this soil is very shaly. As a result of erosion, the depth to shale bedrock is only 14 to 19 inches.

Because this soil is moderately steep, tillage is difficult. Protection of the soil from further erosion is also difficult. The content of organic matter is low. Runoff is rapid, and the available water capacity is low. Gullies are common.

This soil is best suited to hay, pasture, or trees. (Capability unit VIe–65; woodland group 4d1)

Pits

Pits (Pg) are excavations from which sand, gravel, or clay has been or is being taken.

Most of the gravel pits are in Aura or Sassafras soils. Most of the sand pits are in Evesboro, Tinton, or Galestown soils. A few small areas of abandoned pits have been leveled for farming. The abandoned clay pits are still open, and some of them contain water that is many feet deep. (Capability unit and woodland group not assigned)

Plummer Series

The Plummer series consists of deep, loose, sandy, poorly drained, nearly level soils that are in low places. These soils developed in uniform, sandy materials. They are scattered throughout the Coastal Plain section of the county.

The surface layer of a typical Plummer soil is sandy loam about 12 inches thick. The upper part of the surface layer is very dark gray, and the lower part is grayish-brown. The next layer, to a depth of about 47 inches, is grayish-brown loamy sand that is distinctly mottled in the upper part. Beneath that layer is light-gray very fine sand and gravelly sand.

The thickness of the surface layer varies from place to place, depending on the amount of soil material that has been washed from higher areas and deposited on it. Most of the deposits are lighter in color than the normal surface layer of a Plummer soil.

In their natural state, the Plummer soils are wet almost all the time. The water table in winter is very near the surface. In summer, it is about 3½ to 4 feet below the surface. Permeability is moderately rapid or rapid. The available water capacity is low. The reaction is extremely acid or very strongly acid unless lime has been applied. The content of organic matter is moderate or high.

Most areas of these soils have been cleared and used for farming. Many are now idle, however, and are being covered with trees as a result of natural reseeding. If a system of controlled drainage is installed to lower the water table, many kinds of vegetables can be grown on these soils. Fieldwork must often be delayed because of wetness.

Limitations of the Plummer soils are severe, because of the high water table, for use as homesites and for septic systems. If the soils are drained, their permeability is moderately rapid, and they can be used for disposal of sewage. There is a hazard, however, that nearby streams and shallow wells will be contaminated.

Representative profile of Plummer sandy loam in a cultivated field near Bear Swamp Road, about one-fourth of a mile north of County Route 535:

Ap—0 to 8 inches, very dark gray (10YR 3/1) sandy loam; weak, fine, granular structure; friable; abundant roots; clear, abrupt boundary.

A2g—8 to 12 inches, grayish-brown (10YR 5/2) sandy loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; firm plow pan; gradual, wavy boundary.

C1g—12 to 23 inches, grayish-brown (2.5Y 5/2) loamy sand; many, coarse, distinct mottles; single grain; loose; gradual, wavy boundary.

C2g—23 to 47 inches, grayish-brown (10YR 5/2) loamy sand; single grain; loose; clear, wavy boundary.

C3g—47 to 51 inches, light-gray (2.5Y 7/1) very fine sand; single grain; loose; clear, wavy boundary.

C4—51 inches +, gravelly coarse sand; single grain; loose.

The A horizon almost everywhere is sandy loam; only a few small areas are loamy sand. The texture of the C horizon ranges from loamy sand or sand to gravelly sand.

The hue in all horizons of the profile is 10YR or 2.5Y. The value is 3 in the Ap horizon and is 1 or 2 in the deeper horizons.

Plummer soils adjoin and grade to areas of Woodstown, Fallsington, and Evesboro soils, and to Klej soils, sandy loam subsoil variants. They are less clayey in all horizons than either the Woodstown or the Fallsington soils. Their plow layer is much darker than that of either the Evesboro soils or the sandy loam subsoil variants of Klej soils.

Plummer sandy loam (Pu).—This nearly level, naturally wet soil has the profile described as representative of the series. Included in mapping were small areas of loamy sand. A layer of clay is present in some areas at a depth of about 30 inches, but these areas are not extensive enough to be mapped separately.

Because of the high water table, this soil without artificial drainage is suited to trees or grasses that thrive on wet sites. Limitations of this soil are severe for use as homesites and as septic fields. (Capability unit IVw–22; woodland group 3w2)

Plummer sandy loam, very wet (Pv).—A very high water table, a black plow layer, and the dominant gray color of horizons beneath the surface layer set this nearly level soil apart from the other Plummer soil.

The upper layer is sandy loam to a depth of 12 to 16 inches. The underlying material is sand or gravelly sand. A layer of clay is present in some areas at a depth of about 30 inches, but these areas are not extensive enough to be mapped separately.

The surface layer of this soil has a high content of organic matter, but the organic matter is readily lost if the soil is drained and cultivated. Obtaining outlets for drains is likely to be difficult and expensive. After the soil is drained, its available water capacity is low. Natural fertility is low, and added fertilizers are leached out rapidly. Drainage is generally worthwhile only if crops of high value are to be grown. The natural soil is so wet that it is best suited to trees and shrubs that have shallow root systems and can tolerate wetness.

Limitations of this soil are severe for use as homesites and for septic systems. (Capability unit IVw–22; woodland group 3w2)

Portsmouth Series, Thin Surface Variant

This variant of the Portsmouth series consists of deep, very poorly drained, silty, nearly level soils. These soils were formed in a silty mantle that is underlain by sand and gravel. Many of the areas are circular depressions. These soils are in small areas scattered throughout the Coastal Plain section of the county.

Typically, the surface layer of a Portsmouth soil, thin surface variant, consists of very dark gray silt loam about 9 inches thick and, under that, mottled light-gray silt loam about 4 inches thick. The subsoil is light-gray and gray silt loam that is distinctly and prominently mottled with brownish yellow and yellowish brown. The substratum, which begins at a depth of about 26 inches, is stratified sand and gravel.

The water table is at the surface during winter, but it is at a depth of 1 foot to 2 feet in summer. Permeability of the soil to a depth of 24 to 30 inches is moderate. Permeability of the sandy and gravelly substratum is moderately rapid.

These soils, if adequately drained, are suited to the common farm crops and to pasture. Because of the very high water table, their limitations are severe for foundations of buildings and for septic systems.

Representative profile of Portsmouth silt loam, thin surface variant, in an idle field along White Horse-Hamilton Square Road near Assunpink Creek:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; faintly mottled; weak, fine, granular structure to a depth of 3 inches; moderate, very thick, platy structure below that depth; friable; abundant, fine and medium roots; abrupt, wavy boundary.

A2g—9 to 13 inches, light-gray (10YR 6/1) silt loam; distinct, fine and medium, brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/8) mottles; moderate, thick and very thick, platy structure; slightly firm; few, medium roots; clear, wavy boundary.

B22tg—13 to 18 inches, light-gray (10YR 6/1) silt loam; fine and medium, distinct, brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/8) mottles; weak, very thick, platy structure breaking to moderate, coarse, subangular blocky structure; slightly firm; faint clay bridges; few, medium roots; clear, wavy boundary.

B23tg—18 to 26 inches, gray (5Y 6/1) silt loam; fine and medium, prominent, brownish-yellow (10YR 6/8) and yellowish-brown (10YR 5/8) mottles; weak, very thick, platy structure breaking to moderate, coarse and medium, angular blocky and subangular blocky structure; slightly firm; faint clay bridges; very few, medium roots; clear, wavy boundary.

IIC1g—26 to 31 inches, gray (N 6/0) fine sand; coarse, prominent, yellowish-brown (10YR 5/8) and brown (10YR 5/3) mottles; massive breaking to single grain; very friable.

IIC2—31 to 60 inches, brownish-yellow (10YR 6/8) coarse sand and gravel; single grain; loose.

The thickness of the solum is normally 24 to 30 inches but ranges to 40 inches.

The predominant texture of the A horizon in this county is silt loam. Loam is much less common. The B horizon is heavy silt loam or silty clay loam.

The color of the Ap horizon is generally very dark gray (10YR 3/1) or black (10YR 2/1). The color of the B horizon is light gray or gray (10YR 6/1, N 6/0, or 5Y 6/1).

The soils of this Portsmouth variant adjoin and grade to areas of Elkton and Othello soils. The soils of this Portsmouth variant are more silty and less clayey in all their horizons than the Elkton soils. Their surface layer is much darker than that of the Othello soils.

Portsmouth silt loam, thin surface variant (Pw).—This soil is nearly level. Included in mapping were small areas in which the surface layer is sandy loam and the subsoil is sandy clay loam. Also included were areas of soil in which there is a layer of clay at a depth of 40 inches or more. These inclusions are not extensive enough to be mapped separately.

Because this soil is nearly level, runoff is slow and water stands on some areas part or much of the time. Tile drains or open ditches can be installed to lower the very high water table. Surface drainage is also needed in some of the areas if crops are grown.

Limitations of this soil are severe for use as homesites and for septic systems. (Capability unit IIIw–24; woodland group 2w1)

Quakertown Series

The Quakertown series consists of moderately deep and deep, well-drained, gently sloping or sloping soils on uplands. These soils were formed in materials derived from fine-grained sandstone or from interbedded sandstone and argillite. They are in the Piedmont section of the county. Their slopes range from 1 to 18 percent.

The surface layer of a typical Quakertown soil is dark-brown silt loam about 12 inches thick. Beneath the surface layer there is slightly paler, heavier silt loam that crumbles readily. Beginning at a depth of about 20 inches, there is a firm, more clayey horizon. In this layer are very small, flat fragments of weathered sandstone. The substratum, below a depth of about 29 inches, is firm, dark-brown silt loam. Many rock fragments are in it. The substratum grades to weathered rock and then to hard bedrock at a depth of about 42 inches.

Permeability of the upper part of a Quakertown soil is moderate. Permeability of the lower part of the subsoil and of the substratum is moderate or moderately slow. The available water capacity is high. During a long rainy period, the soil from a depth of 16 to 30 inches is likely to become saturated. Water then flows down the slope over the firm layer.

The reaction is strongly acid unless lime has been applied.

Except for small wet spots, the Quakertown soils without artificial drainage are suited to most crops that are grown in the area.

Representative profile of a Quakertown silt loam having a slope of 2 percent, in a pasture along Stoutsburg-Amwell Road, 2 miles northwest of County Route 518:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; abundant, fine roots; 8 to 10 percent shale fragments; gradual, smooth boundary.

A2—8 to 12 inches, dark-brown (10YR 4/3) silt loam; weak, medium, subangular blocky structure breaking to weak, medium, granular structure; friable; abundant, fine and medium roots; 8 to 10 percent shale fragments; gradual, wavy boundary.

B1—12 to 16 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium and coarse, subangular blocky structure; friable; numerous roots; 2 to 3 percent shale fragments; gradual, wavy boundary.

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B21t—16 to 20 inches, brown (7.5YR 5/4) heavy silt loam; moderate, medium, subangular blocky structure; firm to friable; few, discontinuous, slightly shiny clay films on ped faces; 3 to 5 percent coarse fragments; diffuse, wavy boundary.

B22t—20 to 29 inches, brown (7.5YR 5/4) heavy silt loam or light silty clay loam; massive breaking to moderate, medium, subangular blocky structure; firm; discontinuous, slightly shiny clay films on ped faces; 3 to 8 percent coarse fragments; diffuse, wavy boundary.

C—29 to 42 inches, dark-brown (7.5YR 4/4) silt loam; massive; firm; few, discontinuous, slightly shiny clay films on some ped faces; 12 to 18 percent sandstone fragments; clear, wavy boundary.

R—42 inches +, fractured, fine-grained sandstone bedrock.

The A horizon in most areas is silt loam. In some, it is channery silt loam. The B2 horizon is heavy silt loam or light silty clay loam. It is channery in some places. The C horizon is silt loam or channery silt loam. In some places the firm horizons, which are the lower part of the B horizon and the C horizon, are slightly brittle. The depth to the firm horizon commonly is 20 to 30 inches, but it ranges from 16 to 30 inches. The amount of stone fragments in each of the horizons ranges from 3 to 30 percent. Depth to bedrock ranges from 3 to 5 feet.

The hue in the Ap horizon is 10YR. In the deeper horizons it is 7.5YR or 10YR. The value is 3 or 4 in the Ap horizon and 4 or 5 in the A2, B, and C horizons. The chroma is 3 in the Ap horizon and ranges from 3 to 5 in the deeper horizons.

Quakertown soils adjoin and grade to areas of Bucks and Chalfont soils. They are firmer than the Bucks soils. They do not have prominent mottling in the subsoil as do the Chalfont soils.

Quakertown silt loam, 0 to 6 percent slopes (QkB).—This soil has the profile described as representative of the series. The depth to the firm layer in the lower part of the subsoil normally is 24 to 30 inches. Included in mapping were small, nearly level areas in which the surface layer is thicker and more silty than the typical one. In these areas, the depth to the firm, restricting layer is greater than in the typical profile.

Corn, small grains, and grasses are the crops commonly grown on this soil. Runoff and erosion are slight and can be controlled by simple practices. (Capability unit IIe–55; woodland group 2o1)

Quakertown silt loam, 2 to 6 percent slopes, eroded (QkB2).—The profile of this soil is similar to the one described as representative of the series, except that the original surface layer has been thinned several inches by erosion. In some areas, part of the more clayey subsoil has been mixed into the plow layer. Shallow gullies are common.

Because this soil is more eroded in some places than in others, its available moisture capacity is variable, and crops do not mature evenly. Maintaining a good supply of organic matter is more difficult than on the less eroded Quakertown soils. The risk of further erosion is moderate, and some special conservation practices are required for safe cultivation. Cover crops and sod crops will help control runoff and erosion. (Capability unit IIe–55; woodland group 2o1)

Quakertown silt loam, 6 to 12 percent slopes (QkC).—Because this soil is sloping, runoff is rapid and there is a severe hazard of erosion. This soil is more droughty than the less sloping Quakertown soils. Conservation measures are needed in cultivated fields to control runoff and water erosion. If erosion is controlled, this soil is suited to the crops that are grown on the less sloping Quakertown soils. (Capability unit IIIe–55; woodland group 2o1)

Quakertown silt loam, 6 to 12 percent slopes, eroded (QkC2).—The profile of this soil is similar to the one described as representative of the series, except that the surface layer is thinner. The surface layer tends to be a little more clayey than that of the less eroded Quakertown soils.

This soil is suited to the common farm crops if erosion is controlled. Intensive conservation practices, such as stripcropping, cover crops, and sod crops, will help conserve soil moisture and control erosion. (Capability unit IIIe–55; woodland group 2o1)

Quakertown channery silt loam, 2 to 6 percent slopes (QuB).—Platy fragments of sandstone up to 6 inches long cover more than 15 percent of the surface of this soil and are in all the horizons. The fragments interfere slightly with farmwork. They also reduce the hazard of erosion. Included in mapping were small areas of silt loam.

Runoff and erosion on this soil are slight and can be controlled by simple conservation practices. The crops commonly grown on this soil are corn, small grains, and grasses. (Capability unit IIe–55; woodland group 2o1)

Quakertown channery silt loam, 6 to 12 percent slopes (QuC).—Flat fragments of stone are on the surface and in all the horizons of this soil. Even though the stones reduce the hazard of erosion, conservation measures are needed to control erosion and conserve moisture.

If erosion is controlled, this soil is suited to the same crops as the more gently sloping Quakertown soils. (Capability unit IIIe–55; woodland group 2o1)

Quakertown channery silt loam, 6 to 12 percent slopes, eroded (QuC2).—The profile of this soil is similar to the one described as representative of the series, but erosion has thinned the surface layer by several inches. In some places, part of the more clayey subsoil has been mixed into the plow layer. There are a few gullies in some fields.

A good level of fertility and a good supply of organic matter are harder to maintain on this soil than on the less eroded Quakertown soils. Intensive conservation practices that include the growing of cover crops and of sod crops will help to conserve moisture and control erosion. (Capability unit IIIe–55; woodland group 2o1)

Quakertown channery silt loam, 12 to 18 percent slopes, eroded (QuD2).—Moderately steep slopes, the hazard of erosion, and the flat stones make this soil more limited in use and less well suited to crops than the more gently sloping Quakertown channery soils. This soil is poorly suited to row crops and should be cultivated only in a rotation in which hay is grown for several years. The maximum measures to control erosion are needed if this soil is cultivated. (Capability unit IVe–55; woodland group 3o1)

Readington Series

The Readington series consists of moderately deep and deep, moderately well drained, gently sloping or sloping soils on uplands. These soils were formed in a silty mantle that is underlain by bedrock of Triassic red shale or argillite. They are in the Piedmont section of the county.

The plow layer of a typical Readington soil is dark-brown silt loam about 7 inches thick. The upper part of the subsoil is yellowish-brown silt loam. The lower part of the subsoil, below a depth of about 15 inches, is yellowish-brown, faintly mottled heavy silt loam. From a depth of 21 to 24 inches, the mottles are distinct and are pinkish gray and strong brown. Below a depth of 24 inches, the substratum grades to weathered shale and, at a depth of about 40 inches, to hard bedrock.

If Readington soils are not artificially drained, their lower subsoil is saturated for short periods by a perched water table. The wet subsoil delays farmwork slightly in spring and restricts somewhat the kinds of crops that can be grown. Artificial drainage permits better timing of farmwork and improves growth of crops.

Permeability of the soil above the underlying bedrock is moderate or moderately slow. Available water capacity is high. Natural fertility is moderate. The reaction is moderately acid or strongly acid unless lime has been applied.

Most areas of Readington soils have been cleared for farming. These soils, when drained, are suited to most of the crops commonly grown in the area.

Because of a moderate depth to bedrock and an intermittent, perched water table that is 22 to 24 inches below the surface, limitations of these soils are severe for disposal of sewage in individual systems.

Representative profile of a Readington silt loam in a pasture on the west side of the road one-half of a mile north of Marshalls Corner; Public Service excavation:

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, fine to medium, granular structure; friable; abundant roots; abrupt, smooth boundary.

B21—7 to 15 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable; many roots; few, discontinuous, nonshiny films on ped faces; films slightly redder than interior of peds; many pores; organic stains in root channels; gradual, wavy boundary.

B22t—15 to 21 inches, yellowish-brown (10YR 5/6) silt loam; lower part faintly mottled; massive breaking to moderate, medium, subangular blocky structure; firm; some coarse roots; discontinuous, nonshiny films on ped faces, redder than interior of peds; organic stains in large root channels; small root channels filled with silt; many pores; gradual, wavy boundary.

B23t—21 to 24 inches, yellowish-brown (10YR 5/6) silt loam; many, distinct, pinkish-gray (7.5YR 7/2) and strong-brown (7.5YR 5/8) mottles; very weak, thick, platy structure breaking to weak, fine and medium, subangular blocky structure; firm; discontinuous, nonshiny films on ped faces; few pores; clear, wavy boundary.

C1—24 to 28 inches, mottled pinkish-gray (7.5YR 7/2) and dark-brown (7.5YR 4/4) silt loam; very weak, thick, platy structure; firm.

IIC2—28 to 40 inches, reddish-brown (5YR 4/4), weathered, shattered shale and soil material.

IIR—40 inches +, red shale bedrock.

The A horizon of Readington soils in this county is dominantly silt loam. Areas of shaly silt loam are of minor extent. The amount of shale fragments in all the horizons ranges from 0 to 10 percent. In some places a very firm layer (pan) is present in the lower part of the B horizon and in the horizon just above the bedrock. This very firm layer is brittle in some places. The depth to bedrock ranges from 34 to 50 inches.

In the Ap horizon the hue is 10YR or 7.5YR. The value there is 3 or 4, and the chroma is 3. The hue in the matrix of the B horizon ranges from 10YR to 5YR. The value there is 5 or 4, and the chroma ranges from 6 to 4.

All the acreage of Readington soils was mapped in undifferentiated units of Readington and Abbottstown soils.

Readington and Abbottstown silt loams, 0 to 2 percent slopes (RaA).—These two soils were mapped together because they are much alike and their uses are similar. Any given area mapped as this undifferentiated unit may be nearly all Readington soil or nearly all Abbottstown soil, or it may consist of both soils in any proportion. In most places the surface layer of each of the soils is thicker than the one described as representative of its series. The surface layer has been thickened by deposits of material washed from nearby soils.

Included in mapping these soils were small areas of somewhat poorly drained sandy loam and silt loam on river terraces. Also included were small areas of a Lawrenceville silt loam.

These Readington and Abbottstown soils are suited to corn, soybeans, mixed hay, and pasture. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Early plowing is generally difficult because the soils are wet in spring.

Diversion of surface water and artificial drainage will reduce the seasonal wetness so that most crops can be grown. Water erosion generally is not significant, because these soils are nearly level. (Capability unit IIIw–71; woodland group 3o1)

Readington and Abbottstown silt loams, 2 to 6 percent slopes (RaB).—Areas mapped as this unit may be all Readington soil or Abbottstown soil, or they may contain both soils in any proportion. These two soils are much alike, and their uses are similar. Each of them has retained most of its original surface layer. In some places, fragments of shale are scattered on the surface, and shale fragments make up 2 to 10 percent of the horizons in the profile of each of the soils. Included in mapping these soils were small areas of somewhat poorly drained sandy loam and silt loam on river terraces. Also included were small areas of a Lawrenceville silt loam.

The soils of this mapping unit are suited to corn, soybeans, mixed hay, and pasture. Because a perched water table is moderately high for long periods, legumes and other deep-rooted crops that do not tolerate wetness should not be grown. Both soils generally are wet in spring, and early plowing is difficult. Tile drains and diversions are needed to remove excess water. In some places, rapid runoff and a moderate risk of erosion require some special conservation measures for safe cultivation. (Capability unit IIIw–71; woodland group 3o1)

Readington and Abbottstown silt loams, 2 to 6 percent slopes, eroded (RaB2).—Any given area of this unit may be nearly all Readington soil or Abbottstown soil, or it may consist of both soils in any proportion. The original surface layer of each of these soils has been thinned several inches by erosion. In some areas, so much soil has been lost that part of the more clayey subsoil has been mixed into the plow layer. There are gullies in some fields. In some places, shale fragments are scattered on the surface, and shale fragments make up 2 to 10 percent of the horizons in the profile of each of the soils. Included in this mapping unit were small areas of somewhat poorly drained sandy loam on river terraces.

The soils of this mapping unit are moderately well suited to most crops that are grown in the area. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Tile drainage is feasible to lower the water table. These soils are subject to erosion if row crops are grown on them. Diversion of surface water will reduce the risk of erosion and improve the drainage. Maintaining a good supply of organic matter is more difficult on these soils than on the less eroded Readington and Abbottstown soils. (Capability unit IIIw–71; woodland group 3o1)

Readington and Abbottstown silt loams, 6 to 12 percent slopes, eroded (RaC2).—Areas mapped as this unit may consist entirely of Readington soil or Abbottstown soil, or they may consist of both soils in any proportion. The original surface layer of each of these soils has been thinned several inches by erosion. In some small areas, so much soil has been lost that part of the more sticky subsoil has been mixed into the surface layer. Shallow gullies are common.

These soils are sloping, runoff is rapid, and the hazard of erosion is severe. Careful control of erosion is needed when crops are grown. Maintaining a good level of fertility and a good supply of organic matter is more difficult than on the less eroded Readington and Abbottstown soils.

The soils of this mapping unit are suited to corn, soybeans, and small grains if erosion is controlled. Mixed hay and pasture plants also grow well. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Diversion of surface water improves drainage and helps control erosion. (Capability unit IIIe–71; woodland group 3o1)

Reaville Series

The Reaville series consists of moderately deep, moderately well drained to somewhat poorly drained, nearly level to moderately sloping soils on uplands. These soils were formed in areas of red shale and siltstone of the Triassic formations. They are scattered in the Piedmont section of the county.

The plow layer of a typical Reaville soil is dark reddish-brown silt loam about 7 inches thick. The subsoil is reddish-brown silt loam or shaly silt loam that is mottled with pinkish gray and strong brown. The subsoil grades to shaly silt loam and then to bedrock at a depth of about 28 inches.

If these soils have not been drained, their subsoil is saturated in winter by a water table. The wet subsoil delays farmwork in spring and restricts the kinds of crops that can be grown. Drainage overcomes many of these limitations. The permeability of these soils is moderate. The underlying bedrock restricts downward movement of water.

Most areas of Reaville soils have been cleared and farmed. When drained they are moderately well suited to corn, soybeans, small grains, and spring and fall pastures.

Because these soils are moderately deep over bedrock and have a perched water table part of each year, their limitations are severe for disposal of sewage in individual systems.

Representative profile of a Reaville silt loam having a slope of 2 percent, in an idle field on the north side of Elm Ridge Road one-fourth of a mile east of County Route 569:

Ap—0 to 7 inches, dark reddish-brown (5YR 3/3) silt loam; moderate, medium and coarse, granular structure; friable; abundant, fine and medium roots; 1 to 3 percent shale fragments; abrupt, smooth boundary.

B21—7 to 14 inches, reddish-brown (5YR 4/4) silt loam; common, fine, faint, pinkish-gray (5YR 6/2) and strong-brown (7.5YR 5/8) mottles near the bottom of the horizon; weak, medium, subangular blocky structure; friable; many, medium roots; 3 to 5 percent shale fragments; diffuse, wavy boundary.

B22t—14 to 23 inches, reddish-brown (5YR 4/4) heavy silt loam; many, medium, distinct or prominent, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) mottles and few, fine, reddish-yellow (7.5YR 6/8) mottles; moderate, medium, subangular blocky structure; firm; discontinuous, slightly redder, dull films on some ped faces; few, medium roots; 3 to 6 percent shale fragments; diffuse, wavy boundary.

C—23 to 28 inches, reddish-brown (5YR 4/4) shaly silt loam; common, medium, distinct to prominent, light-gray (10YR 7/2) and gray (7.5YR 6/1) mottles and few, fine, faint, strong-brown (7.5YR 5/6) mottles; structure masked by shale fragments; friable; gradual, wavy boundary.

R—28 inches +, fragments of fractured shale in place.

The A horizon is silt loam or shaly silt loam. The B horizon is silt loam, shaly silt loam, or light silty clay loam. In some places, shale fragments make up 2 to 30 percent of some or all the horizons. The depth to bedrock ranges from 20 to 40 inches.

In the B horizon, the hue is 5YR or 7.5YR, the value is 4 or 5, and the chroma ranges from 3 to 5. The hue of the C horizon is 5YR or 2.5YR.

Reaville soils adjoin and grade to areas of Penn, Bucks, Readington, Abbottstown, and Doylestown soils. They have a mottled subsoil, and the Penn and the Bucks soils do not. The Reaville soils are moderately deep over bedrock, but the Readington and the Abbottstown soils are deep. There are more shale fragments in the Reaville than in the Doylestown soils. Reaville soils are not so gray as Doylestown soils. The Reaville soils are more shallow than the Lehigh and the Chalfont soils, and they do not have a firm layer, as do those soils.

Reaville silt loam, 0 to 2 percent slopes (ReA).—This soil has the profile described as representative of the series. The surface layer in most places is thicker than the one described in that profile. In those places, soil that was washed from nearby areas has been deposited.

This soil is suited to corn, soybeans, mixed hay, and pasture. It is only fairly well suited to other crops that are grown in the area. A perched water table generally keeps the soil wet in spring, and early plowing is difficult. Open ditches are feasible in some places to remove excess water and improve the drainage. Diversion of water from higher areas helps to keep water from reaching this nearly level soil and increasing its wetness. (Capability unit IIIw–76; woodland group 3w1)

Reaville silt loam, 2 to 6 percent slopes (ReB).—In some places, shale fragments are on the surface and make up more than 15 percent of this soil. The depth to bedrock in most places is more than 18 inches, but in a few places it is less.

This soil is suited to corn, soybeans, mixed hay, and pasture. It is only fairly or poorly suited to small grains and alfalfa. Grasses and legumes that tolerate wetness should be planted for hay and pasture. This soil generally is wet in spring, and early plowing is difficult. Winter grains often are damaged by excess surface water that comes from seeps or springs. Heaving of alfalfa is likely to occur. Open ditches and diversions are needed to remove excess surface water. In some places, runoff and a moderate risk of erosion require some special conservation practices for safe cultivation. (Capability unit IIIw-76; woodland group 3w1)

Reaville silt loam, 2 to 6 percent slopes, eroded (ReB2).—The original surface layer of this soil has been thinned several inches by erosion. In some places, so much soil has been lost that part of the more clayey subsoil has been mixed into the plow layer. Shale fragments in some places are on the surface and make up 15 percent or more of the soil. The depth to bedrock in most places is less than 18 inches, but in a few places it is more. Shallow gullies are common. Maintaining a good supply of organic matter is more difficult on this soil than on the less eroded Reaville soils.

This soil is suited to corn, soybeans, mixed hay, and pasture. It is only fairly to poorly suited to small grains and alfalfa. Grasses and legumes that tolerate wetness should be planted for hay and pasture. Small grains and alfalfa are likely to winterkill as a result of heaving. Because this soil is gently sloping, it is subject to erosion if used to grow row crops. Diversion of surface water helps to control erosion, as well as to reduce wetness. (Capability unit IIIw-76; woodland group 3w1)

Reaville silt loam, 6 to 12 percent slopes, eroded (ReC2).—The original surface layer of this soil has been thinned by erosion. Shallow gullies are common. The depth to bedrock in most places is less than 18 inches. Included in mapping this soil were a few areas in which slopes are 12 to 18 percent.

This soil is moderately well suited to corn, soybeans, mixed hay, and pasture. Grasses and legumes that tolerate wetness can be planted for hay and pasture. Winter grains sometimes are damaged by excess surface water that comes from seeps and springs. This soil is sloping, runoff is rapid, and the hazard of erosion is severe. Careful control of erosion is needed. Diversion of surface water helps to control erosion and to reduce wetness. (Capability unit IIIe-76; woodland group 3w1)

Reaville Series, Wet Variant

The wet variant of the Reaville series consists of moderately deep, poorly drained soils on uplands. These soils were formed in areas of red shale and siltstone of the Triassic formations. Their slopes range from 1 to 12 percent. These soils are scattered in the Piedmont section of the county.

Typically, the plow layer of a wet variant of the Reaville soils is dark reddish-gray silt loam about 8 inches thick. The upper part of the subsoil is dark reddish-gray silt loam. The lower part of the subsoil is weak-red silty clay loam that is mottled with light gray and strong brown. The lower part of the subsoil grades to fractured bedrock at a depth of about 20 inches.

If these soils have not been drained, their subsoil is saturated in winter by a high water table. The wet subsoil delays farmwork in spring and restricts the kinds of crops that can be grown. Permeability of the surface layer is moderate, and that of the subsoil is moderately slow. The underlying bedrock restricts downward movement of water.

Most areas of this wet variant of Reaville soils have been cleared for farming. They are used mainly for pasture. These soils, when drained, are moderately well suited to corn, soybeans, and small grains.

Because of a perched water table and shallow depth to bedrock, limitations of these soils are severe for disposal of sewage in individual systems. Seepage of water into dug cellars can be expected during wet seasons.

Representative profile of a Reaville silt loam, wet variant, in a cultivated field on the east side of County Route 569 one-half of a mile south of County Route 518 at Hopewell:

Ap—0 to 8 inches, dark reddish-gray (5YR 4/2) silt loam; very coarse and coarse, granular structure; friable; abundant, fine and medium roots in upper 3 inches; many, fine and medium roots in lower 5 inches; abrupt, smooth boundary.

B21—8 to 12 inches, dark reddish-gray (5YR 4/2) silt loam; moderate, coarse and medium, subangular blocky structure; friable; discontinuous, thin films on ped faces; many, fine and medium roots; clear, wavy boundary.

B22tg—12 to 20 inches, weak-red (2.5YR 4/2) silty clay loam; many, medium, prominent, light-gray (10YR 7/1) and strong-brown (7.5YR 5/6) mottles; strong, coarse and medium, subangular blocky structure; firm; discontinuous, thick, slightly shiny films on ped faces; few shale fragments near top of horizon, and the number increases with depth; few, medium roots; abrupt, wavy boundary.

R—20 inches +, shale bedrock, fractured but in place.

The A horizon in most places is silt loam or shaly silt loam. The texture of the B22tg horizon ranges from light silty clay loam to heavy silty clay loam. In many places, fragments of shale make up 2 to 20 percent of the various horizons. The depth to bedrock ranges from 20 to 28 inches.

The hue of the B horizon is 5YR or 2.5YR. The value is 4 or 5, and the chroma is 2 or less.

The Reaville soils, wet variant, were mapped in this county only in undifferentiated units of these soils and Dolyestown soils. For descriptions of these units, see the Dolyestown series.

Rowland Series

The Rowland series consists of deep, moderately well drained and somewhat poorly drained soils on flood plains. These soils were formed in deposits of recent silty alluvium along major streams in the Piedmont section of the county. They are nearly level.

The plow layer of a typical Rowland soil is dark reddish-brown silt loam about 8 inches thick. The underlying material is reddish-brown silt loam. Faint mottling is present below a depth of about 18 inches.

Permeability is moderate in all layers of these soils.

The streams overflow frequently, and the safest use of these soils is as pasture or woodland. Most of the areas have been cleared and are used as pastures. Many areas are idle and are being covered with trees.

Because of the overflows and a high water table, limitations of these soils are severe for use as homesites (fig. 6).

Representative profile of Rowland silt loam in a pasture adjacent to Stony Brook on the east side of Mill Road, 1½ miles east of Pennington:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) silt loam; moderate, coarse and medium, granular structure;

Figure 6.—**Floodwater covers an area of Rowland silt loam. This soil occupies flood plains, and flooding imposes severe limitations for many uses.**

friable; abundant, fine and medium roots; abrupt, smooth boundary.

C1—8 to 18 inches, reddish-brown (5YR 4/3) silt loam; weak, thick, platy structure breaking to moderate, medium, subangular blocky structure; friable; many, medium and fine roots; diffuse, wavy boundary.

C2—18 to 48 inches +, reddish-brown (5YR 4/3) silt loam; few, fine, faint, reddish-brown (5YR 5/3) mottles; thick, platy structure; friable; very few, medium roots in the upper 6 inches of this horizon.

The hue in all horizons is 7.5YR or 5YR. The value is 3 or 4, and the chroma generally is 3 but in some places is 2. In some places, a black (N 1/0) layer 4 to 10 inches thick is present at a depth of 15 to 30 inches. This layer is a former surface horizon.

Fine or very fine fragments of red shale are in the soil in many places. The amount of fragments does not exceed 15 percent.

Rowland soils adjoin and grade to areas of Bucks, Penn, Klinesville, Bowmansville, and Birdsboro soils. They have a mottled subsoil, and the Bucks and the Birdsboro soils do not. They are much deeper over bedrock and much less shaly than the Penn and the Klinesville soils. They are not mottled so near the surface as the Bowmansville soils, and their subsoil is less gray. Rowland soils do not have a B horizon as do the Readington soils. They are subject to overflows each year, and the Birdsboro soils are not.

Rowland silt loam (0 to 2 percent slopes) (Ro).—Small areas of slopes slightly greater than 2 percent were included with this soil in mapping. Also included were small areas of a well-drained soil that is not mottled. This included soil is slightly higher than the typical Rowland soil, and the areas of it are narrow strips that are natural levees along the edges of the streams. In other included areas, the underlying material at a depth of 2½ to 4 feet is silty clay rather than silt loam. Other inclusions were a few small areas of moderately well drained or somewhat poorly drained soils on terraces. In some of these included soils, the lower subsoil is very firm. Still other inclusions in mapping were areas of a soil on flood plains near Port Mercer that is similar to the Rowland soil but has a dark-brown surface layer and a reddish-gray substratum. This included soil appears to have inherited its darker and grayer color from the dark-colored rocks that are present upstream.

Areas of this Rowland soil are flooded very frequently late in winter and early in spring and occasionally in summer. Generally, there is little erosion, but some sheet erosion or some gouging by streams sometimes occurs during floods. Soil material is deposited on this soil more often than it is washed away.

Because this soil is likely to be flooded, it is not commonly cultivated. It is well suited to pasture. The usefulness of this soil as pasture is increased by drainage to remove water quickly after floods and to lower the water table. (Capability unit Vw–78; woodland group 1w1)

Sandy and Silty Land, Strongly Sloping

Sandy and silty land, strongly sloping (SdD) consists of sandy and silty soil materials. The areas are strongly sloping, narrow strips along streams or rivers in the Coastal Plain section of the county. In most places, erosion has removed the original surface layer and exposed the subsoil. Gullies, some of them deep, are common. Permeability of the material is moderate or moderately slow. Runoff is rapid, and the hazard of erosion is severe. The content of organic matter is extremely low, and the amounts of nutrients and moisture that can be held for use by plants are variable. This land type is best kept under permanent cover of grass. Large amounts of lime and fertilizers are needed to obtain moderate growth of pasture plants. (Capability unit VIe–5; woodland group 2o1)

Sandy and Silty Land, Steep

Sandy and silty land, steep (SdE) consists of steep, narrow areas along streams and rivers in the Coastal Plain section of the county. Erosion has exposed the subsoil and, in some places, the sandy or gravelly substratum. Gullies, some of them deep, are common. The slopes are steep, runoff is rapid, the hazard of erosion is severe, available water capacity is low, and the content of plant nutrients is low. For these reasons, these areas of Sandy and silty land, steep, are best kept under permanent cover of grass or trees. (Capability unit VIIe–5; woodland group 3r1)

Sassafras Series

The Sassafras series consists of deep, well-drained soils on uplands. These soils were formed in deeply weathered, nonglauconitic, quartzose, medium-textured and moderately fine textured materials that are underlain by sand and gravel. They are mostly gently sloping or sloping. Sassafras soils are extensive in the high parts of the Coastal Plain section of the country.

The plow layer of a typical Sassafras soil is dark yellowish-brown sandy loam about 8 inches thick. The subsoil is slightly yellower and more clayey sandy loam and sandy clay loam that are friable to slightly firm in place but crumble easily when removed. The underlying material, below a depth of about 35 inches, is stratified sandy loam, loose sand, or sand and gravel.

Permeability of the surface layer and of the more clayey subsoil is moderate. That of the underlying loose sand or sand and gravel is moderately rapid. Available water capacity is moderate. Natural fertility is moderate. The reaction is extremely acid or very strongly acid unless lime has been applied.

Most areas of Sassafras soils have been cleared and used for farming. There are small, scattered areas of woodland. These soils are easy to work. They can be worked early, and crops on them respond well to fertilization. These soils are suited to fruits and vegetables and to the other crops that are grown in the county.

Many borrow pits have been excavated by taking the sand and gravel that are under these soils. The materials are used principally for building roads, and are also suitable for embankments. Limitations of these soils are slight for use as homesites and for disposal of sewage in individual systems.

Representative profile of a Sassafras sandy loam having a slope of 3 percent, in a cultivated field on the west side of County Route 535, 2½ miles northeast of Edinburg:

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) sandy loam; weak, medium and fine, granular structure; very friable; abundant, fine roots; clear, smooth boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/6) heavy sandy loam; weak, medium, subangular blocky structure; friable; faint clay bridges; many, fine and medium roots; gradual, wavy boundary.

B21—12 to 17 inches, yellowish-brown (10YR 5/6) light sandy clay loam; weak, coarse, subangular blocky structure breaking easily to moderate, medium, subangular blocky structure; friable; slightly sticky when wet; distinct clay bridges; clay films in pebble cavities; some, medium roots; diffuse, wavy boundary.

B22t—17 to 22 inches, yellowish-brown (10YR 5/8) sandy clay loam; moderate, medium and coarse, subangular blocky structure; friable to slightly firm; slightly sticky when wet; very distinct clay bridges; clay films in pebble cavities; some, medium and coarse roots; diffuse, wavy boundary.

B23t—22 to 35 inches, yellowish-brown (10YR 5/6) heavy sandy loam; very weak, medium, subangular blocky structure; friable; faint clay bridges; clay films in some pebble cavities; very few, coarse and medium roots; diffuse, wavy boundary.

C1—35 to 43 inches, yellowish-brown (10YR 5/8) sandy loam; massive; very friable; very faint clay bridges; diffuse, wavy boundary.

IIC2—43 to 48 inches +, strong-brown (7.5YR 5/8) sand; some gravel; single grain; loose.

The total thickness of the A and B horizons in most places is 20 to 40 inches, but in some places it ranges to 50 inches. In some places rounded quartzose pebbles, ½ inch to 2 inches in diameter, are scattered over the surface and through the various horizons. Gravel in some places makes up 10 to 30 percent of one or more of the horizons. The B horizon is sandy clay loam, light sandy clay loam, or heavy sandy loam. The C horizon generally consists of stratified sand, gravelly sand, and sandy loam.

The color of the A horizon generally is dark yellowish brown (10YR 4/4) or dark brown (7.5YR 4/4). The hue of the B horizon ranges from 10YR to 5YR. The value is generally 5 but in some places is 4. The chroma is generally 6 but ranges from 4 to 8. The color of the C horizon ranges from yellowish brown (10YR 5/6 to 5/8) through strong brown (7.5YR 5/6) and reddish yellow (7.5YR 6/6) to yellowish red (5YR 5/6).

Sassafras soils adjoin and grade to areas of Aura soils, moderately firm, and of Evesboro, Woodstown, Dragston, and Matapeake soils. The subsoil of Sassafras soils is less firm than that of the moderately firm Aura soils. The subsoil of Sassafras soils is less silty than that of Matapeake soils. It is not mottled as is the subsoil of Woodstown and of Dragston soils. There is more silt and more clay in the profile of Sassafras soils than in that of Evesboro soils.

Sassafras sandy loam, 0 to 2 percent slopes (SrA).—The surface layer of this soil is about 12 inches thick, which is thicker than the one in the profile described as representative of the series. The hazard of erosion on this soil is slight. This soil is well suited to most crops that are grown in the county. Many fields of crops on it are irrigated (fig. 7). (Capability unit I–5; woodland group 2o1)

Sassafras sandy loam, 2 to 5 percent slopes (SrB).—This soil has the profile described as typical for the series. The hazard of erosion is slightly greater on it than on the nearly level Sassafras soil. Small gravelly spots are common.

Included in mapping this soil were areas of an Aura sandy loam, moderately firm, that amount to as much as 15 percent of the area mapped. In very small spots of this Sassafras soil near Etra, there are many grains of black sand and many flakes of mica in all the horizons. Also included in mapping were areas near Princeton Junction in which the surface layer is silty and the subsoil is sandy clay loam more reddish than that described in the representative profile. In still other included areas, the surface layer is sandy loam and the subsoil is reddish sandy loam.

This Sassafras sandy loam is well suited to most of the crops grown in the county. (Capability unit IIe–5; woodland group 2o1)

Sassafras sandy loam, gently undulating (5 to 10 percent slopes) (SrC).—Most of the acreage of this mapping unit consists of the gently undulating Sassafras soil. This soil is well drained, and it lies on broad, low ridges that are irregular and follow no regular pattern. Enclosed by the ridges are circular, basinlike depressions that are areas of Woodstown soil, a moderately well drained soil that has mottling in the lower part of the subsoil. These depressions make up 10 to 20 percent of the mapping unit. They have no outlets for surface drainage, and, as a result, the soil in them is wet in

Figure 7.—Irrigating potatoes on Sassafras sandy loam, 0 to 2 percent slopes.

spring and after heavy rains. Also included in mapping were minor areas of gravelly sandy loam.

The slopes of the ridges and enclosed depressions are so complex that they affect drainage and use of the soil. The ridges and pockets make farmwork difficult. The gently undulating soil is subject to erosion. The short, irregular slopes make impractical most of the usual methods for controlling runoff and erosion. The soil in the depressions is moderately permeable. Spot drainage of these pockets reduces greatly the difficulty of cultivating the areas and helps obtain even germination of seed and even maturing of crops.

Limitations of this Sassafras soil are slight to moderate for use as homesites and moderate for septic fields. (Capability unit IIIe-5; woodland group 2o1)

Sassafras sandy loam, 5 to 10 percent slopes, eroded (SrC2).—This soil has a profile similar to the one described as representative of the series, except that the original surface layer has been thinned by several inches as a result of erosion. In some places part of the slightly more clayey subsoil has been mixed into the plow layer. There are a few gullies in some fields.

Included with this soil in mapping were small areas of uneroded or slightly eroded Sassafras soil. Also included were small areas in which gravel makes up more than 15 percent of the soil. Other inclusions were areas of an Aura sandy loam, moderately firm; areas in which there are grains of black sand and flakes of mica; areas that have a silty surface layer and subsoil of reddish sandy clay loam; and areas that have a surface layer of sandy loam and subsoil of reddish sandy loam.

Because this soil is eroded, its available water capacity and its capacity to hold plant nutrients are not uniform. Crops tend to grow and to mature unevenly. Preparation of a good seedbed in the surface layer is somewhat difficult. The hazard of erosion is greater on this soil than on the gently sloping Sassafras soil. If erosion is controlled, this soil is suited to the common farm crops and to fruit and vegetables.

Limitations of this soil are slight for use as homesites and moderate for disposal of sewage in individual systems. The slope must be considered in design of septic fields. The hazard of erosion is moderate while a lawn is being established. (Capability unit IIIe-5; woodland group 2o1)

Sassafras gravelly sandy loam, 2 to 5 percent slopes (SsB).—The profile of this soil is similar to the one described as representative of the series, except that small, rounded pieces of quartz gravel make up 15 to 35 percent of the surface layer. Included in mapping were a few scattered spots in which the subsoil has been exposed by erosion, some small areas in which the surface layer is sandy loam, and small areas that are nearly level.

This gravelly soil is more droughty than the Sassafras sandy loams. Seeding of crops is made difficult by the gravel. This soil is used for most crops that are commonly grown in the area, but crops do not grow so well as on the less gravelly soils. (Capability unit IIe-5; woodland group 2o1)

Sassafras sandy clay loam, 5 to 10 percent slopes, severely eroded (StC3).—This soil has lost practically all of its original surface layer by erosion. The present surface layer is largely material that was subsoil. Texture of the surface layer ranges from sandy clay loam to heavy sandy loam. Shallow gullies are common. Included in the mapping were small areas of less eroded Sassafras soil and very small areas in which gravel makes up more than 15 percent of the surface layer.

This soil is sticky when wet and hard when dry. Tillage is difficult, and so is protection of the soil from further erosion. This soil has a low content of organic matter. Its available water capacity is less than that of the other Sassafras soils.

If this soil is cultivated, intensive measures are needed to control runoff and erosion. Growth of crops is irregular. Because of runoff and the hazard of erosion, this soil is poorly suited to row crops. It should be cultivated only occasionally in a long rotation that includes several years of hay or pasture.

Limitations of this soil are slight for use as homesites. Control of erosion is needed while a lawn is being established. Limitations are moderate for disposal of sewage from septic tanks, and the slope must be considered in design of a system. (Capability unit IVe-5; woodland group 2o1)

Sassafras-Woodstown sandy loams, gently undulating (0 to 5 percent slopes) (SyB).—This complex consists of Sassafras and Woodstown soils in an intricate pattern. The two soils could not be shown separately in a practical way at the scale used in mapping. The Sassafras soil is in high positions, it is well drained, and its slopes range from 0 to 5 percent. It makes up 50 to 70 percent of this mapping unit. The Woodstown soil, which makes up the rest, is moderately well drained. It is in depressions and on low flats and very gentle slopes. Generally, its slopes are less than 2 percent.

The slopes of this mapping unit are complex. They generally do not have a uniform pattern. The rises, which are occupied by the Sassafras soil, are a few feet higher than the intervening depressions. Many of the hollows are basins entirely enclosed by the higher land. In these pockets of Woodstown soil, the water table is moderately high. The water table rises into the Woodstown subsoil, and sometimes water saturates the lower part of the Sassafras subsoil for short periods.

The Sassafras soil can be tilled easily. Wetness of the Woodstown soil limits the use of this mapping unit and controls the timing of field work. The Woodstown soil cannot be plowed until several days after the Sassafras soil is ready. Permeability of the Woodstown soil is moderate, and the areas can be drained if an outlet can be found. The sloping areas, which are mostly the Sassafras soil, are subject to erosion unless control measures are applied.

Limitations of the Woodstown part of this mapping unit for use as septic fields are moderate because of the moderately high water table. (Capability unit IIIw-14; woodland group 2o1)

Tinton Series

The Tinton series consists of deep, well-drained to somewhat excessively drained, gently sloping soils on stream terraces. These soils were formed in old Alluvial deposits that are dominantly quartzose sand, but in which there is a low to moderate amount of glauconite.

They are in the Coastal Plain section, in the southern part of the county near North Crosswicks and Extonville.

The surface layer of a typical Tinton soil is loamy sand about 21 inches thick. The upper part of this layer is dark yellowish brown, and the lower part is brown. The subsoil, about 16 inches thick, is dark-brown sandy clay loam. It is slightly firm in place, but it crumbles easily when removed. The underlying material is dark yellowish-brown, stratified loamy sand and sand.

Permeability is rapid in the surface layer, moderate in the more clayey subsoil, and moderately rapid in the loose, sandy underlying material. The subsoil contains enough clay to prevent rapid percolation of water and rapid leaching away of added fertilizer. Because of the thick surface layer of loamy sand, natural fertility is low, and these soils are subject to wind erosion.

Limitations of the Tinton soils are slight for use as homesites and as septic fields. Lawns should be seeded with grasses that tolerate drought and low fertility, and they should be watered regularly.

Representative profile of a Tinton loamy sand in an idle field one-half of a mile northeast of North Crosswicks, on the north side of the road toward County Route 524:

Ap—0 to 8 inches, dark yellowish-brown (10YR 3/4) loamy sand; single grain; loose; abundant roots; abrupt to clear, smooth boundary.

A2—8 to 21 inches, brown (7.5YR 5/4) loamy sand; massive; very friable; many roots in upper part of horizon, few in lower part; 5 to 10 percent glauconite grains; gradual, wavy boundary.

B2t—21 to 37 inches, dark-brown (7.5YR 4/4) sandy clay loam; massive breaking to very weak, subangular blocky structure; friable; occasional roots; 5 to 10 percent glauconite grains; discontinuous, thin, clay films on some ped faces; gradual, wavy boundary.

C—37 to 51 inches, dark yellowish-brown (10YR 4/4), stratified loamy sand and sand; massive; very friable; 5 to 15 percent glauconite.

The A horizon is dominantly loamy sand. Sand and sandy loam are less common. Thickness of the A horizon ranges from 20 to 30 inches. The B horizon is heavy sandy loam or sandy clay loam, and the C horizon is sandy loam or loamy sand and sand.

In the Ap and the A2 horizons, the hue is 7.5YR or 10YR, the value ranges from 3 to 5, and the chroma ranges from 2 to 4. The hue of the B horizon is 7.5YR or 5YR, the value is 4, and the chroma ranges from 4 to 6. The hue of the C horizon ranges from 10YR to 5Y, the value is 4 or 5, and the chroma ranges from 4 to 6.

Tinton soils adjoin and grade to areas of Sassafras, Woodstown, and Dragston soils. Their A horizon is 20 to 30 inches thick, which is thicker than that of the Sassafras soils. They are not mottled as are the Woodstown and the Dragston soils, and their A horizon is thicker than the one in either of those soils. The amount of glauconite (greensand) is greater in Tinton than in Fort Mott soils. Tinton soils have a more clayey subsoil than the Evesboro soils, the sandy subsoil variants of Evesboro soils, or the Galestown soils.

Tinton loamy sand, 2 to 5 percent slopes (TnB).—The surface layer of this soil in most places is loamy sand. Small areas of sand and of sandy loam were included in mapping. Also included were some areas in which the surface layer is much thinner than the one described in the representative profile, some areas having slopes of 5 to 10 percent, and some areas having slopes of 0 to 2 percent. In the vicinity of Groveville, there were also included areas of a soil that has a dark-brown surface layer 8 to 10 inches thick and a subsoil that is yellowish-red sandy clay loam 26 to 32 inches thick. These included areas near Groveville make up 5 to 6 percent of the area of this mapping unit. They are less droughty than the typical Tinton loamy sand, and crops on them should grow better than on the main soil of this mapping unit.

This Tinton loamy sand is suited to sweetpotatoes, small fruits, melons, and early lettuce. Irrigation of most crops is needed for good growth and quality. Some control of wind erosion is needed if a large area is cultivated and exposed.

Limitations of this Tinton soil are slight for use as homesites and as septic fields. Lawns should be seeded with grasses that tolerate drought and low fertility, and they should be watered regularly. (Capability unit IIIs-6; woodland group 3o2)

Tioga Series

The Tioga series consists of deep, well-drained, nearly level soils on low stream terraces. These soils were formed in thick deposits of fine sandy alluvium along the Delaware River. They are subject to a slight flooding hazard, but a flood can be expected less often than once in 5 years. The soils are of small extent and are in the northwestern corner of the county.

The plow layer of a typical Tioga soil is dark-brown fine sandy loam about 9 inches thick. The upper part of the subsoil is brown loamy fine sand. The lower part of the subsoil is dark-brown fine sandy loam. The boundary between the two parts of the subsoil is gradual. Below a depth of about 24 inches, the substratum is dark-brown fine sandy loam or loamy fine sand.

Permeability of the surface layer and of the subsoil is moderately rapid. Permeability of the substratum is rapid. Added fertilizer is leached away easily. The content of organic matter is moderately low. These soils can be worked early in spring, and they are suited to a wide variety of vegetables. Irrigation is needed if crops of high value are grown.

The area in and around Titusville is rarely flooded, if ever. Areas of these soils in other sections are flooded occasionally if rainfall is extremely heavy.

Limitations of these soils for use as homesites are moderate to severe.

Representative profile of Tioga fine sandy loam in a cultivated field along River Road on the Mercer County Workhouse Farm:

Ap—0 to 9 inches, dark-brown (10YR 3/3) fine sandy loam; very weak, fine and medium, granular structure; friable; abundant, medium and fine roots; abrupt, smooth boundary.

AB—9 to 16 inches, brown (10YR 5/3) loamy fine sand; very weak, subangular blocky structure breaking to single grain; very friable; few, medium and coarse roots; gradual, wavy boundary.

B2—16 to 24 inches, dark-brown (7.5YR 4/4) fine sandy loam; interiors of peds are reddish brown (5YR 4/4); weak, medium, subangular blocky structure; friable; bridges between sand grains are very spotty and weak; gradual, wavy boundary.

C—24 to 60 inches, dark-brown (7.5YR 4/4) fine sandy loam or loamy fine sand; massive breaking to single grain; very friable to loose.

The A horizon is fine sandy loam or loamy fine sand.

Tioga soils adjoin and grade to areas of Birdsboro soils. They are much more sandy than the Birdsboro soils.

Tioga fine sandy loam (0 to 2 percent slopes) (To).—In most areas of this soil, the slopes are less than 2 percent. Included in mapping were extremely small areas in which slopes are between 2 percent and 12 percent. Also included were small areas of a similar soil that is somewhat poorly drained.

This Tioga soil is suited to a wide variety of vegetables. Irrigation is needed for crops of high value.

In the areas near Titusville, limitations of this soil are slight for use as homesites and for disposal of sewage in individual systems. Elsewhere the limitations for those purposes are moderate to severe because of the hazard of flooding. (Capability unit I–56; woodland group 2o1)

Urban Land, Galestown Material

Urban land, Galestown material (Ug) consists of areas of Galestown soils and some of Evesboro soils that have been shaped for residential, commercial, or industrial uses. Slopes were mostly less than 5 percent before the shaping and grading were begun. In the process of grading, the original soil horizons were destroyed. Normal development of a site includes stockpiling of topsoil; excavations for utilities, roads, and buildings; grading; filling; and replacement of a layer of topsoil. During the grading, soil material is removed from some places and deposited on others. In most places, the soil material after shaping is sandy, and its permeability is rapid.

Because the soil material was mixed during the shaping, inspection of each site is needed to determine its limitations for any intended use. (Capability unit and woodland group not assigned)

Urban Land, Sassafras Material

Urban land, Sassafras material (Us) consists of Sassafras soils and some Fort Mott soils that have been shaped for residential, commercial, or industrial uses. The slopes, before shaping and grading were begun, were mostly less than 5 percent, but some were between 5 and 10 percent. The original soil horizons were destroyed by grading. The soil material that remains in most places is sandy loam, but in some places it is somewhat gravelly.

Permeability of the material is moderate unless severe compaction occurred during the grading and construction. Compaction generally has been most severe in the large developments where heavy machines were used for grading. Disturbance and compaction of soil in the small developments generally have not been severe.

Because the soil material was mixed, inspection of each site is needed to determine its limitations for any intended use. (Capability unit and woodland group not assigned)

Very Stony Land

Three types of Very stony land were mapped in the county. These land types are made up of small areas of soils intermingled with rounded boulders of rock.

Very stony land, Mount Lucas and Neshaminy materials, 0 to 12 percent slopes (VmC).—This land type consists of areas of Neshaminy and of Mount Lucas soils on which there are rounded boulders of diabase, more than 24 inches in diameter, that cover 50 to 90 percent of the surface. Between the boulders, the Neshaminy soil is well drained and the Mount Lucas soil is somewhat poorly drained. Included in mapping were some spots of very stony Watchung soils. The Watchung soils are poorly drained and are wet much of the time.

Most areas of this land type are wooded, and they can be used best as woodland. Their use as pasture is extremely limited because boulders make seeding, mowing, and fencing extremely difficult and not economically feasible. The requirements for woodland management include selective cutting and protection from fire and grazing. (Capability unit VIIs–67; woodland group 2w1)

Very stony land, Neshaminy material, 12 to 30 percent slopes (VnE).—Rounded boulders of diabase that are more than 24 inches in diameter cover 50 to 90 percent of the surface of this land type. Between the boulders the soil is similar to Neshaminy silt loam of comparable slope.

Boulders and moderately steep slopes limit the use of this land type. Woodland is a good use. (Capability unit VIIs–67; woodland group 3r1)

Very stony land, Watchung material (Vw).—This land type consists of gently sloping, poorly drained soil materials on which there are rounded boulders of diabase, more than 24 inches in diameter, that cover 50 to 90 percent of the surface. Slopes range from 0 to 3 percent. The boulders are so numerous that the land cannot be developed economically for use as pasture. Drainage, seeding, mowing, and fencing of pastures generally are not feasible.

Nearly all of this land type is used as woodland, and that is a good use for it. Wetness limits severely the times that this land can be crossed with machines. The only trees and shrubs that can be grown are those that are suited to the wet sites. (Capability unit VIIs–90; woodland group 2w1)

Watchung Series

The Watchung series consists of deep, poorly drained, gently sloping soils. These soils were formed in alluvial materials derived from the weathered products of diabase rock. They lie at the base of ridges of dark-colored rock, which are often called trap ridges, in the Piedmont section of the county.

The plow layer of a typical Watchung soil is faintly mottled, dark grayish-brown silt loam about 7 inches thick. The upper part of the subsoil is mottled, dark grayish-brown silt loam. The lower part of the subsoil is highly mottled silty clay loam. The underlying material, below a depth of about 29 inches, is dark yellowish-brown, gritty loam in which there are some balls of gray clay.

Permeability is moderate in the surface layer and slow in the subsoil. The soils are wet because they are low and because water moves through them at a slow rate. In their natural state, these soils are best suited to pasture or trees. After intensive drainage, they are moderately suited to corn, small grains, hay, and pasture.

Most of the areas are wooded, but some extremely small areas have been cleared and are cultivated.

Because of a high water table, limitations of the Watchung soils are severe for disposal of sewage in individual systems.

Representative profile of Watchung silt loam in a field that formerly was cultivated and is reverting to woodland, on the west side of Drakes Corner Road one-tenth of a mile west of Province Line Road:

O2—¼ inch to 0, very thin organic litter.
Ap—0 to 7 inches, dark grayish-brown (10YR 4/2), faintly mottled silt loam; weak, coarse and medium, granular structure grading to moderate, fine, subangular blocky structure near the bottom of the horizon; friable; abundant, fine and medium roots; clear, wavy boundary.
B1g—7 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; many, fine and medium, prominent, dark reddish-brown (5YR 3/4), reddish-brown (5YR 4/4), and light-gray (5YR 7/1) mottles; moderate, medium, subangular blocky structure; friable; few, medium roots; few, dull, discontinuous films on ped faces; clear, wavy boundary.
B21tg—11 to 16 inches, mottled light-gray (N 7/0), yellowish-brown (10YR 5/8), and reddish-brown (5YR 4/4) silty clay loam; moderate, thick, platy structure breaking to moderate, medium, subangular blocky structure; slightly firm; sticky when wet; occasional, medium and coarse roots; discontinuous, slightly shiny films on ped faces; gradual, wavy boundary.
B22tg—16 to 29 inches, mottled gray (5Y 6/1) and strong-brown (7.5YR 5/6) heavy silty clay loam; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky structure; firm; very sticky when wet; thick, shiny films on ped faces; gradual, wavy boundary.
C—29 to 48 inches, dark yellowish-brown (10YR 4/4) gritty loam; some small, gray (5Y 6/1) clay balls; weak, granular structure; friable; some weathered diabase fragments.
R—48 inches +, diabase bedrock.

The A horizon in most places is silt loam. Areas of silty clay loam and of gravelly silt loam are minor. Texture of the B horizons ranges from heavy silt loam to heavy silty clay loam. Gravel is present in the B horizons in some places.

The total thickness of the A and B horizons ranges from 24 to 30 inches. The depth to bedrock ranges from 45 to 84 inches, and the average is 50 inches.

Watchung soils adjoin and grade to areas of Neshaminy, Legore, and Mount Lucas soils. Their subsoil is mottled, and that of the Neshaminy and the Legore soils is not. In Watchung soils, mottling in the subsoil begins just under the plow layer; in Mount Lucas soils, the upper part of the subsoil is not mottled, but the lower part is. The profile of Watchung soils is more gray than that of Mount Lucas soils.

Watchung silt loam (0 to 3 percent slopes) (Wc).—This soil in its natural state is wet much of the time. There is little or no erosion. Permeability is slow, and tile drains are not effective. Open drains help to remove water if outlets are available. Bedding is helpful in some places. After this soil is drained, its best use is as pasture or hayland, but it is moderately well suited to corn and small grains. This soil becomes puddled and compact if it is grazed, worked, or crossed with machines while it is wet. (Capability unit Vw-80; woodland group 2w1)

Woodstown Series

The Woodstown series consists of deep, moderately well drained, nearly level and gently sloping soils. These soils were formed in deeply weathered, quartzose, moderately sandy materials that are underlain by sand and gravel. They are nearly level or gently sloping or are in circular depressions. The areas are scattered throughout the Coastal Plain section of the county.

The surface layer of a typical Woodstown soil is dark grayish-brown sandy loam about 11 inches thick. The upper part of the subsoil, to a depth of about 17 inches, is yellowish-brown sandy loam that crumbles readily. The middle part of the subsoil, between depths of about 17 and 23 inches, is yellowish-brown, faintly mottled heavy sandy loam. The lower part of the subsoil, to a depth of about 30 inches, is yellowish-brown sandy loam that is prominently mottled with strong brown and light gray. Beneath the subsoil is the substratum of stratified loamy sand and sandy loam. Gravel is in the substratum in some places.

If these soils have not been drained, the subsoil is saturated by a moderately high water table for several months late in winter and in spring. The permeability is moderate to a depth of about 30 inches and moderately rapid below that depth. Farmwork normally is slightly restricted by wetness. Artificial drainage makes possible more uniform farmwork and improves the growth of crops. Tile drains work well in most places.

Most areas of Woodstown soils have been cleared and farmed. After drainage, these soils are well suited to vegetables and to the common field crops.

If these soils are used as homesites, deep drainage is needed to lower the water table. Otherwise, the soils have moderate limitations for disposal of sewage in septic fields, and seepage can be expected in basements.

Representative profile of a Woodstown sandy loam in an idle field on the west side of Hickory Corner-Hightstown Road, 200 feet east of U.S. Highway No. 130, behind a housing development:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, medium and fine, granular structure; friable; abundant, fine and medium roots; abrupt, wavy boundary.
B1—11 to 17 inches, yellowish-brown (10YR 5/4) sandy loam; moderate, medium, subangular blocky structure; friable; many, medium roots; 3 to 4 percent rounded quartz gravel; diffuse, wavy boundary.
B2t—17 to 23 inches, yellowish-brown (10YR 5/4) heavy sandy loam; few, faint, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; friable; weak bridges between sand grains; very few, medium roots; 2 to 4 percent rounded quartz gravel; gradual, wavy boundary.
B3t—23 to 30 inches, yellowish-brown (10YR 5/4) sandy loam; many, prominent, medium, strong-brown (7.5YR 5/6) and light-gray (10YR 7/2) mottles; weak, medium, subangular blocky structure; friable; very weak bridges between sand grains; diffuse boundary.
C1—30 to 48 inches, yellowish-brown (10YR 5/4) sandy loam; common, medium, prominent, strong-brown (7.5YR 5/6) and light-gray (10YR 7/2) mottles; weak, granular structure; friable; 2 to 4 percent quartz gravel; diffuse boundary.
IIC2—48 to 60 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; loose.

The hue of the matrix is 10YR in all horizons of the profile. The value in the Ap horizon is 3 or 4. In the other horizons it generally is 5 but ranges to 6. The chroma in the Ap horizon generally is 2 but in some places is 3. In the B horizon, the chroma ranges from 4 to 6, and, in the C horizon, from 4 to 8.

The B horizon is heavy sandy loam or light sandy clay loam. Rounded quartz gravel is present in varying amounts, but in most places is not abundant. The C horizon generally is more sandy than the B horizon, but in some places much clay and silt is mixed with the sand in some of the layers. Thickness of the solum in most places is 26 to 30 inches, but it ranges from 24 to 40 inches.

Woodstown soils adjoin and grade to areas of Sassafras, Dragston, and Fallsington soils. They have a mottled subsoil, and the Sassafras soils do not. They are not so gray as the Fallsington soils. The Woodstown soils are only faintly mottled above a depth of 23 inches. The Dragston soils are faintly mottled at a depth of 10 inches and distinctly to prominently mottled below a depth of 17 inches.

Woodstown soils in this county were not mapped separately but were mapped in an undifferentiated unit of Dragston and Woodstown sandy loams and in complexes of Sassafras-Woodstown sandy loams and Woodstown-Fallsington sandy loams.

Woodstown-Fallsington sandy loams, gently undulating (2 to 5 percent slopes) (WfB).—This complex consists mainly of Woodstown soils, which are moderately well drained. They make up 55 percent of the mapping unit. Fallsington soils, which are poorly drained, are in the bottoms of depressions and make up 25 percent of most of the areas. Dragston soils, which are somewhat poorly drained, are between the other two soils in some places. They make up less than 20 percent of this mapping unit.

The slopes are complex and follow no definite pattern. The Woodstown and the Dragston soils generally surround the circular, wet depressions. In the depressions are Fallsington soils, which have dark-gray surface soil and prominently mottled subsoil. The depressions have no outlets to give natural drainage. As a result, they are very wet in spring and after heavy rains. Some of the depressions are so deep that outlets for artificial drainage cannot be obtained.

Although the poorly drained Fallsington soils make up only a small part of most areas, they limit severely the use of the land, and they control the timing of fieldwork if farming is done. Drainage of the wet pockets permits more uniform farmwork and more uniform growth of crops, even though it does not eliminate completely the limitations caused by wetness.

The undulating soils of this mapping unit are difficult to work. The Woodstown soils and also the Dragston soils are subject to a slight to moderate hazard of erosion if they are not protected. The mapping unit as a whole has moderate to severe limitations for use as homesites and as fields for disposal of sewage from septic tanks. (Capability unit IIIw–14; woodland group 2w1)

Use and Management of the Soils

This section tells about performance of the soils when they are used. The first part begins with an explanation of the capability grouping of soils that is used by the Soil Conservation Service. Next, ratings are given that indicate yields of the common crops that can be expected on the different soils under common management and the best current management. Other subsections tell about use of the soils as commercial woodland, use as wildlife habitats, engineering uses of the soils, and soils in community developments.

Management and Productivity of Soils for Tilled Crops and Pasture

Some suggestions about use and management of each kind of soil for crops and pasture are given in the section "Descriptions of the Soils." Omitted from those discussions are specific suggestions about the kinds and amounts of fertilizer and lime to be applied. The kinds and grades of fertilizing and liming materials on the market are changed from time to time. Decisions about what materials to apply, and how much, depend on the history of the field and the plan of management, as well as on the crop and the kind of soil. It is presumed that fields will be fertilized and limed according to current recommendations of Rutgers University and the Agricultural Extension Service.

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 the 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, for forest trees, or for engineering.

In the capability system, all kinds of soils are grouped at three levels: the capability class, subclass, and unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater limitations. In class VIII are soils and landforms so rough, so shallow, or otherwise so limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be as many as four subclasses. The subclass is indicated 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 some parts of the United States but not in Mercer County, shows that the chief limitation is climate that is too cold or 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.

Within the subclasses are the capability units, which are groups of soils 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. The capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIs-6. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraphs; and the Arabic numeral specifically identifies the capability unit within each subclass. The Arabic numerals assigned to capability units in New Jersey are part of a statewide system and are not consecutive in this county.

The eight classes in the capability system and the subclasses and units in Mercer County are described in the list that follows. The unit designation for each soil in the county can be found in the "Guide to Mapping Units" at the back of this publication.

Class I. Soils that have few limitations that restrict their use.
- (No subclasses.)
  - Capability unit I-4.—Deep, nearly level, well-drained loams in the Coastal Plain.
  - Capability unit I-5.—Deep, nearly level, well-drained sandy loams in the Coastal Plain.
  - Capability unit I-55.—Deep, nearly level, well-drained silt loams in the Piedmont Plateau.
  - Capability unit I-56.—Deep, nearly level, well-drained fine sandy loams in the Piedmont Plateau.

Class II. Soils that have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
- Subclass IIe. Soils have a moderate risk of erosion if they are not protected.
  - Capability unit IIe-4.—Gently sloping, deep, well-drained loams in the Coastal Plain.
  - Capability unit IIe-5.—Gently sloping, deep, well-drained fine sandy loams, gravelly sandy loams, and sandy loams in the Coastal Plain.
  - Capability unit IIe-55.—Gently sloping, deep, well-drained loams, silt loams, and channery silt loams in the Piedmont Plateau.
  - Capability unit IIe-56.—Gently sloping, deep, well-drained fine sandy loams in the Piedmont Plateau.
  - Capability unit IIe-58.—Gently sloping, deep, well-drained sandy loams in the Piedmont Plateau.
  - Capability unit IIe-65.—Gently sloping, moderately deep, well-drained shaly silt loams in the Piedmont Plateau.
- Subclass IIw. Soils that have moderate limitations because of excess water.
  - Capability unit IIw-14.—Deep, gently sloping, moderately well drained and somewhat poorly drained sandy loams in the Coastal Plain.
  - Capability unit IIw-71.—Deep, gently sloping, moderately well drained and somewhat poorly drained silt loams in the Piedmont Plateau.
- Subclass IIs. Soils that have moderate limitations of droughtiness.
  - Capability unit IIs-6.—Gently sloping sandy loams that have low available water capacity.

Class III. Soils that have severe limitations that reduce the choice of plants, require special conservation practices, or both.
- Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
  - Capability unit IIIe-4.—Moderately sloping, deep, well-drained loams in the Coastal Plain.
  - Capability unit IIIe-5.—Moderately sloping, deep, well-drained sandy loams in the Coastal Plain.
  - Capability unit IIIe-6.—Moderately sloping, deep, well-drained loamy sands in the Coastal Plain.
  - Capability unit IIIe-55.—Moderately sloping, deep, well-drained loams, silt loams, and channery silt loams in the Piedmont Plateau.
  - Capability unit IIIe-56.—Moderately sloping, deep, well-drained fine sandy loams in the Piedmont Plateau.
  - Capability unit IIIe-58.—Moderately sloping, deep, well-drained, channery and gravelly loams in the Piedmont Plateau.
  - Capability unit IIIe-70.—Moderately sloping, deep and moderately deep, dominantly somewhat poorly drained silt loams in the Piedmont Plateau; some of the soils are moderately well drained.
  - Capability unit IIIe-71.—Moderately sloping, deep and moderately deep, dominantly moderately well drained silt loams in the Piedmont Plateau; some of the soils are somewhat poorly drained.
  - Capability unit IIIe-76.—Moderately sloping, moderately deep, moderately well drained and somewhat poorly drained silt loams in the Piedmont Plateau.
- Subclass IIIw. Soils that have severe limitations because of excess water.
  - Capability unit IIIw-11.—Gently sloping, moderately well drained and somewhat poorly drained, slowly permeable silt loams in the Coastal Plain.
  - Capability unit IIIw-13.—Gently sloping, moderately well drained and somewhat

poorly drained silt loams in the Coastal Plain.

Capability unit IIIw-14.—Gently sloping, dominantly moderately well drained, moderately permeable sandy loams in the Coastal Plain; soils in complexes range from well drained to poorly drained.

Capability unit IIIw-16.—Nearly level, moderately well drained and somewhat poorly drained sandy loams and loamy sands in the Coastal Plain.

Capability unit IIIw-18.—Nearly level, poorly drained, slowly permeable silt loams that have a clay subsoil, in the Coastal Plain.

Capability unit IIIw-20.—Nearly level, poorly drained, moderately slowly permeable, deep silty soils in the Coastal Plain.

Capability unit IIIw-21.—Nearly level, poorly drained, moderately permeable sandy loams in the Coastal Plain.

Capability unit IIIw-24.—Nearly level, very poorly drained, deep silty soils in the Coastal Plain.

Capability unit IIIw-70.—Nearly level and gently sloping, deep and moderately deep, moderately well drained and somewhat poorly drained silt loams in the Piedmont Plateau.

Capability unit IIIw-76.—Gently sloping, moderately deep, moderately well drained and somewhat poorly drained silt loams in the Piedmont Plateau.

Subclass IIIs. Soils that have severe limitations because of low available water capacity.

Capability unit IIIs-6.—Gently sloping, deep, well-drained loamy sands in the Coastal Plain.

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

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Capability unit IVe-5.—Severely eroded, moderately sloping soils in the Coastal Plain.

Capability unit IVe-55.—Strongly sloping channery silt loams in the Piedmont Plateau.

Capability unit IVe-56.—Strongly sloping channery and gravelly loams in the Piedmont Plateau.

Capability unit IVe-65.—Moderately sloping, shallow, well-drained shaly silt loams in the Piedmont Plateau.

Capability unit IVe-66.—Moderately sloping, shallow, excessively drained shaly loams in the Piedmont Plateau.

Subclass IVs. Soils that have very severe limitations because of low available water capacity.

Capability unit IVs-7.—Nearly level and gently sloping sandy loams and loamy sands in the Coastal Plain.

Subclass IVw. Soils that have very severe limitations because of excess water.

Capability unit IVw-22.—Nearly level, poorly drained and very poorly drained sandy loams that have a sand subsoil, in the Coastal Plain.

Capability unit IVw-80.—Nearly level or gently sloping, poorly drained silt loams in the Piedmont Plateau.

Class V. Soils that are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife.

Subclass Vw. Soils have severe limitations because of wetness.

Capability unit Vw-27.—Nearly level soils on flood plains subject to stream overflow several times annually, in the Coastal Plain.

Capability unit Vw-78.—Nearly level soils on flood plains subject to stream overflow several times annually, in the Piedmont Plateau.

Capability unit Vw-80.—Nearly level, poorly drained silt loams in the Piedmont Plateau.

Class VI. Soils that have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Subclass VIe. Soils severely limited, chiefly by risk of erosion, if protective cover is not maintained.

Capability unit VIe-5.—Strongly sloping, mixed sandy and silty soils in the Coastal Plain.

Capability unit VIe-58.—Moderately steep, deep gravelly loams in the Piedmont Plateau.

Capability unit VIe-65.—Strongly sloping, shallow shaly silt loams in the Piedmont Plateau.

Capability unit VIe-66.—Strongly sloping and moderately steep, shallow shaly loams in the Piedmont Plateau.

Subclass VIw. Soils severely limited by excess water, which cannot be readily removed.

Capability unit VIw-28.—Nearly level, poorly drained soils on flood plains subject to stream overflow several times annually, in the Coastal Plain.

Capability unit VIw-80.—Moderately sloping, poorly drained silt loams in the Piedmont Plateau.

Capability unit VIw-86.—Nearly level, poorly drained soils on flood plains subject to stream overflow several times annually, in the Piedmont Plateau.

Subclass VIs. Soils severely limited by a high content of stones.

Capability unit VIs-61.—Very stony, gently sloping and moderately sloping, well-drained loams and silt loams in the Piedmont Plateau.

Capability unit VIs-75.—Very stony, gently sloping, moderately well drained and somewhat poorly drained silt loams in the Piedmont Plateau.

Class VII. Soils that have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Subclass VIIe. Soils very severely limited, chiefly by risk of erosion, if protective cover is not maintained.

Capability unit VIIe-5.—Steep, mixed sandy and silty soils in the Coastal Plain.

Subclass VIIs. Soils that have very severe limitations because of abundant stone content.

Capability unit VIIs-61.—Very stony, strongly sloping to steep, well-drained soils in the Piedmont Plateau.

Capability unit VIIs-67.—Very stony, gently sloping to steep, well-drained to somewhat poorly drained soils in the Piedmont Plateau.

Capability unit VIIs-90.—Very stony, poorly drained soils in the Piedmont Plateau.

Class VIII. Soils and landforms having limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

Subclass VIIIw. Soils that are extremely wet.

Capability unit VIIIw-29.—Marshes that are almost constantly wet.

Estimated yields

Estimated indexes, or ratings, of yields of the principal crops on each soil are given in table 2. Ratings are given for yields expected at two levels of management. The lowest rating is 1, and the highest is 10. Table 3 shows how each rating is converted to a range in yield.

Ratings in columns A are based on yields expected under the management used by most farmers in the county. Ratings in columns B are based on yields expected under the best current management for the crop on that soil. The ratings in columns B do not represent averages of the highest yields obtained under ideal conditions. They are based on averages of yields obtained over a period of at least 4 years after allowing for exceptional weather and for pests and diseases. The differences between column A and column B for any crop may be the result of a single factor or a combination of factors. In general, all factors must be favorable to obtain yields represented by the ratings in columns B.

Details of the practices that are recommended to obtain high yields are changed somewhat from year to year. Current detailed recommendations are published each year in bulletins of the Agricultural Extension Service. In general, the recommended practices include the following: Choose varieties of crops that are suited to the soil and climate and are resistant to the common pests and diseases. Treat seed by sterilizing or inoculating when appropriate. Plant seed at the proper rate, and maintain the proper number of plants per acre. Apply fertilizer after choosing the formula, amount per acre, and time of application in relation to the soil, crop, plant population, and amount of available water in the soil. Apply lime according to soil tests and needs of the crop. Take measures to control pests, diseases, and weeds. Install drainage if the water table interferes with growth of crops. Irrigate potatoes, tomatoes, and possibly other high-value crops. Apply practices to control runoff, water erosion, and soil blowing. Plant crops in an appropriate sequence, grow cover crops, and use minimum tillage where applicable. Keep the soil in good tilth.

Estimated yields on soils for which records are not available are based on yields from similar soils. The county agricultural agent and other agricultural leaders helped in making all the estimates.

The following soils and land types are omitted from table 2 because the crops listed generally are not grown on them.

Alluvial land, wet.
Alluvial land, very wet.
Chalfont very stony silt loam, 0 to 6 percent slopes.
Cut and fill land, clayey substratum.
Cut and fill land, gravelly material.
Cut and fill land, rock substratum.
Cut and fill land, stratified substratum.
Fresh water marsh.
Made land, dredged river materials.
Pits.
Sandy and silty land, strongly sloping.
Sandy and silty land, steep.
Urban land, Galestown material.
Urban land, Sassafras material.
Very stony land, Mount Lucas and Neshaminy materials, 0 to 12 percent slopes.
Very stony land, Neshaminy material, 12 to 30 percent slopes.
Very stony land, Watchung material.
Watchung silt loam.

Use of Soils as Commercial Woodland

All of Mercer County was originally covered with trees. The forests were mainly of the oak types. Later, most of the land was cleared for farming, but from time to time, some idle fields have been reforested by natural seeding. In 1967, forests and woodland made up 25 percent of the county. Idle fields in the Coastal Plain section generally are reseeded naturally to sweetgum or oaks; in the Piedmont section, to redcedar and ash.

Woodland suitability groups

The soils of the county have been grouped according to their suitability as woodland. The soils in each group are similar, within defined ranges, in their productive capacity for trees, in the major hazards or limitations that affect their use as woodland, and in the problems in management of trees that are caused by soil characteristics. The woodland suitability groups of soils have been placed in a national system of woodland suitability classes and subclasses.

Table 2.—*Estimated average yield ratings of principal crops under two levels of management*

[Ratings are from 1, the lowest, to 10, the highest. Yield equivalents for ratings are listed in table 3. Ratings in columns A are for common management; those in columns B, for the best current management. Absence of a rating indicates crop generally is not grown on the soil. Listed in the text are the soils and land types not rated because crops generally are not grown on them]

Soil	Corn (grain)		Soybeans		Barley		Wheat		White potatoes		Tomatoes		Alfalfa hay		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Aura sandy loam, moderately firm, 2 to 5 percent slopes	5	7	5	8	5	8	7	9	----	----	5	7	4	6	4	6
Aura sandy loam, moderately firm, 5 to 10 percent slopes	----	----	----	----	----	----	----	----	----	----	3	6	3	5	3	5
Birdsboro loam, 0 to 6 percent slopes	8	10	7	9	7	9	8	10	----	----	----	----	8	10	8	10
Birdsboro loam, 2 to 6 percent slopes, eroded	5	9	6	8	6	8	7	9	----	----	----	----	6	9	6	9
Birdsboro loam, 6 to 12 percent slopes, eroded	5	8	5	7	5	7	7	9	----	----	----	----	5	8	5	7
Birdsboro silt loam, 0 to 2 percent slopes	8	10	8	9	7	9	8	10	----	----	----	----	8	10	8	10
Birdsboro silt loam, 2 to 6 percent slopes	8	10	8	9	7	9	8	10	----	----	----	----	8	10	8	10
Birdsboro soils, sandy subsoil variants, 0 to 2 percent slopes	6	9	7	9	6	9	7	9	----	----	----	----	7	9	7	9
Birdsboro soils, sandy subsoil variants, 2 to 6 percent slopes	6	9	7	9	6	9	7	9	----	----	----	----	7	9	7	9
Birdsboro soils, sandy subsoil variants, 6 to 12 percent slopes	5	8	6	8	5	8	6	8	----	----	----	----	6	8	6	8
Birdsboro soils, gravelly solum variants, 0 to 5 percent slopes	4	6	4	6	4	6	4	6	----	----	----	----	----	----	----	----
Bowmansville silt loam	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	6
Bucks silt loam, 0 to 2 percent slopes	8	10	7	9	7	9	8	10	----	----	----	----	8	10	8	10
Bucks silt loam, 2 to 6 percent slopes	8	10	7	9	7	9	8	10	----	----	----	----	8	10	8	10
Bucks silt loam, 2 to 6 percent slopes, eroded	7	9	6	8	6	8	7	9	----	----	----	----	7	9	7	9
Bucks silt loam, 6 to 12 percent slopes	7	9	6	8	6	8	7	9	----	----	----	----	7	9	7	9
Bucks silt loam, 6 to 12 percent slopes, eroded	6	8	5	7	5	7	6	8	----	----	----	----	6	8	6	8
Chalfont silt loam, 0 to 2 percent slopes	4	6	----	----	----	----	4	7	----	----	----	----	----	----	4	7
Chalfont silt loam, 2 to 6 percent slopes	5	7	----	----	----	----	5	8	----	----	----	----	----	----	5	8
Chalfont silt loam, 2 to 6 percent slopes, eroded	4	6	----	----	----	----	4	7	----	----	----	----	----	----	4	8
Chalfont silt loam, 6 to 12 percent slopes, eroded	4	6	----	----	----	----	4	7	----	----	----	----	----	----	4	7
Downer fine sandy loam, gravelly clay loam substratum	6	8	6	8	6	9	6	9	----	----	6	8	5	7	5	7
Doylestown silt loam and Reaville silt loam, wet variant, 0 to 2 percent slopes	3	5	----	----	----	----	4	6	----	----	----	----	----	----	3	6
Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes	4	6	----	----	----	----	5	7	----	----	----	----	----	----	4	7
Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes, eroded	3	6	----	----	----	----	4	6	----	----	----	----	----	----	3	6
Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes	4	7	----	----	----	----	5	7	----	----	----	----	----	----	4	7
Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes, eroded	----	----	----	----	----	----	4	6	----	----	----	----	----	----	3	6
Dragston and Woodstown sandy loams, 0 to 4 percent slopes	4	7	5	8	5	7	5	7	----	----	----	----	----	7	6	9
Elkton silt loam	4	7	5	7	3	6	4	7	----	----	----	----	----	----	5	8
Evesboro loamy sand, 0 to 5 percent slopes	1	2	5	6	3	5	4	6	----	----	----	----	----	----	----	----
Evesboro soils, sandy loam subsoil variants, 0 to 5 percent slopes	2	3	5	7	5	7	5	7	----	----	----	----	----	----	----	----
Fallsington sandy loam	5	8	6	8	4	8	5	8	----	----	----	----	----	----	6	9
Fort Mott loamy sand, 0 to 5 percent slopes	2	4	5	6	4	6	4	6	----	----	----	----	2	4	3	4
Fort Mott loamy sand, 5 to 10 percent slopes	2	3	3	5	4	6	4	6	----	----	----	----	2	4	3	4
Galestown loamy sand, 0 to 5 percent slopes	1	2	5	6	4	6	4	6	----	----	----	----	4	5	4	5
Galestown sandy loam, 0 to 6 percent slopes	2	4	6	8	5	7	6	8	----	----	2	4	5	6	5	6
Klej soils, sandy loam subsoil variants	4	7	5	7	5	8	5	7	----	----	----	----	----	----	4	7
Klinesville shaly loam, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	1	3	2	4
Klinesville shaly loam, 12 to 30 percent slppes	----	----	----	----	----	----	----	----	----	----	----	----	----	2	1	3
Lansdale sandy loam, 2 to 6 percent slopes	5	8	----	----	6	7	8	9	----	----	----	----	6	10	6	10
Lansdale channery loam, 6 to 12 percent slopes, eroded	4	8	4	7	5	6	7	9	----	----	----	----	4	8	4	8
Lansdale channery loam, 12 to 18 percent slopes, eroded	----	----	----	----	----	----	----	----	----	----	----	----	4	8	4	8
Lansdale very stony loam, 0 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	3	7	3	7
Lansdale very stony loam, 12 to 30 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	3	5	3	7
Lawrenceville and Mount Lucas silt loams, 0 to 2 percent slopes	4	7	----	----	3	5	5	8	----	----	----	----	----	----	3	6
Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes	5	8	----	----	4	6	6	9	----	----	----	----	----	----	3	7
Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, eroded	4	7	----	----	3	5	5	8	----	----	----	----	----	----	3	6

TABLE 2.—*Estimated average yield ratings of principal crops under two levels of management*—Continued

Soil	Corn (grain)		Soy-beans		Barley		Wheat		White potatoes		Toma-toes		Alfalfa hay		Mixed hay	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
Lawrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded	4	7	----	----	3	5	5	8	----	----	----	----	----	----	2	5
Legore gravelly loam, 6 to 12 percent slopes	3	5	----	----	3	5	5	7	----	----	----	----	6	9	6	9
Legore gravelly loam, 12 to 18 percent slopes	----	----	----	----	3	4	4	6	----	----	----	----	5	8	5	8
Legore gravelly loam, 18 to 30 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	5	8	5	8
Lehigh silt loam, 0 to 6 percent slopes	5	7	----	----	3	6	6	8	----	----	----	----	----	----	3	7
Lehigh silt loam, 2 to 6 percent slopes, eroded	4	7	----	----	2	5	5	7	----	----	----	----	----	----	3	6
Lehigh silt loam, 6 to 12 percent slopes, eroded	4	6	----	----	2	4	5	7	----	----	----	----	----	----	3	6
Lenoir-Keyport silt loams	5	7	5	8	5	8	5	8	----	----	----	----	----	----	7	10
Matapeake loam, 0 to 2 percent slopes	7	10	7	10	7	9	7	9	6	10	6	10	7	10	7	10
Matapeake loam, 2 to 5 percent slopes	7	10	7	10	7	9	7	9	6	10	6	10	7	10	7	10
Matapeake loam, 5 to 10 percent slopes, eroded	6	9	5	8	5	8	6	9	5	8	5	9	7	10	7	10
Mattapex and Bertie loams	5	8	6	9	6	9	6	9	4	8	5	8	4	8	6	9
Mount Lucas very stony silt loam, 0 to 6 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	8
Mount Lucas very stony silt loam, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	8
Neshaminy silt loam, 0 to 6 percent slopes	6	10	7	10	8	10	8	10	----	----	----	----	7	10	8	10
Neshaminy silt loam, 6 to 12 percent slopes	5	9	6	9	6	8	8	9	----	----	----	----	6	9	8	9
Neshaminy silt loam, 6 to 12 percent slopes, eroded	5	8	5	7	4	7	7	9	----	----	----	----	5	8	6	8
Neshaminy very stony silt loam, 0 to 12 percent slopese	----	----	----	----	----	----	----	----	----	----	----	----	6	9	7	9
Neshaminy very stony silt loam, 12 to 30 percent slops	----	----	----	----	----	----	----	----	----	----	----	----	5	8	5	8
Othello silt loam	4	7	5	8	4	7	5	7	----	----	----	----	----	----	4	8
Penn shaly silt loam, 0 to 6 percent slopes	4	6	5	7	5	7	5	7	----	----	----	----	4	8	4	8
Penn shaly silt loam, 6 to 12 percent slopes	3	5	4	6	4	6	4	7	----	----	----	----	3	7	3	7
Penn shaly silt loam, 12 to 18 percent slopes	2	4	----	----	4	5	4	6	----	----	----	----	2	5	2	5
Plummer sandy loam	4	6	3	5	----	----	----	----	----	----	----	----	----	----	5	7
Plummer sandy loam, very wet	3	5	4	6	----	----	----	----	----	----	----	----	----	----	4	7
Portsmouth silt loam, thin surface variant	4	6	5	7	4	7	5	8	----	----	----	----	----	----	4	8
Quakertown silt loam, 0 to 6 percent slopes	5	8	5	8	5	8	7	9	----	----	----	----	6	9	6	9
Quakertown silt loam, 2 to 6 percent slopes, eroded	4	7	4	7	4	7	6	8	----	----	----	----	4	8	4	8
Quakertown silt loam, 6 to 12 percent slopes	5	7	5	7	5	7	7	9	----	----	----	----	5	9	6	9
Quakertown silt loam, 6 to 12 percent slopes, eroded	4	7	4	6	4	6	6	7	----	----	----	----	4	8	4	8
Quakertown channery silt loam, 2 to 6 percent slopes	4	7	5	8	5	8	7	9	----	----	----	----	6	8	6	8
Quakertown channery silt loam, 6 to 12 percent slopes	4	6	5	7	5	7	6	8	----	----	----	----	6	7	6	7
Quakertown channery silt loam, 6 to 12 percent slopes, eroded	3	6	4	6	4	6	5	7	----	----	----	----	5	7	5	7
Quakertown channery silt loam, 12 to 18 percent slopes, eroded	----	----	----	----	----	----	----	----	----	----	----	----	4	6	4	6
Readington and Abbottstown silt loams 0 to 2 percent slopes	5	7	4	6	5	7	6	8	----	----	----	----	3	6	4	7
Readington and Abbottstown silt loams, 2 to 6 percent slopes	6	8	4	6	5	7	6	8					3	6	4	7
Readington and Abbottstown silt loams, 2 to 6 percent slopes, eroded	5	8	3	5	4	6	5	7	----	----	----	----	2	5	3	6
Readington and Abbottstown silt loams, 6 to 12 percent slopes, eroded	5	7	3	4	4	6	5	7	----	----	----	----	2	5	3	6
Reaville silt loam, 0 to 2 percent slopes	2	4	4	8	3	5	5	8	----	----	----	----	----	----	2	6
Reaville silt loam, 2 to 6 percent slopes	2	4	5	9	4	6	6	9	----	----	----	----	----	----	3	7
Reaville silt loam, 2 to 6 percent slopes, eroded	2	4	4	8	3	5	5	8	----	----	----	----	----	----	3	7
Reaville silt loam, 6 to 12 percent slopes, eroded	2	5	4	7	2	4	5	7	----	----	----	----	----	----	3	6
Rowland silt loam	----	----	----	----	----	----	----	----	----	----	----	----	----	----	4	7
Sassafras sandy, loam 0 to 2 percent slopes	7	9	7	10	7	9	7	9	6	8	6	10	7	10	7	10
Sassafras sandy loam, 2 to 5 percent slopes	7	9	7	10	7	9	7	9	6	8	6	10	7	10	7	10
Sassafras sandy loam, gently undulating	6	8	6	10	6	9	6	9	5	7	5	9	6	9	6	10
Sassafras sandy loam, 5 to 10 percent slopes, eroded	5	7	5	8	5	8	6	8	4	6	4	7	5	8	6	8
Sassafras gravelly sandy loam, 2 to 5 percent slopes	6	8	7	9	6	8	6	8	5	8	4	9	7	10	7	10
Sassafras sandy clay loam, 5 to 10 percent slopes, severely eroded	4	6	5	8	4	7	5	7	3	6	3	6	5	8	6	8
Sassafras-Woodstown sandy loams, gently undulating	5	7	5	8	6	8	6	8	5	7	5	8	5	8	6	9
Tinton loamy sand, 2 to 5 percent slopes	2	4	5	6	4	6	4	6	----	----	----	----	2	4	3	4
Tioga fine sandy loam	4	6	----	----	3	6	6	8	----	----	----	----	----	----	----	----
Woodstown-Fallsington sandy loams, gently undulating	5	8	5	8	5	8	5	8	----	----	----	----	----	----	6	10

TABLE 3.—*Rating-yield per acre conversion table* [1]

Rating	Crop							
	Corn (grain)	Soybeans	Barley	Wheat	White potatoes	Tomatoes	Alfalfa hay	Mixed hay
	Bu.	*Bu.*	*Bu.*	*Bu.*	*100 lb.*	*Tons*	*Tons*	*Tons*
1	50–60	5–10	18–26	10–15	175–200	8–10	1.0–1.5	1.2–1.5
2	60–70	10–15	26–34	15–20	200–225	10–12	1.5–2.0	1.5–1.8
3	70–80	15–20	34–42	20–25	225–250	12–14	2.0–2.5	1.8–2.0
4	80–90	20–25	42–50	25–30	250–275	14–16	2.5–3.0	2.0–2.2
5	90–100	25–30	50–58	30–35	275–300	16–18	3.0–3.5	2.2–2.5
6	100–110	30–35	58–66	35–40	300–325	18–20	3.5–4.0	2.5–2.8
7	110–120	35–40	66–74	40–45	325–350	20–22	4.0–4.5	2.8–3.0
8	120–130	40–45	74–82	45–50	350–375	22–24	4.5–5.0	3.0–3.2
9	130–140	45–50	82–90	50–55	375–400	24–26	5.0–5.5	3.2–3.5
10 [2]	>140	>50	>90	>55	>400	>26	>5.5	>3.5

[1] Based on estimates prepared by an interstate coordinating committee in 1969.
[2] A rating of 10 means a probable yield of more than the amount shown; for example, more than 26 tons of tomatoes.

Woodland suitability classes, the divisions at the most general level in this national system, are defined according to site quality, which means the productivity of the soils for trees. Productivity of a soil for a given species of tree is expressed by the site index, which is the height in feet attained by the dominant trees at 50 years of age in a well-managed stand (natural or planted) that has not been subject to disease, insect infestation, or fire damage. Suitable site-index classes for important forest types are defined as a guide for placing soils into woodland suitability classes.

Measurements of site index were not available for many of the combinations of soils and kinds of trees in this county. Where measurements from this county were not available, information gathered in other areas was used to estimate the site indexes needed for grouping of the soils.

Woodland suitability subclasses are groups of soils within woodland suitability classes. Subclasses are based on selected soil or physiographic characteristics that give rise to important hazards or limitations in using and managing the soils as woodland. Subclasses within each woodland suitability class are designated by adding a small letter to the class numeral, for example, 3o. The letter *x* indicates a stony or rocky soil; *w*, excessive wetness; *t*, toxic substances, such as excess salts; *d*, depth not adequate for the root zone; *c*, clayey soil; *s*, sandy soil; *f*, fragmental or skeletal soil; *r*, unfavorable relief or steep slope; and *o*, slight or no significant limitations for use and management of woodland. Subclasses are named and designated in order as listed. If two small letters are needed to describe a subclass, they are arranged in the same order, for example, 3wt. Aspect, which is the direction of slope, is not significant in this county, because of general low relief. Only the subclasses *w*, *d*, *r*, and *o* are represented in this county.

Woodland suitability groups of soils within the subclasses are numbered consecutively in each local area, beginning with 1. Examples in this county are 3o1 and 3o2. The national system of classes and subclasses shows the general site quality and kind of soil limitation. This system has been developed by Paul E. Lemmon and is explained in *Grouping Soils on the Basis of Woodland Suitability*, Proceedings of the Third North American Forest Soils Conference, Raleigh, N. C., 1968.

The local descriptions are needed, however, to learn many facts about nature of the soils and about practices of woodland management. Nine woodland suitability groups, in classes 1, 2, 3, and 4 and in subclasses w, d, r, and o, were defined in this county.

In the text that follows, each woodland suitability group is described briefly, and several interpretations are given for management of the soils as woodland. The interpretations consist mainly of the kinds of trees that are important wood crops, the kinds that should be planted or should be favored in existing stands, the estimated average site index for important kinds of trees, the hazard of erosion, the major limitations in use of equipment, the expected seedling mortality, the amount of plant competition, and the windthrow hazard.

The soil series that are represented in each woodland suitability group are named in the description of the group. The naming of a soil series under any group, however, does not imply that all the soils of that series are in that group. The group in which each soil has been placed is given in the section "Descriptions of the Soils" and in the "Guide to Mapping Units" that is just ahead of the soil maps at the back of this publication.

Nine land types that are not suited to trees were not placed in woodland suitability groups. They are four units of Cut and fill land; Fresh water marsh; Made land, dredged river materials; Pits; and two units of Urban land.

In listing important wood crops, reference is made to upland oaks and lowland oaks. The upland oak plant community includes mainly red oak, scarlet oak, black oak, white oak, hickories, beech, white ash, black birch, and black walnut. The lowland oak community includes mainly pin oak, willow oak, swamp white oak, and red maple.

In listing trees to be planted, hardwood trees are listed before conifers. Both hardwoods and conifers are listed in order of priority. Most of the conifers that are listed can be planted for use as Christmas trees. Generally the trees suggested are suitable either for planting in open fields or for interplanting in thin stands.

The ratings of erosion hazard are based on erodibility of the soil where it is not fully protected by woodland cover; for example, while trees are in the seedling stage and after clear harvesting has been done. The rating is *slight*, *moderate*, or *severe*.

The ratings of limitations in use of equipment are based on the degree to which soil and topographic features interfere with use of implements commonly used in planting trees, tending the growing trees, or harvesting the crop. Steep slopes, wetness, coarse texture, and extreme stoniness are the soil factors that most commonly limit these operations. The rating is *slight*, *moderate*, or *severe*.

Ratings of seedling mortality are based on the percentage of seedlings likely to die. The ratings reflect the effects of soil and topography in either natural or planted stands. Competition from other plants is assumed not to be a limiting factor. A rating of *slight* means that fewer than 25 percent of the seedlings are expected to die. *Moderate* means that the expected rate is between 25 and 50 percent, and *severe* means that losses from the effect of the soil are likely to be more than 50 percent.

Plant competition refers to the rate at which undesirable plants invade the site when openings are made in the canopy. The rating *slight* means that competition does not keep a good stand of young seedlings from growing naturally and does not prevent or slow greatly the growth of planted seedlings. *Moderate* means that competition delays the formation and growth of natural stands and the growth of planted young trees, but does not prevent the longtime growth of a fully stocked, normal stand. *Severe* means that competition prevents growth of a good natural or planted stand unless the site is prepared intensively and treatments such as weeding are carried out.

Windthrow hazard is the risk that trees will be blown over by wind. Hurricanes are not frequent in this county, but one or more can be expected during the lifespan of a forest crop. A rating of *slight* means that trees are not expected to be blown down in commonly occurring winds. *Moderate* means that some trees are likely to be blown down when the soil is excessively wet and the velocity of wind is high. *Severe* means that many trees are likely to be blown down if moderate or high winds occur while the soil is excessively wet.

WOODLAND SUITABILITY GROUP 1w1

This group consists of deep, nearly level soils that are subject to frequent overflows. These soils are on alluvial plains. The texture of the surface layer is commonly silt loam, but some minor areas are sandy. In this group are Alluvial land and soils of the Bowmansville and Rowland series.

Important wood crops that grow well on soils of this group are upland oaks, lowland oaks, yellow-poplar, sweetgum, and white ash. They occur in most places in mixtures with other species that vary in economic importance. The most common other species are red maple, sycamore, beech, boxelder, hickories, birches, redcedar, sassafras, and elm, but there are many more.

Trees that should be favored in existing stands are upland oaks, yellow-poplar, sweetgum, lowland oaks, and white ash. Planting is generally not practicable, because of the profuse natural reseeding of many species.

The estimated average site index for oaks is 85 or more, and that for yellow-poplar and sweetgum is 95 or more.

Equipment limitations are severe because of the overflow hazard and a high water table during long periods. Seedling mortality is moderate, and plant competition is severe. The windthrow hazard is slight to moderate.

WOODLAND SUITABILITY GROUP 2o1

This group consists of deep, well-drained, gently sloping or moderately sloping soils. Slopes are generally less than 12 percent. Texture of the surface layer generally is sandy loam, loam, silt loam, or channery silt loam. In this group are soils of the Birdsboro, Neshaminy, Quakertown, Sassafras, and Tioga series, and Sandy and silty land, strongly sloping, a miscellaneous land type.

Important wood crops that grow well on soils of this group are upland oaks, yellow-poplar, and white ash. The trees to be favored in existing stands are upland oaks, yellow-poplar, black walnut, and white ash. Trees that can be planted are red oak, yellow-poplar, black walnut, black locust, white pine, Norway spruce, and Austrian pine.

The estimated average site index for oaks is 75 to 85, and for yellow-poplar, 85 to 95.

The erosion hazard, equipment limitations, and seedling mortality are slight on most soils in this group. Frost heaving is sometimes severe on the silt loams and loams. Plant competition on all soils in this group is slight to moderate for hardwood trees and moderate to severe for conifers.

WOODLAND SUITABILITY GROUP 2w1

The natural drainage of soils in this group ranges from moderately good to very poor. Slopes of the soils are less than 12 percent. The texture of the surface layer ranges through sandy loam, loam, silt loam, and very stony silt loam. In this group are soils of the Dragston, Elkton, Fallsington, Lawrenceville, Lenoir, Keyport, Mount Lucas, Portsmouth, Watchung, and Woodstown series, and Very stony lands consisting of Mount Lucas, Neshaminy, and Watchung soil materials.

Important wood crops that grow well on soils of this group are upland oaks, yellow-poplar, and white ash. Trees to be favored in existing stands are yellow-poplar and upland oaks. Trees that can be planted are yellow-poplar, red oak, black walnut, black locust, white pine, Austrian pine, and Norway spruce.

The estimated site index for oaks is 75 to 85, and for yellow-poplar and sweetgum, 85 to 95.

Equipment limitations range from slight to moderate and are moderate on the Elkton, Portsmouth, and Watchung soils, which are poorly or very poorly drained. Seedling mortality is severe on the Elkton, Portsmouth, and Watchung soils and is slight on the other soils and on the land types. Plant competition ranges from slight to severe for hardwood trees and is severe for conifers. The windthrow hazard is slight to moderate.

WOODLAND SUITABILITY GROUP 3o1

The soils in this group are deep or moderately deep and well drained or moderately well drained. Their slopes are less than 12 percent. The surface layer is silt loam,

loam, sandy loam, or fine sandy loam. One of the silt loams is shaly, and some of the loams are gravelly, channery, or very stony. In this group are soils of the Aura, Bucks, Downer, Lansdale, Legore, Matapeake, Penn, Quakertown, Readington, and Abbottstown series.

Wood crops that grow well on soils of this group are upland oaks, yellow-poplar, and white ash. Trees to be favored in existing stands are yellow-poplar and upland oaks. Trees that can be planted are yellow-poplar, red oak, black walnut, black locust, white pine, Austrian pine, and Norway spruce.

The estimated average site index for oaks is 65 to 75, and for yellow-poplar, 75 to 85.

The erosion hazard, equipment limitations, seedling mortality, and windthrow hazard are slight. Frost heaving sometimes is severe on the silt loams and loams. Plant competition is slight for hardwood trees and moderate for conifers.

WOODLAND SUITABILITY GROUP 3o2

The soils in this group are very sandy or sandy, and all of them are droughty. The surface layer is mostly loamy sand, but in some areas it is sandy loam. Slopes of the soils are less than 10 percent and are mostly less than 5 or 6 percent. In this group are soils of the Evesboro, Fort Mott, Galestown, and Tinton series, the sandy loam subsoil variants of the Evesboro series, and the sandy loam subsoil variants of the Klej series.

Important wood crops are upland oaks, and they are the trees to be favored in existing stands. Trees that can be planted are black oak, Austrian pine, pitch pine, and white pine. The estimated site index for upland oaks is mostly 65 to 75, but on some sites is less than 65.

Because these soils are sandy and loose, equipment limitations and seedling mortality are moderate. The windthrow hazard is slight, and plant competition is slight.

WOODLAND SUITABILITY GROUP 3r1

The soils and land types in this group are well drained. Their slopes are mostly between 12 and 30 percent, but one land type is steeper. The surface layer is mostly loam or silt loam, and nearly all the areas are channery, gravelly, or very stony. In this group are soils of the Lansdale, Legore, and Neshaminy series, and also Sandy and silty land, steep, and Very stony land, Neshaminy materials, 12 to 30 percent slopes.

Important wood crops on the soils and land types of this group are yellow-poplar and upland oaks. Trees to be favored in existing stands are upland oaks, yellow-poplar, black walnut, and white ash. Trees to be planted are red oak, yellow-poplar, black walnut, black locust, Norway spruce, white pine, and Austrian pine.

The erosion hazard and equipment limitations on soils of this group are moderate. The windthrow hazard is slight. Seedling mortality is slight on the loams, but young trees on the silt loams are subject to heaving by frost.

WOODLAND SUITABILITY GROUP 3w1

The soils in this group are deep or moderately deep and moderately well drained or somewhat poorly drained. Their slopes are less than 12 percent. The surface layer generally is silt loam, but one mapping unit consists of loam. In this group are soils of the Chalfont, Lehigh, Mattapex, Bertie, Othello, and Reaville series.

Important wood crops on these soils are upland oaks, lowland oaks, yellow-poplar, and white ash. Trees to be favored in existing stands are upland oaks, yellow-poplar, black walnut, and white ash. Trees that can be planted are red oak, pin oak, yellow-poplar, Norway spruce, white pine, and Austrian pine.

The estimated site index for oaks is 65 to 75, and for yellow-poplar, 75 to 85.

The erosion hazard and seedling mortality are slight. Equipment limitations are moderate. Plant competition is severe for conifers and moderate for hardwood trees. The windthrow hazard is slight to moderate.

WOODLAND SUITABILITY GROUP 3w2

The soils in this group are poorly drained. The water table in them is high for long periods. Their slopes are less than 12 percent. The surface layer is silt loam or sandy loam. The soils are members of the Doylestown, Reaville, and Plummer series.

Important wood crops on these soils are lowland oaks, white ash, and sweetgum. Trees to be favored in existing stands are lowland oaks, sweetgum, and white ash. Trees that can be planted are sweetgum, pin oak, pitch pine, Austrian pine, and white pine.

The estimated site index for oaks is 65 to 75, and for sweetgum, 75 to 85.

The erosion hazard on soils of this group is slight. Seedling mortality and plant competition are severe. Equipment limitations and the windthrow hazard are severe.

WOODLAND SUITABILITY GROUP 4d1

The soils in this group are shallow shaly loams or shaly silt loams that have a restricted root zone for the growth of trees. Slopes range from 6 to 30 percent. The soils in this group are members of the Klinesville and the Penn series.

Important wood crops on these soils are upland oaks. Upland oaks are also the trees to be favored in existing stands. Trees that can be planted are Norway spruce, white pine, and Austrian pine.

The estimated site index for upland oaks on these soils is 55 to 65.

The erosion hazard is slight to moderate. Plant competition is slight, and seedling mortality is severe. Equipment limitations are slight. The windthrow hazard is moderate.

Use of Soils for Wildlife

The wildlife population of any area depends on the availability of food, cover, and water in suitable combinations. Habitats are created, improved, or maintained by establishing desirable vegetation and developing water supplies in suitable places.

In table 4, all the soils and several of the land types in the county are rated as to their suitability for eight elements of wildlife habitats and also for three kinds of wildlife. These ratings refer only to the suitability of the soil and do not take into account the climate, the present use of the soil, or the present distribution of wildlife and

TABLE 4.—*Suitability of the soils for wildlife habitats and for kinds of wildlife*

[Soils rated 1 are well suited; 2, suited; 3, poorly suited; and 4, unsuited]

Soil and map symbol	Elements of wildlife habitat: Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Kinds of wildlife: Openland wildlife	Woodland wildlife	Wetland wildlife
Alluvial land:											
Wet (Ad)	4	2	2	1	2	1	2	4	2	1	1
Very wet (Ae)	4	3	3	1	2	1	2	4	3	1	1
Aura (AfB, AfC)	2	1	1	1	3	4	4	4	1	2	4
Birdsboro:											
Loam (BbB, BbB2, BbC2)	2	1	1	1	3	4	4	4	1	1	4
Silt loam (BdA)	1	1	1	1	3	4	4	4	1	1	4
Silt loam (BdB)	2	1	1	1	3	4	4	4	1	1	4
Birdsboro, sandy subsoil variants: (BnA, BnB, BnC)	2	1	1	1	3	4	4	4	1	1	4
Birdsboro, gravelly solum variants: (BoB)	2	1	1	1	3	4	4	4	1	1	4
Bowmansville (Bt)	3	2	2	1	2	1	2	4	2	1	1
Bucks:											
Silt loam (BuA)	1	1	1	1	3	4	4	4	1	1	4
Silt loam (BuB, BuB2, BuC, BuC2)	2	1	1	1	3	4	4	4	1	1	4
Chalfont:											
Silt loam (CdA)	2	2	1	1	2	2	2	2	2	1	2
Silt loam (CdB, CdB2)	2	2	1	1	2	3	4	4	2	1	3
Silt loam (CdC2)	2	2	1	1	2	4	4	4	2	1	4
Very stony silt loam (CeB)	4	3	2	1	2	2	2	2	2	1	2
Downer (Df)	2	1	1	1	3	4	4	4	1	1	4
Doylestown and Reaville, wet variants:											
Silt loams (DgA)	3	2	2	1	2	1	1	1	2	1	1
Silt loams (DgB, DgB2, DgC, DgC2)	3	2	2	1	2	3	4	4	2	1	4
Dragston and Woodstown (DwB)	2	2	1	1	3	2	2	2	1	1	2
Elkton (Ek)	3	2	2	1	2	1	1	1	2	1	1
Evesboro:											
Loamy sand (EvB)	3	3	2	3	1	4	4	4	2	3	4
Evesboro, sandy loam subsoil variants: (EwB)	2	1	1	2	2	4	4	4	1	2	4
Fallsington (Fd)	3	2	2	1	2	1	1	1	2	1	1
Fresh water marsh (Fm)	4	4	4	4	4	1	3	4	4	4	2
Fort Mott (FrB, FrC)	3	2	2	1	2	4	4	4	2	1	4
Galestown:											
Loamy sand (GaB)	3	3	2	1	1	4	4	4	2	1	4
Sandy loam (GeB)	2	1	1	1	2	4	4	4	1	1	4
Klej, sandy loam subsoil variants (Km)	2	1	1	1	3	2	2	2	2	1	2
Klinesville:											
Shaly loam (KsC)	3	3	2	2	2	4	4	4	2	2	4
Shaly loam (KsE)	4	3	3	3	2	4	4	4	3	3	4

TABLE 4.—*Suitability of the soils for wildlife habitats and for kinds of wildlife*—Continued

Soil and map symbol	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Lansdale:											
Sandy loam and channery loam (LaB, LcC2)	2	1	1	1	3	4	4	4	1	1	4
Channery loam (LcD2)	2	2	1	1	3	4	4	4	2	1	4
Very stony loam (LdC, LdE)	4	3	1	1	3	4	4	4	3	1	4
Lawrenceville and Mount Lucas:											
Silt loams (LeA)	2	2	1	1	3	2	2	2	2	1	2
Silt loams (LeB, LeB2)	2	2	1	1	3	3	4	4	2	1	3
Silt loams (LeC2)	2	2	1	1	3	4	4	4	2	1	4
Legore:											
Gravelly loam (LgC, LgD)	2	1	2	2	3	4	4	4	2	2	4
Gravelly loam (LgE)	3	2	2	2	3	4	4	4	2	2	4
Lehigh:											
Silt loam (LhB, LhB2)	2	2	1	1	3	2	3	3	2	1	2
Silt loam (LhC2)	2	2	1	1	3	3	4	4	2	1	3
Lenoir-Keyport (Lk)	2	2	2	1	3	2	2	2	2	1	2
Matapeake:											
Loam (MoA)	1	1	1	1	3	4	4	4	1	1	4
Loam (MoB, MoC2)	2	1	1	1	3	4	4	4	1	1	4
Mattapex and Bertie (Mq)	2	2	1	1	3	2	3	3	2	1	3
Mount Lucas:											
Very stony silt loam (MvB)	2	1	1	1	3	3	3	3	2	1	3
Very stony silt loam (MvC)	2	1	1	1	3	4	4	4	2	1	4
Neshaminy:											
Silt loam (NeB, NeC, NeC2)	2	1	1	1	3	4	4	4	1	1	4
Very stony silt loam (NhC, NhE)	4	3	1	1	3	4	4	4	2	1	4
Othello (Ot)	3	2	2	1	2	1	1	1	2	1	1
Penn:											
Shaly silt loam (PeB)	2	1	1	1	3	4	4	4	2	1	4
Shaly silt loam (PeC, PeD)	3	2	2	2	3	4	4	4	3	2	4
Plummer:											
Sandy loam (Pu)	3	2	2	1	2	1	1	1	2	1	1
Sandy loam, very wet (Pv)	4	3	3	1	2	1	1	1	3	1	1
Portsmouth, thin surface variant (Pw)	4	3	3	1	2	1	1	1	3	1	1
Quakertown:											
Silt loam and channery silt loam (QkB, QkB2, QkC, QkC2, QuB, QuC, QuC2)	2	1	1	1	3	4	4	4	1	1	4
Channery silt loam (QuD2)	3	2	1	1	3	4	4	4	2	1	4
Readington and Abbottstown:											
Silt loams (RaA)	2	2	1	1	3	2	2	3	2	1	2
Silt loams (RaB, RaB2, RaC2)	2	2	1	1	3	3	4	4	2	1	3
Reaville:											
Silt loam (ReA)	2	2	1	1	3	2	2	4	2	1	2
Silt loam (ReB)	3	2	2	2	3	3	4	4	3	2	3
Silt loam (ReB2, ReC2)	3	2	2	2	3	4	4	4	3	2	4
Rowland (Ro)	2	2	1	1	3	2	2	3	1	1	2

TABLE 4.—*Suitability of the soils for wildlife habitats and for kinds of wildlife*—Continued

Soil and map symbol	Elements of wildlife habitat								Kinds of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Excavated ponds	Openland wildlife	Woodland wildlife	Wetland wildlife
Sandy and silty land:											
Strongly sloping (SdD)	3	1	2	1	3	4	4	4	2	1	4
Steep (SdE)	4	2	2	1	3	4	4	4	2	1	4
Sassafras (SrA, SrB, SrC, SrC2, SsB, StC3)	2	1	1	1	3	4	4	4	1	1	4
Sassafras-Woodstown (SyB)	2	1	1	1	3	4	4	4	1	1	4
Tinton (TnB)	3	2	2	3	2	4	4	4	2	3	4
Tioga (To)	2	1	1	2	2	4	4	4	2	2	4
Very stony land:											
Mount Lucas and Neshaminy materials (VmC)	4	3	1	1	3	3	4	4	3	1	4
Neshaminy material (VnE)	4	3	1	1	3	4	4	4	3	1	3
Watchung material (Vw)	4	3	2	1	3	1	2	3	3	1	1
Watchung (Wc)	3	2	2	1	2	1	1	3	2	1	1
Woodstown and Fallsington (WfB)	2	2	1	1	3	3	3	2	2	2	3

of the human population. The suitability of an individual site has to be determined by inspection.

Land types that do not provide a suitable habitat for wildlife are not rated in table 4. They are Cut and fill land (Cf, Cg, Ct, and Cu); Made land (Mf); Pits (Pg); and Urban land (Ug and Us).

The meanings of the ratings used in table 4 are as follows: 1, well suited; 2, suited; 3, poorly suited; and 4, unsuited. *Well suited* means that habitats generally are easily created, improved, or maintained; that the soil has few or no limitations that affect management of wildlife; and that satisfactory results can be expected. *Suited* means that habitats can be created, improved, or maintained in most places; that the soil has moderate limitations that affect management of wildlife; and that moderate intensity of management and fairly frequent attention may be required for satisfactory results. *Poorly suited* indicates that habitats can be created, improved, or maintained in most places; that the soil has rather severe limitations; that management of the habitat for wildlife is difficult and expensive and requires intensive effort; and that results are not always satisfactory. *Unsuited* indicates that it is impractical or impossible to create, improve, or maintain habitats and that unsatisfactory results are probable.

Wildlife habitats

Soil ratings for the elements of wildlife habitats listed in table 4 are explained as follows.

Grain and seed crops are grain-producing or seed-producing annual plants, such as corn, sorghum, wheat, oats, barley, millet, buckwheat, soybeans, or sunflowers.

Grasses and legumes are the domestic perennial grasses and herbaceous legumes that are established by planting and that furnish food and cover for wildlife. The grasses include fescue, bromegrass, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, and panicgrass. The legumes include alfalfa, clovers, and trefoils.

Wild herbaceous upland plants are native or introduced grasses and forbs (including weeds) that provide food and cover for upland wildlife. These plants include bluestem, indiangrass, wild ryegrass, oatgrass, pokeweed, strawberry, lespedeza, beggarweed, wild bean, nightshade, goldenrod, and dandelion.

Hardwood woody plants are nonconiferous trees, shrubs and woody vines that produce fruits, nuts, buds, catkins, twigs for browse, or foliage used extensively as food by wildlife. These plants commonly become established by natural processes, but sometimes they are planted. They include oaks, beech, cherry, hickory, sassafras, hawthorn, dogwood, viburnum, maple, birch, poplar, grape, honeysuckle, blueberry, greenbrier, other briers, autumn-olive, and multiflora rose.

Coniferous woody plants are cone-bearing trees and shrubs that are used by wildlife mainly as cover. Some of them also furnish food in the form of browse, seeds, or fruitlike cones. These plants commonly become established through natural processes, but sometimes they are planted. They include spruce, pine, white-cedar, hemlock, balsam fir, red-cedar, juniper, and yew.

Wetland plants are annual and perennial, wild, herbaceous plants that grow on moist to wet sites; they do not include submerged or floating aquatic plants. These plants furnish food or cover mostly for wetland wildlife. They include smartweed, wild millet, spike-rush and other rushes, sedges, burreed, wildrice, rice cutgrass, and cattails.

Shallow water developments are impoundments or excavations for controlling water. Generally, the water is not more than 6 feet deep. Control structures include low dikes and levees, shallow dug-out ponds, level ditches, and devices to control the water level in marshy drainageways or channels.

Excavated ponds are dug-out ponds or combinations of dug-out areas and impoundments held by low dikes. To be suitable for fish, they require an ample supply of water. Ponds that are suitable for fish are built on nearly level land, have a surface area of at least one-fourth of an acre, have an average depth of 6 feet over at least one-fourth of their acreage, and have a dependable source of water of suitable quality. Areas subject to frequent overflows are rated not suitable.

Kinds of wildlife

The kinds of wildlife that are listed in table 4 are defined as follows:

Openland wildlife consists of birds and mammals that normally live on cropland, pastures, meadows, lawns, and other areas of open land where grasses, herbs, and shrubby plants are growing. Examples are quail, pheasants, meadowlarks, field sparrows, doves, cottontail rabbits, red foxes, and woodchucks.

Woodland wildlife consists of the birds and mammals that normally live in wooded areas where hardwood trees and shrubs and coniferous trees and shrubs are growing. Examples are ruffed grouse, towhees, thrushes, vireos, scarlet tanagers, gray squirrels, red squirrels, gray foxes, white-tailed deer, and raccoons.

Wetland wildlife consists of the birds and mammals that normally live in wet areas, such as ponds, marshes, and swamps. Examples are ducks, geese, herons, minks, muskrats, and beavers.

Engineering Uses of the Soils [2]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. Among the properties most important to engineers are permeability to water, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and reaction. The depth to the water table, depth to bedrock, and topography are also important.

This soil survey contains information about the soils of Mercer County that can be used by engineers to:

1. Make soil and land studies that will aid in selecting and developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning drainage systems, ponds, irrigation systems, and terraces.
3. Make preliminary evaluation of soil and ground conditions that will aid in selecting highway, airport, pipeline, and cable locations and in planning detailed soil investigations at the selected locations.
4. Locate probable sources of sand, gravel, or other construction materials.
5. Correlate performance of engineering structures with soil mapping units to develop information for planning that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soil mapping units for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps and reports and aerial photographs to make maps and reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

The engineering interpretations reported here can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing soil at the site of specific engineering works that involve heavy loads or where the excavations are deeper than the depth of the layers reported. Even in those situations, the soil map is useful for planning more detailed field investigations and for suggesting the kind of problems that may be expected.

Much information that is useful to engineers is given in tables 5, 6, and 7. These tables contain a summary of soil properties significant to engineering and some engineering interpretations. Preliminary evaluation of the engineering properties of the soils at any location in the county can be obtained from the detailed soil map at the back of this survey and from data in these tables.

Some of the terms used by soil scientists may be unfamiliar to engineers, and some have special meaning in soil science. Those and other special terms that are used in this soil survey are defined in the Glossary.

Engineering classification systems

Most highway engineers classify soil materials according to the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly and coarse sandy soils of high bearing capacity, to A–7, consisting of clayey soils having low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. These numbers range from 0 for the best materials to 20 for the poorest. The AASHO classification of the soils in Mercer County is given in tables 5 and 6.

Other engineers prefer to use the Unified Soil Classification System (*13*). In this system the soils are identified according to their texture and plasticity and are grouped according to their performance as engineering construction materials. Soil materials are classified as coarse grained (8 classes), fine grained (6 classes), or highly organic. The Unified classification of the soils in the county is given in tables 5 and 6.

[2] KENNETH S. WERKMAN, State conservation engineer, Soil Conservation Service, helped in preparing this section.

Engineering test data

All engineering soil test data in this survey are based on sampling and testing done by Rutgers University, College of Engineering (*4, 8*). Soils were sampled at 29 sites. The soils sampled were classified according to the current system of classification.

The results of the tests are given in table 5. Also in table 5, the soil materials are classified according to the Unified and the AASHO systems and the textural classification of the U. S. Department of Agriculture. Names of some of the soils that were sampled in the original engineering study of 1954 were changed to conform with the current soil classification.

Test data in table 5 were used as a basis for interpretations of the soils shown in table 6. That table gives estimates of the classification and the properties of important layers in each kind of soil. Estimates for the soils not tested were made after study of their descriptions and comparison with the tested soils.

Soil properties significant to engineering

Table 6 gives estimates of several properties of the soils that are significant to engineering. The table lists the soils alphabetically and gives the symbol by which each is shown on the detailed soil map at the back of this publication. The information in this table is based on the test data in table 5 and other available data. Not listed in table 6, because their properties are too variable to be rated in this way, are Alluvial land (Ad and Ae); Cut and fill land (Cf, Cg, Ct, Cu); Fresh water marsh (Fm); Made land, dredged river materials (Mf); Pits (Pg); Sandy and silty land (SdD and SdE); Urban land (Ug and Us); and Very stony land (VmC, VnE, and Vw).

Depth to seasonal high water table indicates the depth to which free water will rise at least once a year, measured in feet from the surface.

Permeability is given for the soil as the soil material occurs in place. The estimates were based on soil structure and porosity and were compared with the results of permeability tests on undisturbed cores of similar soil material.

The available water capacity is expressed in this table in inches per inch of soil depth. It is the approximate amount of water held in a 1-inch layer of soil when wet to field capacity. When the soil is air dry, this amount of water will wet the material described to a depth of 1 inch without deeper penetration.

The reaction, or pH value, given in table 6 is that of a soil in its natural, or untreated, state. Heavy applications of lime, however, have raised the pH value of the surface soil in most fields that have been farmed.

The shrink-swell potential indicates the change in volume to be expected when the content of moisture in the soil is changed. The shrink-swell potential is estimated primarily on the basis of the amount and type of clay. Ratings are low, moderate, or high. For example, the soil material in the subsoil of Lenoir silt loam and Keyport silt loam is slightly sticky to sticky when wet and develops shrinkage cracks when the material becomes dry. Therefore, it has moderate shrink-swell potential. In contrast, the material in the subsoil of Galestown loamy sand contains little or no plastic fines and has a low shrink-swell potential.

409-526—72——5

The plasticity index and liquid limit are not shown in table 6. Not enough test data were available to permit good estimates.

Engineering interpretations of the soils

In table 7 are given suitability ratings of the soils in the county as a source of topsoil, sand or gravel, and road fill. Also listed are the features of the soil that affect stated engineering practices. These interpretations are based on the test data shown in table 5, the estimated soil properties in table 6, and experience in using the soils in this county and in other parts of the State. Not listed in table 7 are Urban land, Galestown material, and Urban land, Sassafras material.

As a rule, interpretations in table 7 are given by soil series unless there are members of the series that have different properties of engineering significance. For example, interpretations are given for the normal Birdsboro soils and also for the Birdsboro soils, sandy subsoil variants, and the Birdsboro soils, gravelly solum variants. These soils are sufficiently different to require separate interpretations.

The suitability of soils as a source of topsoil, sand or gravel, and road fill is indicated by a rating of good, fair, poor, or not suitable. In some places, a high water table or other soil characteristics make excavation of sand or gravel difficult or impossible.

The soil features mentioned in table 7 are mainly those that limit use for the stated engineering practices. Favorable features are noted, however, in some places.

Soils in Community Developments

This section is mainly for planners, developers, zoning officials, landowners, and prospective landowners. It indicates the relative suitability of each soil in the county for various community developments. Planners and zoning officials who are interested in comparing the suitability of soils for town and country planning with their capability for use in farming will be interested in the section "Capability grouping". Readers needing more information about the soil mapping units should refer to the section "Descriptions of the Soils."

The name and map symbol of each soil and land type are shown alphabetically in table 8. The soils are rated according to their degree of limitations for the various uses. For moderate and severe ratings in the table, the main cause of the limitation is listed.

The uses rated in table 8 are disposal of sewage effluent, development of homesites and lawns (including landscaping), streets, parking lots, athletic fields, parks and play areas, sanitary land fills, and cemeteries. The table also gives briefly the soil properties that affect foundations for dwellings with a basement.

Limitations that affect community developments are rated *slight*, *moderate*, or *severe*. A rating of *slight* means there are few or no significant limitations. *Moderate* means there is one limitation or more that can normally be overcome at moderate cost by careful design and construction. *Severe* means that there is one limitation or more that cannot be overcome without considerable cost. A severe limitation does not imply that the soil is unsuitable, but rather that development costs are abnormally high.

TABLE 5.—*Engineering*

[Tests performed by the College of Engineering, Rutgers University, in accordance with standard procedures of the American

Soil	Sampling site			Depth	Test results				
					Sieve analysis				
					Cumulative percentage passing—				
	Site number	Latitude	Longitude		¾-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
				Inches					
Birdsboro soils, sandy subsoil variant (solum thicker than modal).	40	40°16′33″	74°51′00″	0–8	----	----	----	----	----
				8–30	99	97	97	93	44
				30–60	100	100	100	98	51
Bucks silt loam (modal)	39	40°17′13″	74°46′27″	0–9	100	98	97	94	92
				9–26	100	100	99	99	96
				26–52	100	100	100	99	94
				52–60	99	82	69	57	49
Bucks silt loam (finer textured than modal).	89	40°21′19″	74°50′11″	0–9	99	98	96	94	89
				9–36	100	99	96	94	90
				36–47	100	99	97	90	67
				47–56	98	94	91	86	71
Chalfont silt loam (modal)	75	40°22′41″	74°50′07″	0–8	90	88	88	87	85
				8–22	100	99	96	94	92
				22–39	100	100	99	97	95
				39–46	100	99	95	86	80
Dragston sandy loam (modal).	34	40°10′45″	74°37′21″	0–9	98	97	97	79	43
				9–20	100	100	99	79	47
				20–31	100	100	100	85	57
				31–55	100	98	96	72	23
				55–72	100	98	97	87	19
Elkton silt loam (sandy (substratum).	69	40°11′38″	74°37′10″	0–2	----	----	----	----	----
				2–20	100	98	96	86	60
				20–30	100	100	99	94	78
				30–40	96	93	91	72	45
				40–60	98	96	92	87	73
Evesboro loamy sand (modal).	6	40°19′15″	74°36′25″	0–6	----	----	----	----	----
				6–120	100	100	100	91	13
Evesboro loamy sand (modal).	65	40°17′16″	74°32′48″	0–8	100	100	100	83	6
				8–50	100	100	100	86	6
				50–62	95	75	73	61	13
				62–72	98	86	81	54	8
				72–84	100	95	94	75	8
Evesboro loamy sand (modal).	67	40°15′07″	74°29′29″	0–12	100	100	100	88	13
				12–66	100	100	100	84	8
				66–84	100	100	100	91	20
Galestown sandy loam (modal).	49	40° 13′ 43″	74° 44′ 41″	0–9	100	100	99	88	28
				9–40	100	99	98	88	31
				40–67	100	96	88	57	5
				67–90	100	96	91	75	9
				90–110	100	99	98	68	2
Keyport silt loam (subsoil finer textured than modal).	70	40° 11′ 31″	74° 37′ 58″	0–6	100	99	98	90	69
				6–18	100	97	95	92	75
				18–48	100	100	100	99	80
				48–56	100	100	100	99	55
Legore gravelly loam (more gravelly than modal).	52	40° 20′ 13″	74° 52′ 29″	0–9	86	51	37	28	20
				9–16	70	34	29	22	17
				16–96	66	14	7	4	2

See footnotes at end of table.

test data

Association of State Highway Officials (AASHO) (*1*). Absence of data indicates the determination was not made]

Test results—Continued						Classification		
Hydrometer analysis		Liquid limit[1]	Plasticity index[2]	Maximum density	Optimum moisture content	AASHO		Unified[3]
0.05–0.005 mm.	<0.005 mm.					Group	Group index	
Percent	*Percent*	*Percent*		*Lb. per cu. ft.*	*Percent*			
		20	2			A–4	2	SM
		NL	NP			A–4	3	ML
		32	8			A–4	8	ML–CL
64	29	30	8			A–4	8	ML–CL
		29	5			A–4	8	ML–CL
29	18	30	8			A–4	3	SM–SC
		34	8			A–4	8	ML–CL
49	39	33	8	102	19	A–4	8	ML–CL
		34	5	99	21	A–4	6	ML
		36	2			A–4	7	ML
		38	11			A–6	9	ML–CL
58	33	32	9			A–4	8	ML–CL
60	31	32	9			A–4	8	ML–CL
50	27	28	7			A–4	8	ML–CL
		21	2			A–4	2	SM
		21	5			A–4	2	SM–SC
		22	4			A–4	4	ML–CL
		17	NP			A–2–4	0	SM
		NL	NP			A–2–4	0	SM
		24	2			A–4	5	ML
23	48	28	7			A–4	8	ML–CL
28	16	27	7			A–4	2	SM–SC
39	30	40	14			A–6	10	ML–CL
		NL	NP			A–2–4	0	SM
		NL	NP			A–3	0	SP–SM
		NL	NP	105	13	A–3	0	SP–SM
		NL	NP			A–2–4	0	SM
		NL	NP	122	11	A–3	0	SP–SM
		NL	NP			A–3	0	SP–SM
		NL	NP			A–2–4	0	SM
		NL	NP	109	11	A–3	0	SP–SM
		NL	NP	109	13	A–2–4	0	SM
		NL	NP			A–2–4	0	SM
		NL	NP			A–2–4	0	SM
		NL	NP			A–3	0	SP–SM
		NL	NP			A–3	0	SP–SM
		NL	NP			A–3	0	SP
		41	12			A–7–6	8	ML
		41	15	96	23	A–7–6	10	ML–CL
51	21	57	25	89	21	A–7–5	17	MH
26	29	50	15	93	27	A–7–5	6	ML or MH
		34	6			A–1–b	0	GM
10	7	33	7			A–2–4	0	GM
1	2	34	6			A–2–4	0	GP

TABLE 5.—*Engineering*

Soil	Sampling site: Site number	Sampling site: Latitude	Sampling site: Longitude	Depth	Test results — Sieve analysis — Cumulative percentage passing—: ¾-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
				Inches					
Matapeake loam (modal)	9	40° 16′ 16″	74° 47′ 08″	0–7	99	97	96	91	79
				7–50	100	100	100	99	94
				50–72	100	98	96	45	25
				72–83	100	100	99	49	16
Matapeake loam (modal)	27	40° 09′ 35″	74° 35′ 43″	0–9	100	97	95	94	66
				9–20	100	100	99	97	82
				20–36	100	100	99	98	80
Mattapex loam (modal)	16	40° 19′ 43″	74° 38′ 47″	0–10	100	96	96	90	69
				10–29	100	100	99	97	84
				29–39	96	82	80	68	36
				39–50	100	97	96	56	33
				50–113	100	100	100	61	26
Mount Lucas silt loam (modal).	57	40° 22′ 07″	74° 03′ 01″	0–7	99	97	95	90	81
				7–22	99	97	97	92	84
				22–54	100	100	96	92	84
				54–67	99	95	92	80	70
Mount Lucas silt loam (modal).	60	40° 19′ 52″	74° 51′ 42″	0–12	100	100	100	91	70
				12–30	100	100	100	99	97
				30–60	100	100	100	99	98
Neshaminy silt loam (subsoil finer textured than modal).	56	40° 22′ 28″	74° 45′ 35″	0–6	97	95	95	93	89
				6–30	100	100	100	98	95
				30–33	55	53	53	48	40
Othello silt loam (subsoil coarser textured and solum thicker than modal).	26	40° 13′ 59″	74° 32′ 35″	0–11	100	100	98	91	63
				11–24	100	98	98	96	79
				24–40	98	92	90	84	58
				40–52	100	100	99	94	70
Othello silt loam (solum thicker than modal).	36	40° 13′ 25″	74° 36′ 03″	0–12	------	------	------	------	------
				12–28	100	96	86	82	61
				28–60	100	100	99	97	85
Quakertown channery silt loam (modal).	74	40° 21′ 27″	74° 50′ 12″	0–8	80	78	75	70	67
				8–34	95	93	89	84	82
				34–38	86	84	80	75	72
Quakertown channery silt loam (modal).	93	40°23′50″	74°48′04″	0–16	100	97	96	86	76
				16–40	96	94	92	88	84
				40–52	95	90	87	81	76
Readington silt loam (subsoil finer textured than modal).	85	40°20′51″	74°43′56″	0–8	99	84	71	64	60
				8–30	97	92	88	83	78
				30–36	92	82	68	64	60
Sassafras sandy loam (subsoil coarser textured than modal).	5	40°09′39″	74°37′59″	0–9	100	100	99	88	35
				9–24	100	100	100	89	31
				24–36	100	100	99	88	26
				36–56	------	------	------	------	------
				56–65	100	100	100	89	42
				65–97	------	------	------	------	------
				97–115	97	96	94	81	8
Sassafras sandy loam (subsoil coarser textured than modal).	19	40°13′52″	74°36′26″	0–5	100	98	97	81	41
				5–28	99	98	97	93	70
				28–40	100	99	99	92	51
				40–46	98	85	81	71	41

See footnotes at end of table.

test data—Continued

Test results—Continued						Classification		
Hydrometer analysis						AASHO		
0.05–0.005 mm.	<0.005 mm.	Liquid limit [1]	Plasticity index [2]	Maximum density	Optimum moisture content	Group	Group index	Unified [3]
Percent	*Percent*	*Percent*		*Lb. per cu. ft.*	*Percent*			
		29	5			A–4	8	ML–CL
61	29	29	7			A–4	8	ML–CL
		28	5			A–1–b	0	SM–SC
		NL	NP			A–1–b	0	SM
		26	5			A–4	6	ML–CL
55	23	29	7			A–4	8	ML–CL
54	18	32	12			A–6	9	CL
		26	7			A–4	7	ML–CL
52	25	27	10	113	14	A–4	8	
		20	2			A–4	0	SM
14	16	32	11	114	14	A–2–6	1	SM–SC
		33	NP			A–2–4	0	SM
		33	8			A–4	8	ML–CL
58	23	27	7	105	18	A–4	8	ML–CL
56	24	28	8			A–4	8	ML–CL
		NL	NP	110	16	A–4	7	ML
		43	14			A–7–6	10	ML
62	26	33	9			A–4	8	ML–CL
74	18	31	9			A–4	8	ML–CL
		36	9			A–4	8	ML
56	34	33	11			A–6	8	ML–CL
23	15	38	13			A–6	2	GM–GC
		27	7			A–4	6	ML–CL
		36	6			A–4	8	ML
		24	5			A–4	5	ML–CL
50	15	26	7			A–4	7	ML–CL
		43	12			A–7–5	6	ML
55	25	31	11			A–6	8	CL
		39	10			A–4	7	ML
50	31	31	10			A–4	8	ML–CL
42	28	30	10			A–4	7	ML–CL
		34	8			A–4	8	ML–CL
61	23	29	7	105	17	A–4	8	ML–CL
50	23	31	8	107	18	A–4	8	ML–CL
		38	10			A–4	5	ML
41	37	30	10	107	19	A–4	8	ML CL
33	25	28	8	106	19	A–4	5	ML–CL
		23	5			A–2–4	0	SM–SC
13	14	25	6			A–2–4	0	SM–SC
		24	3			A–2–4	0	SM
		22	2			A–4	1	SM
		NL	NP			A–3	0	SP–SM
		29	5			A–4	1	SM–SC
44	15	23	8			A–4	7	CL
32	13	21	6			A–4	3	ML–CL
25	14	20	6			A–4	1	SM–SC

TABLE 5.—*Engineering*

Soil	Sampling site: Site number	Sampling site: Latitude	Sampling site: Longitude	Depth	Test results: Sieve analysis: Cumulative percentage passing—: ¾-inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)
				Inches					
Tioga fine sandy loam (modal).	46	40°15′00″	74°50′04″	0–12	98	95	94	90	38
				12–25	95	91	90	87	31
Very stony land, Watchung material.	59	40°22′31″	74°41′32″	0–8	100	100	100	89	74
				8–40	100	100	100	99	96
Woodstown sandy loam (subsoil coarser textured than modal).	22	40°15′03″	70°33′19″	0–6	100	100	100	48	19
				6–20	100	99	99	77	48
				20–38	99	95	95	65	33
				38–57	100	97	96	46	27

[1] NL means nonliquid.
[2] NP means nonplastic.

TABLE 6.—*Estimated engineering*

[Properties of bedrock and of

Soil and map symbol	Depth to—: Bedrock	Depth to—: Seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Abbottstown (Mapped only with Readington soils.)	3–4	1–1½	0–33	Silt loam
			33–40	Shattered shale
			40	Shale bedrock.
Aura (AfB, AfC)	10+	7+	0–16	Sandy loam
			16–26	Heavy sandy loam
			26–50	Gravelly sandy clay loam
			50–64	Gravelly sandy loam
			64–72	Coarse sand
Bertie (Mapped only with Mattapex soil.)	10+	1–1½	0–32	Loam or silt loam
			32–60	Fine sandy loam
Birdsboro (BbB, BbB2, BbC2, BdA, BdB)	3½–6	5	0–32	Silt loam
			32–48	Sandy loam
Birdsboro, sandy subsoil variants (BnA, BnB, BnC).	3–4	5+	0–9	Fine sandy loam
			9–34	Fine sandy loam
Birdsboro, gravelly solum variants (BoB)	10+	7+	0–35	Gravelly sandy loam
			35–60	Gravelly sand
Bowmansville (Bt)	3–5+	0	0–44	Silt loam
			44	Shale bedrock.
Bucks (BuA, BuB, BuB2, BuC, BuC2)	3½–5	6+	0–39	Silt loam
			39–48	Shale fragments.
			48	Shale bedrock.
Chalfont (CdA, CdB, CdB2, CdC2, CeB)	3–5	1–1½	0–43	Silt loam
			43	Argillite bedrock.

See footnotes at end of table.

test data—Continued

Test results—Continued						Classification		
Hydrometer analysis		Liquid limit [1]	Plasticity index [2]	Maximum density	Optimum moisture content	AASHO		Unified [3]
0.05–0.005 mm.	<0.005 mm.					Group	Group index	
Percent	*Percent*	*Percent*		*Lb. per cu. ft.*	*Percent*			
----------	----------	21	3	----------	----------	A–4	1	SM
----------	----------	NL	NP	----------	----------	A–2–4	0	SM
----------	----------	43	9	----------	----------	A–5	8	ML
57	33	44	22	----------	----------	A–7–6	14	CL
----------	----------	56	17	----------	----------	A–2–7	0	SM
23	13	42	16	90	22	A–7–6	6	SM–SC
----------	----------	21	6	120	10	A–2–4	0	SM–SC
8	16	30	12	----------	----------	A–2–6	0	SC

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points from the A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are SM–SC and ML–CL.

properties of the soils

rock fragments were not estimated]

Classification—Continued		Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
ML or CL	A–4	85–95	70–90	65–85	60–80	<0. 20–2. 0	0. 16–0. 26	5. 0–6. 0	Low.
ML or CL	A–4	70–90	60–85	50–80	50–60	0. 63–2. 0	0. 10–0. 15	5. 0–6. 0	Low.
SM	A–2	80–100	75–100	40–60	25–35	2. 0–6. 3	0. 12–0. 16	4. 0–4. 5	Low.
SM	A–2 or A–4	85–100	80–100	45–65	30–40	0. 2–2. 0	0. 12–0. 16	4. 5–5. 0	Low.
SM or SC	A–4	75–85	70–80	50–70	35–45	0. 2–2. 0	0. 10–0. 14	4. 5–5. 0	Moderate.
SM or SC	A–1, A–2, or A–4	75–85	70–90	40–60	25–40	2. 0–6. 3	0. 04–0. 08	4–5–5. 0	Low.
SP or SP–SM	A–3	90–100	90–100	40–60	0–10	2. 0–6. 3	0. 04–0. 08	4. 5–5. 0	Low.
ML or CL	A–4	95–100	90–100	80–95	60–80	0. 2–0. 63	[1] 0. 21–0. 23	4. 0–4. 5	Low.
SM	A–2 or A–4	90–100	80–100	75–95	30–50	0. 63–2. 0	0. 14–0. 18	4. 5–5. 0	Low.
ML	A–4	95–100	90–98	85–95	50–90	0. 63–2. 0	0. 23–0. 27	5. 5–6. 0	Low.
SM	A–2 or A–4	90–100	80–100	70–95	25–45	2. 0–6. 3	0. 12–0. 16	5. 0–5. 5	Low.
SM or ML	A–2 or A–4	90–100	90–100	80–95	30–65	2. 0–6. 3	0. 16–0. 20	5. 5–6. 0	Low.
SM	A–2 or A–4	85–100	80–100	80–95	30–45	2. 0–6–3	0. 14–0. 18	5. 0–5. 5	Low.
SM or SC	A–2 or A–4	75–100	70–100	40–55	30–40	2. 0–6. 3	0. 10–0. 14	5. 5–6. 0	Low.
SM or SP–SM	A–2 or A–3	75–95	70–95	35–65	5–15	>6. 3	0. 04–0. 08	5. 0–5. 5	Low.
ML	A–4	95–100	90–98	85–100	70–90	0. 63–2. 0	0. 24–0. 28	5–5–6. 0	Low.
ML or CL	A–6	95–100	95–100	90–100	70–90	0. 2–2. 0	0. 20–0. 28	5. 0–5. 5	Low.
ML	A–4 or A–6	80–100	70–90	70–90	70–85	<0. 2–2. 0	[2,3] 0. 20–0. 25	5. 0–6. 0	Low.

TABLE 6.—*Estimated engineering*

Soil and map symbol	Depth to— Bedrock	Seasonal high water table	Depth from surface	Classification USDA texture
	Feet	*Feet*	*Inches*	
Downer (Df)	10+	10+	0–41	Fine sandy loam
			41–66	Stratified gravelly clay loam
Doylestown (DgA, DgB, DgB2, DgC, DgC2). (For Reaville part, see Reaville series.)	3½–5	0–1	0–11	Silt loam
			11–28	Silt loam
			28–58	Silt loam
Dragston (DwB) (For Woodstown part, see Woodstown series.)	10+	1–1½	0–26	Sandy loam
			26–45	Gravelly sandy loam
Elkton (Ek)	10+	1	0–6	Silt loam
			6–40	Silty clay or clay
Evesboro (EvB)	10+	10+	0–60	Loamy sand to coarse sand
Evesboro, sandy loam subsoil variants (EwB)	10+	10+	0–60	Fine sandy loam or sandy loam
Fallsington (Fd)	10+	1	0–19	Sandy loam
			19–56	Sand
Fort Mott (FrB, FrC)	10+	10+	0–23	Loamy sand
			23–40	Sandy loam
			40–60	Loamy sand
Galestown:				
Loamy sand (GaB)	10+	10+	0–60	Loamy sand or fine sand
Sandy loam (GeB)	4–8	5+	0–60	Sandy loam or loamy sand
Keyport (Mapped only with Lenoir soil.)	10+	1½–2½	0–10	Silt loam
			10–26	Silty clay
			26–60	Silty clay loam
Klej, sandy loam subsoil variants (Km)	10+	1½–2	0–40	Sandy loam
			40–60	Loamy sand
Klinesville (KsC, KsE)	½–1½	3	0–11	Shaly loam
			11	Shale bedrock.
Lansdale (LaB, LcC2, LcD2, LdC, LdE)	3½–6	10+	0–20	Sandy loam
			20–49	Sandy clay loam
			49–60	Channery sand
Lawrenceville (LeA, LeB, LeB2, LeC2). (For Mount Lucas part, see Mount Lucas series.)	5+	1–2½	0–60	Silt loam
			60	Shale bedrock.
Legore (LgC, LgD, LgE)	4–6	10+	0–11	Gravelly loam
			11–27	Gravelly clay loam
			27–45	Very gravelly loam
			45	Diabase bedrock.
Lehigh (LhB, LhB2, LhC2)	2–4	1–2	0–21	Silt loam
			21–29	Silty clay loam
			29–34	Shaly silty clay
			34	Weathered metamorphosed shale.
Lenoir (Lk) (For Keyport part, see Keyport series.)	10+	1–1½	0–7	Silt loam
			7–48	Silty clay
Matapeake (MoA, MoB, MoC2)	10+	4+	0–15	Loam
			15–41	Clay loam
	10	4	6	Silty clay

See footnotes at end of table.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
SM	A–2 or A–4	95–100	95–100	50–80	30–50	0. 63–2. 0	0. 18–0. 22	4. 0–5. 0	Low.
SM, SC, or ML	A–4	90–100	85–100	60–80	35–55	0. 2–0. 63	0. 08–0. 14	4. 5–5. 0	Low.
ML	A–4 or A–6	95–100	95–100	85–100	80–95	0. 2–2. 0	0. 22–0. 26	5. 5–6. 0	Low.
ML or CL	A–4 or A–6	95–100	95–100	90–100	70–90	<0. 2	0. 20–0. 24	5. 5–6. 0	Moderate.
ML or CL	A–4 or A–6	95–100	95–100	85–100	70–90	<0. 2	0. 20–0. 24	5. 0–5. 5	Low.
SM	A–2 or A–4	85–100	80–100	45–80	20–40	0. 63–2. 0	[1] 0. 14–0. 18	4. 0–4. 5	Low.
SM	A–2	70–100	70–100	40–70	15–25	2. 0–6. 3	0. 10–0. 14	4. 5–5. 0	Low.
ML or CL	A–4 or A–6	95–100	90–100	85–95	65–95	0. 2–0. 63	0. 18–0. 22	4. 0–4. 5	Low.
CL	A–6 or A–7	95–100	90–100	85–95	70–95	<0. 2	0. 14–0. 18	4. 5–5. 0	Moderate.
SP or SP–SM	A–2 or A–3	90–100	85–100	75–90	5–20	>6. 3	0. 06–0. 10	4. 0–5. 0	Low.
SM	A–2	95–100	90–100	80–95	20–35	2. 0–6. 3	0. 14–0. 18	4. 0–5. 0	Low.
SM	A–2 or A–4	95–100	95–100	60–85	25–45	0. 63–2. 0	[1] 0. 14–0. 18	4. 0–4. 5	Low.
SP–SM or SM	A–2 or A–3	90–100	90–100	50–75	5–20	>6. 3	0. 06–0. 10	4. 5–5. 0	Low.
SP–SM or SM	A–2 or A–3	95–100	90–100	60–90	5–20	>6. 3	0. 08–0. 12	4. 0–4. 5	Low.
SM or SC	A–2 or A–4	95–100	95–100	75–95	20–50	0. 63–2. 0	0. 12–0. 16	4. 5–5. 0	Low.
SM or SP–SM	A–2	90–100	80–95	50–75	10–25	2. 0–6. 3	0. 08–0. 12	4. 5–5. 0	Low.
SM or SP–SM	A–2	95–100	90–100	50–80	10–20	2. 0–6. 3	0. 08–0. 12	4. 0–5. 0	Low.
SM	A–2 or A–4	80–100	75–85	70–80	20–45	2. 0–6. 3	0. 10–0. 18	4. 0–5. 0	Low.
ML or CL	A–4	95–100	95–100	90–100	65–90	0. 2–0. 63	0. 18–0. 22	4. 0–4. 5	Low.
ML, MH, or CL	A–4 or A–6	95–100	95–100	95–100	70–90	<0. 2	0. 16–0. 20	4. 5–5. 0	Moderate.
ML or CL	A–4 or A–6	95–100	90–100	80–90	60–80	<0. 2	0. 16–0. 20	4. 5–5. 0	Moderate.
SM	A–2 or A–4	95–100	95–100	60–85	20–40	2. 0–6. 3	[1] 0. 14–0. 18	4. 0–5. 0	Low.
SM	A–2	95–100	90–100	70–90	15–30	2. 0–6. 3	0. 08–0. 12	4. 5–5. 0	Low.
SM, ML, or GM	A–4 or A–2	55–85	50–80	45–70	20–40	2. 0–6. 3	0. 13–0. 17	5. 0–6. 0	Low.
SM	A–2 or A–4	80–100	80–100	70–95	25–40	2. 0–6. 3	[2] 0. 16–0. 20	5. 5–6. 0	Low.
SM, SC, or ML	A–2 or A–4	85–100	85–100	30–75	30–55	2. 0–6. 3	0. 16–0. 20	5. 0–5. 5	Low.
GP or GM	A–2	30–60	30–60	30–50	0–20	>6. 3	0. 06–0. 10	5. 0–5. 5	Low.
ML or CL	A–4 or A–6	95–100	95–100	90–100	50–85	0. 2–2. 0	[3] 0. 20–0. 24	5. 0–6. 0	Low.
SM or ML	A–4	70–85	60–85	50–80	40–65	2. 0–6. 3	0. 15–0. 19	5. 0–5. 5	Low.
ML	A–4	70–85	60–85	55–85	50–70	0. 63–2. 0	0. 16–0. 20	5. 0–5. 5	Low to moderate.
SM	A–2 or A–4	60–70	60–70	40–50	30–40	2. 0–6. 3	0. 12–0. 16	5. 5–6. 0	Low.
ML or CL	A–4	85–100	80–100	80–95	65–85	0. 63–2. 0	0. 24–0. 28	5. 5–6. 0	Low.
ML or CL	A–4	90–100	90–100	85–100	75–90	0. 2–0. 63	0. 20–0. 24	5. 0–6. 0	Moderate.
ML, CL, or GM	A–4	80–90	70–80	70–80	60–80	0. 2–0. 63	0. 20–0. 24	5. 0–6. 0	Moderate.
ML	A–4 or A–7	95–100	95–100	90–100	85–90	0. 2–0. 63	0. 16–0. 20	4. 0–4. 5	Low to moderate.
ML or MH	A–7	95–100	95–100	95–100	70–90	<0. 2	0. 16–0. 20	4. 5–5. 0	Moderate.
ML	A–4	95–100	95–100	80–95	60–75	0. 2–0. 63	0. 21–0. 23	4. 0–4. 5	Low.
ML or CL	A–4 or A–6	95–100	95–100	80–98	50–70	0. 20–0. 63	0. 18–0. 22	4. 5–5. 0	Low.
ML or CL	A–4 or A–6	85–100	85–100	80–95	80–90	<0. 2	0. 16–0. 20	4. 5–5. 0	Moderate.

TABLE 6.—*Estimated engineering*

Soil and map symbol	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	Classification: USDA texture
	Feet	*Feet*	*Inches*	
Mattapex (Mq) (For Bertie part, see Bertie series.)	10+	1½–2½	0–41 41–60	Loam Silty clay
Mount Lucas (MvB, MvC)	4½–10	1–2	0–43 43–53	Silt loam Stony loam
Neshaminy (NeB, NeC, NeC2, NhC, NhE)	5–10	5+	0–8 8–41 41–60	Silt loam Silty clay loam Loam
Othello (Ot)	10+	0–1	0–11 11–26 26–42	Silt loam Silty clay loam Fine sandy loam
Penn (PeB, PeC, PeD)	1½–2½	3+	0–14 14–23 23	Shaly silt loam Shaly loam Shale bedrock.
Plummer (Pu, Pv)	10+	0–1	0–12 12–51	Sandy loam Loamy sand
Portsmouth (Pw)	10+	0	0–26 26–60	Silt loam Layers of fine and coarse sand
Quakertown (QkB, QkB2, QkC, QkC2, QuB, QuC, QuC2, QuD2).	3–5	4+	0–42 42	Silt loam or light silty clay loam Sandstone bedrock.
Readington (RaA, RaB, RaB2, RaC2) (For Abbottstown parts, see Abbottstown series.)	3–4	1½–2½	0–28 28–40 40	Silt loam Weathered shattered shale Shale bedrock.
Reaville (ReA, ReB, ReB2, ReC2)	1½–3½	1–2	0–14 14–28 28	Silt loam Heavy silt loam Shale bedrock.
Reaville, wet variant (Mapped only with Doylestown soils.)	1½–2½	0–1	0–12 12–20 20	Silt loam Silty clay loam Fractured shale bedrock.
Rowland (Ro)	5+	1–2	0–48	Silt loam
Sassafras:				
Sandy loam (SrA, SrB, SrC, SrC2, SyB) and sandy clay loam[4] (StC3). (For Woodstown part of SyB, see Woodstown series.)	10+	5+	0–12 12–22 22–48	Sandy loam Sandy clay loam Layers of sandy loam and sand
Gravelly sandy loam [5] (SsB)	10+	5+	0–12	Gravelly sandy loam
Tinton (TnB)	10+	10+	0–21 21–37 37–51	Loamy sand Sandy clay loam Stratified loamy sand and sand
Tioga (To)	5+	3+	0–60	Fine sandy loam or loamy fine sand
Watchung (Wc)	4–7	0–1	0–11 11–29 29–48 48	Silt loam Silty clay loam Loam Diabase bedrock.
Woodstown (WfB) (For Fallsington part, see Fallington series.)	10+	1½–2½	0–48 48–60	Sandy loam Loamy sand and sandy loam

[1] Ground water may also be available to plants.
[2] Channery, stony, or very stony phases have available water capacity near the lower limit of the range indicated.
[3] A pan in this soil restricts roots and prevents plants from obtaining all the water that the soil can hold.

properties of the soils—Continued

Classification—Continued		Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH*	
ML	A–4	95–100	90–100	80–95	60–80	0.2–0.63	[1] 0.21–0.23	4.0–4.5	Low.
ML or CL	A–4 or A–6	85–100	85–100	80–95	80–90	<0.2	0.18–0.22	4.5–5.0	Moderate.
ML or CL	A–4	90–100	90–100	90–100	60–80	0.2–0.63	[2] 0.16–0.25	5.0–5.5	Low
SM or ML	A–2 or A–4	70–90	60–85	60–80	30–60	0.63–2.0	[2] 0.16–0.22	5.5–6.0	Low.
ML or CL	A–4 or A–6	95–100	90–100	85–95	70–90	0.63–2.0	[2] 0.20–0.24	5.5–6.0	Low.
ML or CL	A–4 or A–6	98–100	98–100	95–100	90–100	0.2–2.0	0.16–0.20	5.0–5.5	Moderate.
ML, CL, SM, or SC	A–4 or A–6	90–100	90–100	50–80	40–60	0.63–6.3	0.17–0.20	5.0–5.5	Low.
ML or CL	A–4 or A–6	98–100	98–100	80–95	55–75	0.63–2.0	[1] 0.20–0.24	4.0–4.5	Low
ML or CL	A–4 or A–6	95–100	85–100	80–95	75–90	0.2–0.63	0.20–0.24	4.5–5.0	Low.
SM	A–4	90–100	85–95	80–90	40–80	0.63–2.0	0.10–0.16	4.5–5.0	Low.
ML	A–4	60–90	60–80	50–75	50–65	0.63–2.0	0.20–0.24	5.5–6.0	Low.
SM, SC, or ML	A–4	60–85	60–75	40–70	40–55	0.2–2.0	0.18–0.24	5.0–6.0	Low.
SM	A–2 or A–4	95–100	90–100	50–80	20–40	2.0–6.3	[1] 0.14–0.18	4.0–4.5	Low.
SP–SM or SM	A–2 or A–3	90–100	85–100	75–90	5–30	>6.3	0.04–0.08	4.5–5.0	Low.
ML–CL	A–4	98–100	98–100	80–90	65–85	0.63–2.0	[1] 0.20–0.25	4.0–4.5	Low.
SP or SP–SM	A–2 or A–3	90–100	90–100	50–80	0–15	2.0–6.3	0.08–0.12	4.5–5.0	Low.
ML or CL	A–4	80–100	75–95	70–90	65–85	0.20–2.0	[2] 0.20–0.25	5.0–6.0	Low.
ML or CL	A–4	85–95	70–90	65–85	60–80	0.20–2.0	0.22–0.26	5.0–6.0	Low.
ML, CL, or GM	------------	80–90	65–75	60–70	55–75	0.63–2.0	0.10–0.15	5.0–6.0	Low.
ML or CL	A–4	95–100	85–100	85–95	70–90	0.63–2.0	0.20–0.24	5.5–6.0	Low.
ML or CL	A–4	95–100	90–100	80–95	80–95	0.63–2.0	0.20–0.26	5.0–6.0	Moderate.
ML or CL	A–4	90–100	85–100	80–95	70–90	0.63–2.0	0.20–0.24	5.5–6.0	Low.
ML or CL	A–4 or A–6	80–100	75–95	70–90	65–85	0.2–0.63	0.20–0.24	5.0–6.0	Moderate.
ML or CL	A–4 or A–6	95–100	95–100	90–100	80–95	0.63–2.0	[1] 0.24–0.28	5.0–6.0	Low.
SM	A–2 or A–4	95–100	95–100	80–90	30–45	0.63–2.0	0.12–0.16	4.0–5.0	Low.
SM or SC	A–4	98–100	95–100	85–95	35–50	0.63–2.0	0.12–0.16	4.5–5.0	Low.
SM or SP–SM	A–2 or A–4	85–100	80–100	70–95	10–30	2.0–6.3	0.08–0.12	4.5–5.0	Low.
SM	A–2 or A–4	70–80	70–80	60–70	25–40	0.63–2.0	0.10–0.14	4.0–4.5	Low.
SP–SM or SM	A–2	95–100	90–100	60–90	5–20	>6.3	0.08–0.12	4.0–4.5	Low.
SM or SC	A–2 or A–4	95–100	95–100	75–95	20–50	0.63–2.0	0.14–0.18	4.5–5.0	Low.
SP–SM or SM	A–2 or A–3	90–100	80–95	50–75	5–20	2.0–6.3	0.08–0.12	4.5–5.0	Low.
SM	A–2 or A–4	90–100	90–100	85–95	25–50	>2.0–6.3	0.15–0.20	5.0–6.0	Low.
ML or CL	A–4 or A–6	95–100	90–100	85–95	70–90	0.63–2.0	0.22–0.26	5.5–6.0	Moderate.
ML or CL	A–4 or A–6	95–100	95–100	90–100	75–95	<0.2	0.20–0.26	5.0–5.5	Moderate.
SM or ML	A–4	90–100	90–100	40–60	40–55	0.63–2.0	0.12–0.18	5.0–5.5	Low.
SM	A–2 or A–4	95–100	90–100	60–90	20–40	0.63–2.0	[1] 0.14–0.18	4.0–5.0	Low.
SP–SM or SM	A–2	85–100	80–100	70–90	10–30	2.0–6.3	0.08–0.12	4.5–5.0	Low.

[4] Sassafras sandy clay loam is similar to Sassafras sandy loam except that the horizon from 0 to 12 inches is missing.
[5] Sassafras gravelly sandy loam below a depth of 12 inches is similar to Sassafras sandy loam.

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of— Topsoil	Sand or gravel	Road fill	Soil features affecting— Road location	Reservoirs: Reservoir areas
Abbottstown (Mapped only with Readington soils.)	Fair; moderately high seasonal water table.	Unsuitable; silty material.	Fair; A–4; fair compaction and stability; moderately high seasonal water table.	Shale bedrock at depth of 3 to 4 feet; moderately high seasonal water table.	Shale bedrock is permeable.
Alluvial land: Wet (Ad)	Fair; high water table.	Poor; silty material.	Poor; high water table; variable material.	Constantly high water table.	Variable; high water table.
Very wet (Ae)	Poor; constantly high water table.	Unsuitable; silty material.	Poor; constantly high water table.	Constantly high water table.	Constantly high water table.
Aura (AfB, AfC)	Fair; contains quartzose gravel.	Good	Good; good compaction characteristics; fair stability.	Soil features favorable.	Moderately rapid permeability below 5 feet.
Bertie (Mapped only with Mattapex soil.)	Fair; moderately high seasonal water table.	Fair to poor; sand in some places below 30 to 40 inches, but variable.	Fair; fair compaction and stability; hazard of frost heaving.	Moderately high seasonal water table.	Variably permeable substratum; loss by seepage is likely where sandy.
Birdsboro (BbB, BbB2, BbC2, BdA, BdB).	Good	Poor; silty material to a depth of 2½ or 3 feet, then 1 to 2 feet of more sandy material.	Poor; poor compaction and poor stability in upper 2½ feet; next 1½ feet, A–2 or A–4.	Soil features favorable.	Moderately rapid permeability below 2½ feet.
Birdsboro, sandy subsoil variants (BnA, BnB, BnC).	Good	Fair; sandy material below depth of 1 foot; bedrock at 3 to 4 feet.	Fair; A–2 or A–4; good compaction; low shrink-swell potential.	Soil features favorable.	Moderate to moderately rapid permeability.
Birdsboro, gravelly solum variants (BoB).	Good; contains some quartzose gravel.	Good for sand and for rounded quartzose gravel.	Fair; A–2 or A–4; good compaction; fair stability.	Soil features favorable.	Moderately rapid permeability.
Bowmansville (Bt)	Good; constantly high water table; overflow hazard.	Unsuitable; silty material.	Poor; A–4; fair compaction; poor stability; low shrink-swell potential; constantly high water table.	Overflow hazard; constantly high water table.	Moderate permeability; moderate loss by seepage.
Bucks (BuA, BuB, BuB2, BuC, BuC2).	Good	Unsuitable; silty material.	Poor; A–4; fair compaction; poor stability.	Soil features favorable.	Moderate permeability; moderate loss by seepage.
Chalfont (CdA, CdB, CdB2, CdC2, CeB).	Fair; seasonally wet. CeB is poor, very stony.	Unsuitable; silty material.	Poor; A–4 or A–6; fair compaction; poor stability; moderately high water table. CeB is very stony.	Moderately high seasonal water table.	Low loss by seepage. CeB is very stony.
Cut and fill land: Clayey substratum (Cf)	Poor; topsoil has been removed.	Fair for sand or gravel; 2 to 3 feet thick if not removed or covered.	Fair	Unstable substratum.	(2)

See footnotes at end of table.

interpretations of the soils

Soil features affecting—Continued					
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials [1]	Excavated reservoirs				
Fair compaction and stability; moderately high seasonal water table; piping hazard.	Low water table in summer.	Moderate permeability; bedrock at depth of 3 to 4 feet.	Moderate intake rate; high water-holding capacity.	Erosion hazard on long slopes.	Soil features favorable.
Variable material	Constantly high water table; severe overflow hazard.	Frequent overflows; high water table.	Constantly high water table.	Subject to flooding; poorly drained soil.	Constantly high water table.
Poor stability; poor compaction characteristics; piping hazard.	Severe overflow hazard; constantly high water table.	Severe overflow hazard; constantly high water table.	Constantly high water table.	Severe overflow hazard; constantly high water table.	Constantly high water table.
Good compaction	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	Very short slopes	Soil features favorable.
Fair compaction; fair stability.	Low water table in summer.	Moderate permeability.	Moderate intake rate; high water-holding capacity; seasonal moderately high water table.	Soil features favorable.	Soil features favorable.
Poor compaction and poor stability in upper 2½ feet.	Low water table; unsuitable.	Well drained	Moderate intake rate; high water-holding capacity.	Gently sloping; erodible.	Soil features favorable.
Good compaction; fair stability; moderate permeability; moderate piping hazard.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Good compaction; fair stability; piping hazard.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; low water-holding capacity.	Short, gentle slopes.	Soil features favorable.
Fair compaction; slow permeability; piping hazard.	Overflow hazard; constantly high water table.	Overflow hazard; constantly high water table.	Constantly high water table; high water-holding capacity.	(2)	(2).
Fair compaction; poor stability; slow permeability; piping hazard.	Low water table; unsuitable.	Well drained	Moderate intake rate; high water-holding capacity.	Soil features favorable.	Soil features favorable.
Fair compaction; poor stability; low shear strength; piping hazard. CeB is very stony.	Low water table in summer.	Slow permeability. CeB is very stony.	Moderate intake rate; high water-holding capacity; poor internal drainage.	CeB is very stony; others favorable.	Soil features favorable.
(2)	(2)	(2)	(2)	(2)	(2).

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of— Topsoil	Sand or gravel	Road fill	Soil features affecting— Road location	Reservoirs: Reservoir areas
Gravelly material (Cg)	Poor; topsoil has been removed.	Good for gravel if gravel has not been removed or covered.	Fair; A-2 or A-4; good compaction; fair stability.	Soil features favorable.	High loss by seepage.
Rock substratum (Ct)	Poor; topsoil has been removed.	Unsuitable; material is silty or rocky.	Poor; A-4 or A-6, or rock.	Variable	Variable.
Stratified substratum (Cu).	Poor; topsoil has been removed.	Poor; sand and gravel thin if not removed.	Poor to fair; materials are variable.	Variable	Variable
Downer (Df)	Good	Poor for sand in in upper 3 feet.	Good to depth of 3 feet; good to fair below.	Soil features favorable.	Low loss by seepage.
Doylestown (DgA, DgB, DgB2, DgC, DgC2). (For Reaville part, see Reaville series.)	Fair; high seasonal water table.	Poor; material is silty.	Poor: A-4 to depth of 1½ feet, A-6 below; fair compaction; poor stability; low shear strength; high seasonal water table.	High seasonal water table.	Fractures in bedrock permit loss by seepage.
Dragston (DwB) (For Woodstown part, see Woodstown series.)	Good; moderately high seasonal water table.	Fair; moderately high seasonal water table.	Fair; A-2 or A-4; good compaction; fair stability; moderately high seasonal water table.	Moderately high seasonal water table.	Moderately rapid permeability of substratum.
Elkton (Ek)	Fair; plastic below a depth of 6 inches.	Unsuitable; material is clayey.	Poor; A-6 or A-7; plastic material; poor internal drainage; moderate shrink-swell potential.	Plastic material; poor internal drainage.	Slow permeability.
Evesboro (EvB)	Poor; low fertility; low water-holding capacity.	Good for sand; small amount of fines.	Good; A-2 or A-3; good compaction; low shrink-swell potential.	Severe hazard of wind erosion; loose sand hinders hauling.	Rapid permeability.
Evesboro, sandy loam subsoil variants (EwB).	Good	Fair for sand; some fines.	Good; A-2; good compaction; low shrink-swell potential.	Soil features favorable.	Moderately rapid permeability.
Fallsington (Fd)	Good; high seasonal water table.	Fair for sand below a depth of 2 to 2½ feet; high seasonal water table.	Fair; A-2 or A-4; good compaction; fair stability; high seasonal water table.	High seasonal water table.	Rapid permeability of substratum; high seasonal water table.
Fresh water marsh (Fm)	Poor; constantly high water table.	Unsuitable; fine material.	Poor; fine material; constantly high water table.	Constantly high water table.	Constantly high water table.
Fort Mott (FrB, FrC)	Poor; low fertility; low water-holding capacity.	Good for sand; some fines in sand below a depth of 2 to 3 feet.	Good; A-2 or A-3; good compaction; fair stability.	Severe hazard of wind erosion; loose sand hinders hauling.	Rapid permeability of substratum; high loss by seepage.

See footnotes at end of table

interpretations of the soils—Continued

Soil features affecting—Continued					
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials [1]	Excavated reservoirs				
Good compaction; fair stability; piping hazard.	Low water table in most places; unsuitable.	(2)	(2)	(2)	(2).
Variable	Silty or rocky; unsuitable.	(2)	(2)	(2)	(2).
Variable	Stratified; unsuitable.	(2)	(2)	(2)	(2).
Good compaction and fair stability to depth of 3 feet; deeper layers, fair to poor stability.	Low water table; unsuitable.	Well drained	Moderate intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Poor compaction and poor stability in upper 1½ feet; low compaction and low shear strength in next 2½ feet; piping hazard.	Bedrock at depth of 1½ to 4 feet; low water table in summer.	Slow permeability; high seasonal water table.	Moderate intake rate; high water-holding capacity; high seasonal water table.	(2)	Soil features favorable.
Good compaction; fair stability; piping hazard.	Low water table in summer.	Moderate permeability of soil.	Moderate intake rate; moderate water-holding capacity.	(2)	Soil features favorable.
Low shear strength; moderate shrink-swell potential; plastic material cracks on drying.	Slow recharge rate; low water table in summer.	Slow permeability	Slow intake rate; moderate water-holding capacity; poor internal drainage.	(2)	(2).
Good compaction; poor stability; rapid permeability; piping hazard.	Low water table; unsuitable.	Well drained	Rapid intake rate; low water-holding capacity.	(2)	Soil features favorable.
Good compaction; fair stability; moderate permeability; piping hazard.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	(2)	Soil features favorable.
Good compaction; fair stability; moderately slow permeability.	Rapid recharge; high seasonal water table.	Moderate permeability; high seasonal water table.	Moderate intake rate; moderate water-holding capacity.	(2)	(2).
Poor stability; constantly high water table.	Constantly high water table; severe overflow hazard.	Constantly high water table; severe overflow hazard.	Constantly high water table.	(2)	(2).
Good compaction; fair stability.	Low water table; unsuitable.	Well drained	Rapid intake rate; low water-holding capacity.	(2)	Soil features favorable.

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand or gravel	Road fill	Road location	Reservoirs: Reservoir areas
Galestown:					
Loamy sand (GaB)	Poor; low fertility; low water-holding capacity.	Good for sand; small amount of fines.	Good; A–2 or A–3; good compaction; fair stability.	Severe hazard of wind erosion; loose sand hinders hauling.	Rapid permeability of substratum; high loss by seepage.
Sandy loam (GeB)	Good	Good for sand below a depth of 2½ feet; some fines mixed with sand above that depth.	Good; A–2 or A–4; good compaction; fair stability.	Soil features favorable.	Rapid permeability of substratum; high loss by seepage.
Keyport (Mapped only with Lenoir soil.)	Fair; shallow depth to plastic material; moderately high seasonal perched water table.	Unsuitable; material is fine grained.	Poor; A–6 or A–7; fine-grained material; moderate shrink-swell potential; moderately high seasonal perched water table.	Moderately high seasonal perched water table; plastic subsoil.	Low loss by seepage.
Klej, sandy loam subsoil variants (Km).	Good; moderately high seasonal water table.	Good for sand below a depth of 40 inches; moderately high seasonal water table.	Fair; A–2; good compaction; fair stability.	Moderately high seasonal water table.	Rapid permeability of substratum; moderately high seasonal water table.
Klinesville (KsC, KsE)	Poor; low fertility; less than 1 foot of shaly loam over bedrock.	Poor; shaly loam over shale bedrock.	Fair; A–2 or A–4; low shrink-swell potential; fair to poor compaction; less than 1 foot of material over bedrock.	Shale bedrock within 1 foot of surface.	Shallow depth to permeable bedrock.
Lansdale (LaB, LcC2, LcD2, LdC, LdE).	LaB good; others fair to poor.	LaB fair for sand mixed with fines to depth of 3 feet; others unsuitable.	Good; A–2 or A–4; good compaction; low shrink-swell potential; stones few in LaB, common in LcC2 and LcD2, and abundant in LdC and LdE.	Stones common in LcC2 and LcD2 and abundant in LdC and LdE.	Rapid permeability of substratum; stoniness.
Lawrenceville (LeA, LeB, LeB2, LeC2) (For Mount Lucas part, see Mount Lucas series.)	Fair; moderately high seasonal water table.	Poor; material is silty.	Fair; A–4 or A–6; fair compaction; fair stability; moderate shrink-swell potential.	Moderately high seasonal water table; bedrock is hard diabase or shale.	Permeable bedrock may permit loss by seepage.
Legore (LgC, LgD, LgE)	Fair; common angular gravel.	Poor; common angular diabase gravel.	Fair; A–4; fair compaction; fair stability; low shrink-swell potential.	Bedrock is hard diabase.	Bedrock may permit loss by seepage.
Lehigh (LhB, LhB2, LhC2).	Fair; moderately high seasonal perched water table.	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability; moderate shrink-swell potential.	Shale bedrock at a depth of 3 to 5 feet; moderately high seasonal perched water table.	Moderately slow permeability of subsoil; bedrock may permit loss by seepage.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued					
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials [1]	Excavated reservoirs				
Good compaction; fair stability; moderately rapid permeability; piping hazard.	Low water table; unsuitable.	Well drained	Rapid intake rate; low water-holding capacity.	(2)	Soil features favorable.
Good compaction; fair stability; moderately rapid permeability; piping hazard.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	(2)	Soil features favorable.
Moderate shrink-swell potential; cracking is likely.	Low water table in summer.	Slow permeability	Moderate intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Good compaction; fair stability; piping hazard.	Low water table in summer.	Moderately rapid permeability; moderately high seasonal water table.	Moderate intake rate; moderate water-holding capacity.	(2)	Soil features favorable.
Small volume of material; fair compaction; fair stability; piping hazard.	Shallow depth to permeable bedrock; unsuitable.	Well drained	Moderately rapid intake rate; low water-holding capacity.	Shallow depth to bedrock.	Shallow depth to bedrock.
Good compaction; fair stability; moderately slow permeability; piping hazard; stones common in LcC2 and LcD2 and abundant in LdC and LdE.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	Stones in LcC2, LcD2, LdC, and LdE.	Stones in LcC2, LcD2, LdC, and LdE.
Fair compaction; fair stability; slow permeability; moderate shrink-swell potential; piping hazard.	Low water table in summer.	Moderate to moderately slow permeability.	Moderate to moderately slow intake rate; high water-holding capacity.	Soil features favorable.	Soil features favorable.
Fair compaction; fair stability; moderate permeability; piping hazard.	Low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	Angular gravel may impede construction.	Angular gravel may impede construction.
Fair compaction; fair stability; moderate shrink-swell potential.	Low water table in summer.	Moderately slow permeability of subsoil.	Moderate intake rate; high water-holding capacity; moderately high seasonal perched water table.	Soil features favorable.	Soil features favorable.

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand or gravel	Road fill	Road location	Reservoirs: Reservoir areas
Lenoir (Lk) (For Keyport part, see Keyport series.)	Fair; shallow depth to plastic material; moderately high seasonal perched water table.	Unsuitable; material is fine grained.	Poor; A–6 or A–7; fine-grained material; moderate shrink-swell potential; moderately high seasonal perched water table.	Moderately high seasonal perched water table; plastic subsoil.	Low loss by seepage.
Made land, dredged river materials (Mf).	Unsuitable; low fertility; low water-holding capacity; numerous pebbles and cobbles.	Good for sand, gravel, and cobbles.	Good; A–1 or A–2; good compaction; low shrink-swell potential.	Features are favorable.	Rapid permeability.
Matapeake (MoA, MoB, MoC2).	Good	Fair to poor for sand below a depth of 30 to 40 inches, depending on the kind of underlying material.	Fair; fair compaction; fair stability; hazard of frost heaving.	Soil features favorable.	Variable permeability of substratum; loss by seepage is likely where substratum is sandy.
Mattapex (Mq) (For Bertie part, see Bertie series.)	Good; moderately high seasonal water table.	Fair to poor for sand below a depth of 30 to 40 inches, depending on the kind of underlying material.	Fair; fair compaction; fair stability; hazard of frost heaving.	Moderately high seasonal water table.	Variable permeability of substratum; loss by seepage is likely where substratum is sandy.
Mount Lucas (MvB, MvC).	Poor; high stone content.	Unsuitable; material is silty.	Fair; A–4 or A–6; fair compaction; fair stability; low shrink-swell potential.	Hard diabase rock at a depth of 4½ to 10 feet; moderately high seasonal water table.	Bedrock may permit loss by seepage.
Neshaminy (NeB, NeC, NeC2, NhC, NhE).	NeB, NeC, and NeC2 good; NhC and NhE poor because of high stone content.	Unsuitable; material is silty.	Fair; fair compaction; fair stability; abundant stones in NhC and NhE.	Hard diabase rock at a depth of 5 to 10 feet.	Bedrock may permit loss by seepage.
Othello (Ot)	Fair; high seasonal water table.	Unsuitable; material is silty.	Fair; fair compaction; fair stability; high seasonal water table; hazard of frost heaving.	High seasonal water table.	Moderate permeability of substratum.
Penn (PeB, PeC, PeD)	Fair; moderate fertility; material is shaly.	Unsuitable; material is shaly and silty.	Poor; A–4; shallow soil over bedrock.	Shale bedrock at a depth of 2 to 2½ feet.	Bedrock is permeable.
Pits (Pg)	Not suitable	Good for sand; good for gravel if not exhausted.	Fair; low shrink-swell potential.	[2]	Rapid permeability in most areas.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued					
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials [1]	Excavated reservoirs				
Moderate shrink-swell potential; cracking is likely.	Low water table in summer.	Slow permeability	Moderate intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Good compaction; good stability; rapid permeability.	Low water table; unsuitable.	([2])	([2])	([2])	([2]).
Fair compaction; fair stability.	Low water table; unsuitable.	Well drained	Moderate intake rate; high water-holding capacity.	Soil features favorable.	Soil features favorable.
Fair compaction; fair stability.	Low water table in summer.	Moderately slow permeability.	Moderately slow intake rate; high water-holding capacity; moderately high seasonal water table.	([2])	([2]).
Fair compaction; fair stability.	Low water table in summer.	Moderately slow permeability.	Moderately slow intake rate; high water-holding capacity.	Abundant stones in MvB and MvC.	Abundant stones in MvB and MvC.
Fair compaction; fair stability; abundant stones in NhC and NhE.	Low water table; unsuitable.	Well drained	Moderate intake rate; moderately high water-holding capacity; abundant stones in NhC and NhE.	Abundant stones in NhC and NhE.	Abundant stones in NhC and NhE.
Upper 2 feet, fair compaction and fair stability; deeper material, good compaction and good stability.	Rapid recharge rate	Moderately slow permeability.	Moderate intake rate; high water-holding capacity.	([2])	([2]).
Shaly material is 2 to 2½ feet deep over bedrock; piping hazard.	Low water table; unsuitable.	Well drained	Moderate intake rate; moderately low water-holding capacity.	Shallow soil	Soil features favorable.
Rapid permeability; high loss by seepage.	Gravelly or sandy; most areas unsuitable unless water table is high.	([2])	([2])	([2])	([2]).

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand or gravel	Road fill	Road location	Reservoirs: Reservoir areas
Plummer (Pu, Pv)	Fair; high water table.	Fair for sand; high water table.	Fair; A–2 or A–4; high water table.	High water table	Rapid permeability of substratum; high water table.
Portsmouth (Pw)	Fair; high water table.	Unsuitable; material is silty.	Poor; A–2 or A–4; fair compaction; fair stability; high water table; hazard of frost heaving.	High water table	Moderately rapid permeability of substratum; high water table.
Quakertown (QkB, QkB2, QkC, QkC2, QuB, QuC, QuC2. QuD2).	QkB, QkB2, QkC, and QkC2 good; others fair because of high stone content.	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability.	Sandstone bedrock at a depth of 3 to 5 feet.	Bedrock may permit loss by seepage in some places.
Readington (RaA, RaB, RaB2, RaC2). (For Abbottstown parts, see Abbottstown series.)	Good; moderately high seasonal water table.	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability; moderately high seasonal water table.	Shale bedrock at a depth of 3 to 4 feet; moderately high seasonal water table.	Shale bedrock is permeable.
Reaville (ReA, ReB, ReB2, ReC2).	Fair; shallow soil over bedrock; moderately high seasonal water table.	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability; moderately high seasonal water table.	Shale bedrock at a depth of 1½ to 2 feet; moderately high seasonal water table.	Shale bedrock is permeable.
Reaville, wet variant (Mapped only with Doylestown soils.)	Poor; shallow soil over bedrock; high seasonal water table.	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability; high seasonal water table.	Shale bedrock at a depth of 1½ to 2 feet; high seasonal water table.	Shale bedrock is permeable.
Rowland (Ro)	Good	Unsuitable; material is silty.	Fair; A–4; fair compaction; fair stability; low shrink-swell potential; hazard of frost heaving; subject to overflow.	Subject to annual overflow.	Moderate permeability.
Sandy and silty land (SdD, SdE).	Poor; original surface soil has been lost by erosion.	Poor; steep slopes.	Good to fair; material is variable.	Steep slopes	Steep slopes
Sassafras (SrA, SrB, SrC, SrC2, SsB, StC3, SyB). (For Woodstown part of SyB, see Woodstown series.)	StC3 poor; others good.	Good for sand below a depth of 3½ feet; gravel is common in some places but generally is not abundant.	Good; A–2 or A–4; good compaction; low shrink-swell potential.	Soil features favorable.	Moderately rapid permeability of substratum; excessive loss by seepage.
Tinton (TnB)	Poor; low fertility; low water-holding capacity.	Good for sand; some fines in subsoil.	Fair; fair compaction; fair stability; low shrink-swell potential.	Hazard of wind erosion; loose sand hinders hauling.	Rapid permeability of substratum; excessive loss by seepage.

See footnotes at end of table.

interpretations of the soils—Continued

Soil features affecting—Continued					
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials [1]	Excavated reservoirs				
Fair compaction; fair stability; moderate permeability.	Rapid recharge rate; high water table.	Moderately rapid permeability to depth of 1 foot, rapid below.	Moderately rapid intake rate; low water-holding capacity.	(2)	(2).
Fair compaction; fair stability.	Rapid recharge rate; high water table.	Moderate permeability.	Moderate intake rate; high water-holding capacity; very poor internal drainage.	(2)	(2).
Fair compaction; fair stability.	Low water table in summer.	Well drained	Moderate intake rate; high water-holding capacity.	Soil features favorable.	Soil features favorable.
Fair compaction; fair stability; moderately high seasonal water table; hazard of piping.	Low water table in summer.	Moderate permeability; depth to bedrock is 3 to 4 feet.	Moderate intake rate; high water-holding capacity.	Hazard of erosion on long slopes.	Soil features favorable.
Fair compaction; fair stability; 1½ to 2 feet of soil material over bedrock.	Shallow over bedrock; low water table in summer; unsuitable.	Moderate permeability; shallow depth to bedrock.	Moderate intake rate; moderate water-holding capacity.	Shallow depth to bedrock.	Shallow depth to bedrock.
Fair compaction; fair stability; 1½ to 2 feet of soil material over bedrock.	Shallow over bedrock; low water table in summer; unsuitable.	Moderately slow permeability; shallow depth to bedrock.	Moderate intake rate; moderate water-holding capacity.	Shallow depth to bedrock.	Shallow depth to bedrock.
Fair compaction; fair stability; piping hazard; subject to overflow.	Moderately high water table; subject to overflow.	Subject to annual overflow; moderately high water table is likely to drop in summer.	Moderate intake rate; high water-holding capacity; moderately high water table is likely to drop in summer.	(2)	(2).
Material is variable; good to fair.	Steep slopes; low water table; unsuitable.	Well drained	Steep slopes; eroded	Steep slopes; eroded.	Steep slopes; eroded.
Good compaction; fair stability.	Low water table; unsuitable.	Well drained	Moderate intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Small amount of fines hinders compaction.	Well drained; low water table; unsuitable.	Well drained	Rapid intake rate; low water-holding capacity.	(2)	(2).

TABLE 7.—*Engineering*

Soil and map symbol	Suitability as a source of— Topsoil	Sand or gravel	Road fill	Soil features affecting— Road location	Reservoirs: Reservoir areas
Tioga (To)	Good	Fair for fine sand mixed with fines.	Fair; A–2 or A–4; fair compaction; low shrink-swell potential.	Soil features favorable.	Moderate permeability of substratum; hazard of excessive loss by seepage.
Very stony land (VmC, VnE, Vw)	Poor; very stony	Unsuitable; silty or loamy material; very stony.	Poor; very stony	Hard diabase bedrock at a depth of 5 to 10 feet.	Hazard of loss by seepage through permeable bedrock.
Watchung (Wc)	Fair; high seasonal water table.	Unsuitable; material is silty.	Poor; A–4 or A–6; fair compaction; poor stability; moderate shrink-swell potential; high seasonal water table.	Hard diabase bedrock at a depth of 5 to 10 feet.	Hazard of loss by seepage through permeable bedrock.
Woodstown (WfB) (For Fallsington part, see Fallsington series.	Good; moderately high seasonal water table.	Fair; moderately high seasonal water table.	Fair; A–2 or A–4; good compaction; fair stability; moderately high seasonal water ta le.	Moderately high seasonal water table.	Moderately rapid permeability of substratum.

[1] Permeability in this column refers to permeability of disturbed soil material. It is likely to differ from that of the undisturbed soil.

interpretations of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued		Drainage	Irrigation	Terraces and diversions	Grassed waterways
Embankment materials[1]	Excavated reservoirs				
Fair compaction; fair stability; piping hazard.	Well drained; low water table; unsuitable.	Well drained	Moderately rapid intake rate; moderate water-holding capacity.	Soil features favorable.	Soil features favorable.
Very stony; fair compaction; fair stability; piping hazard.	Very stony; low water table in VnE, unsuitable; water table in VmC drops in summer, poor; water table in Vw drops if summer is dry, fair.	Very stony; VnE is well drained.	(2)	Very stony	Very stony.
Fair compaction; poor stability.	High seasonal water table; water table drops if summer is dry.	Slow permeability; poor internal drainage.	Moderate intake rate; high water-holding capacity.	High seasonal water table.	High seasonal water table.
Good compaction; fair stability; slow permeability; piping hazard.	Low water table in summer.	Moderate permeability.	Moderate intake rate; moderate water-holding capacity.	(2)	Soil features favorable.

[2] Not applicable, or the practice is not needed.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Alluvial land, wet (Ad)	Frequent stream overflow; water table high.	Severe: frequent stream overflow.	Severe: frequent stream overflow; high water table.
Alluvial land, very wet (Ae)	Frequent stream overflow; water table high.	Severe: frequent stream overflow.	Severe: frequent stream overflow; high water table.
Aura sandy loam, moderately firm, 2 to 5 percent slopes (AfB).	Soil features favorable	Moderate: moderately slow permeability of subsoil; deep excavation may be needed.	Slight
Aura sandy loam, moderately firm, 5 to 10 percent slopes (AfC).	Soil features favorable	Moderate: strong slopes; deep excavations may be needed.	Moderate: strong slopes.
Birdsboro loam, 0 to 6 percent slopes (BbB). Birdsboro loam, 2 to 6 percent slopes, eroded (BbB2).	Rippable bedrock at depth of 3½ to 6 feet.	Moderate to severe: bedrock at a depth of 3½ to 6 feet.	Slight
Birdsboro loam, 6 to 12 percent slopes, eroded (BbC2).	Rippable bedrock at depth of 3½ to 6 feet.	Moderate to severe: bedrock at a depth of 3½ to 6 feet.	Moderate: strong slopes.
Birdsboro silt loam, 0 to 2 percent slopes (BdA)	Rippable bedrock at depth of 3 to 5 feet.	Moderate to severe: bedrock at a depth of 3 to 5 feet.	Slight
Birdsboro silt loam, 2 to 6 percent slopes (BdB)	Rippable bedrock at depth of 3 to 5 feet.	Moderate to severe: bedrock at a depth of 3 to 5 feet.	Slight
Birdsboro soils, sandy subsoil variants, 0 to 2 percent slopes (BnA).	Rippable bedrock at depth of 3 to 4 feet.	Severe: bedrock at depth of 3 to 4 feet.	Slight
Birdsboro soils, sandy subsoil variants, 2 to 6 percent slopes (BnB).	Rippable bedrock at depth of 3 to 4 feet.	Severe: bedrock at depth of 3 to 4 feet.	Slight
Birdsboro soils, sandy subsoil variants, 6 to 12 percent slopes (BnC).	Rippable bedrock at depth of 3 to 4 feet.	Severe: bedrock at depth of 3 to 4 feet.	Moderate: strong slopes.
Birdsboro soils, gravelly solum variants, 0 to 5 percent slopes (BoB).	Soil features favorable	Slight	Slight
Bowmansville silt loam (Bt)	Frequent stream overflow; high water table.	Severe: frequent stream overflow.	Severe: frequent stream overflow; high water table.
Bucks silt loam, 0 to 2 percent slopes (BuA)	Rippable bedrock at depth of 3½ to 5 feet.	Moderate to severe: bedrock at depth of 3½ to 5 feet.	Slight
Bucks silt loam, 2 to 6 percent slopes (BuB). Bucks silt loam, 2 to 6 percent slopes, eroded (BuB2).	Rippable bedrock at depth of 3½ to 5 feet.	Moderate to severe: bedrock at depth of 3½ to 5 feet.	Slight

affecting community developments

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Severe: frequent stream overflow; high water table; high frost action potential.	Severe: frequent stream overflow; high water table.	Moderate: frequent stream overflow; high water table.	Severe: frequent stream overflow; ground water pollution hazard; high water table.	Severe: frequent stream overflow; high water table.
Severe: frequent stream overflow; high water table; high frost action potential.	Severe: frequent stream overflow; high water table.	Severe: water table constantly high; frequent stream overflow.	Severe: frequent stream overflow; ground water pollution hazard; high water table.	Severe: frequent stream overflow; high water table.
Moderate: gentle slopes; moderate frost action potential.	Moderate: gentle slopes.	Slight	Slight	Slight.
Moderate for streets: moderate frost action potential. Severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Moderate: strong slopes.	Slight: strong slopes.
Moderate: frost action potential moderately high.	Moderate: slopes gentle.	Slight	Severe: rippable bedrock at depth of 3½ to 6 feet.	Moderate: rippable bedrock at depth of 3½ to 6 feet.
Moderate for streets, severe for parking lots: strong slopes; frost action potential moderately high.	Severe: strong slopes	Moderate: strong slopes.	Severe: rippable bedrock at depth of 3½ to 6 feet.	Moderate: rippable bedrock at depth of 3½ to 6 feet; strong slopes.
Moderate: frost action potential moderately high.	Slight	Slight	Severe: rippable bedrock at depth of 3 to 5 feet.	Moderate: rippable bedrock at depth of 3 to 5 feet.
Moderate: frost action potential moderately high.	Moderate: gentle slopes.	Slight	Severe: rippable bedrock at depth of 3 to 5 feet.	Moderate: rippable bedrock at depth of 3 to 5 feet.
Slight	Slight	Slight	Severe: rippable bedrock at depth of 3 to 4 feet.	Moderate: rippable bedrock at depth of 3 to 4 feet.
Slight for streets, moderate for parking lots: gentle slopes.	Moderate: gentle slopes.	Slight	Severe: rippable bedrock at depth of 3 to 4 feet.	Moderate: rippable bedrock at depth of 3 to 4 feet.
Moderate for streets, severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Severe: rippable bedrock at depth of 3 to 4 feet.	Moderate: rippable bedrock at depth of 3 to 4 feet.
Slight for streets, moderate for parking lots: gentle slopes.	Moderate: gentle slopes.	Slight	Severe: ground water pollution hazard.	Slight.
Severe: frequent stream overflow; high water table; frost action potential high.	Severe: frequent stream overflow; high water table.	Severe: high water table; frequent stream overflow.	Severe: frequent stream overflow; high water table; ground water pollution hazard.	Severe: frequent stream overflow; high water table.
Moderate: frost action potential moderately high.	Slight	Slight	Severe: rippable bedrock at depth of 3½ to 5 feet.	Moderate: rippable bedrock at depth of 3½ to 5 feet.
Moderate: frost action potential moderately high.	Moderate: gentle slopes.	Slight	Severe: rippable bedrock at depth of 3½ to 5 feet.	Moderate: rippable bedrock at depth of 3½ to 5 feet.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Bucks silt loam, 6 to 12 percent slopes (BuC). Bucks silt loam, 6 to 12 percent slopes, eroded (BuC2).	Rippable bedrock at depth of 3½ to 5 feet.	Moderate to severe: bedrock at depth of 3½ to 5 feet.	Moderate: strong slopes.
Chalfont silt loam, 0 to 2 percent slopes (CdA). Chalfont silt loam, 2 to 6 percent slopes (CdB). Chalfont silt loam, 2 to 6 percent slopes, eroded (CdB2). Chalfont silt loam, 6 to 12 percent slopes, eroded (CdC2).	Water table moderately high; bedrock at depth of 3 to 5 feet.	Severe: water table moderately high; slow permeability; depth to bedrock 3 to 5 feet.	Moderate: water table moderately high.
Chalfont very stony silt loam, 0 to 6 percent slopes (CeB).	Water table moderately high; very stony; bedrock at depth of 3 to 5 feet.	Severe: water table moderately high; slow permeability; very stony.	Severe: water table moderately high; very stony.
Cut and fill land, clayey substratum (Cf)	Unsettled fill; slow permeability of substratum.	Slight to severe: depending on kind of fill and depth; slow permeability of substratum.	Moderate: low organic-matter content.
Cut and fill land, gravelly material (Cg)	Well drained; permeable material.	Slight: ground water pollution hazard.	Moderate: low organic-matter content; low natural fertility; very gravelly in places.
Cut and fill land, rock substratum (Ct)	Bedrock near surface or fill of variable texture over bedrock at depth of 2 to 8 feet.	Slight to severe: permeability variable; depth to bedrock variable.	Slight to severe: depending on depth to bedrock and kind of fill.
Cut and fill land, stratified substratum (Cu)	Well drained; variable texture.	Slight: ground water pollution hazard.	Moderate: low organic-matter content; low natural fertility.
Downer fine sandy loam, gravelly clay loam substratum (Df).	Soil features favorable	Moderate: moderately slow permeability; may require deep trenches.	Slight
Doylestown silt loam and Reaville silt loam, wet variant, 0 to 2 percent slopes (DgA). Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes (DgB). Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes, eroded (DgB2). Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes (DgC). Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes, eroded (DgC2).	Water table ranges from moderately high to high; depth to bedrock ranges from 1½ to 6 feet.	Severe: water table moderately high or high; depth to bedrock 1½ to 6 feet.	Severe: water table moderately high or high.
Dragston and Woodstown sandy loams, 0 to 4 percent slopes (DwB).	Water table moderately high.	Moderate to severe: water table moderately high.	Slight to moderate: water table moderately high.
Elkton silt loam (Ek)	Poorly drained; high clay content.	Severe: water level seasonally high; slow permeability.	Severe: water level seasonally high.
Evesboro loamy sand, 0 to 5 percent slopes (EvB)	Soil features favorable	Slight: ground water pollution hazard.	Severe: low available water capacity; low natural fertility.

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Moderate for streets, severe for parking lots: strong slopes; frost action potential moderately high.	Severe: strong slopes	Moderate: strong slopes.	Severe: rippable bedrock at depth of 3½ to 5 feet.	Moderate: rippable bedrock at depth of 3½ to 5 feet.
Severe: frost action potential high.	Severe: water table moderately high.	Moderate: water table moderately high.	Severe: water table moderately high; bedrock at depth of 3 to 5 feet.	Severe: water table moderately high; bedrock at depth of 3 to 5 feet.
Severe: frost action potential high.	Severe: water table moderately high; very stony.	Moderate: water table moderately high.	Severe: water table moderately high; bedrock at depth of 3 to 5 feet.	Severe: water table moderately high; very stony.
Slight to severe: variable textures provide wide ranges in frost action potential.	Moderate to severe: gentle slopes; variable textures.	Slight	Slight	Slight.
Slight: fill may be unsettled.	Moderate to severe: low organic-matter content; fill material variable; very gravelly in places.	Slight	Severe: ground water pollution hazard.	Slight.
Slight to severe: variable textures.	Moderate to severe: low organic-matter content; variable textures.	Slight	Severe: depth to bedrock variable.	Slight to severe: depth to bedrock variable.
Slight	Moderate: low organic-matter content; low natural fertility.	Slight	Severe: ground water pollution hazard.	Slight.
Slight for streets, moderate for parking lots.	Moderate: gentle slopes	Slight	Severe: ground water pollution hazard.	Slight.
Severe: water table moderately high or high.	Severe: water table moderately high or high; bedrock depth at 1½ to 6 feet.	Moderate to severe: water table moderately high or high.	Severe: water table moderately high or high; depth to bedrock 1½ to 6 feet.	Severe: water table moderately high or high; depth to bedrock 1½ to 6 feet.
Moderate: water table moderately high; frost action potential moderate.	Severe: water table moderately high.	Moderate: water table moderately high.	Severe: water table moderately high.	Severe: water table moderately high.
Severe: water level seasonally high; frost action potential high.	Severe: water level seasonally high; slow permeability.	Severe: water level seasonally high.	Severe: water level seasonally high.	Severe: water level seasonally high.
Slight for streets, moderate for parking lots where slopes are 2 to 5 percent.	Severe: low available water capacity; low natural fertility.	Moderate: loamy sand surface soil.	Severe: rapid permeability; ground water pollution hazard.	Slight.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Evesboro soils, sandy loam subsoil variants, 0 to 5 percent slopes (EwB).	Soil features favorable	Slight: ground water pollution hazard.	Severe: loamy sand surface texture; low natural fertility.
Fallsington sandy loam (Fd)	Seasonal water table high.	Severe: seasonal water table high.	Severe: seasonal water table high.
Fresh water marsh (Fm)	Water table constantly high.	Severe: water table constantly high.	Severe: water table high.
Fort Mott loamy sand, 0 to 5 percent slopes (FrB)	Soil features favorable	Slight: ground water pollution hazard.	Severe: low available water capacity; low natural fertility.
Fort Mott loamy sand, 5 to 10 percent slopes (FrC)	Soil features favorable	Moderate: strong slopes.	Severe: low available water capacity; low natural fertility.
Galestown loamy sand, 0 to 5 percent slopes (GaB)	Soil features favorable	Slight: ground water pollution hazard.	Severe: loamy sand surface soil.
Galestown sandy loam, 0 to 6 percent slopes (GeB)	Soil features favorable	Slight to moderate: ground water pollution hazard; moderate where bedrock depth is 4 to 6 feet.	Slight
Klej soils, sandy loam subsoil variants (Km)	Seasonal water table moderately high; soil profile dominantly sandy.	Moderate: seasonal water table moderately high.	Slight
Klinesville shaly loam, 6 to 12 percent slopes (KsC). Klinesville shaly loam, 12 to 30 percent slopes (KsE).	Rippable bedrock at depth of ½ to 1½ feet.	Severe: depth to bedrock at ½ to 1½ feet; slopes moderately steep or steep in KsE.	Severe: depth to bedrock ½ to 1½ feet.
Lansdale sandy loam, 2 to 6 percent slopes (LaB)	Soil features favorable; gentle slopes.	Moderate to severe: depth to bedrock 3½ to 6 feet.	Slight
Lansdale channery loam, 6 to 12 percent slopes, eroded (LcC2).	Soil features favorable; strong slopes.	Moderate to severe: depth to bedrock 3½ to 6 feet.	Moderate: strong slopes.
Lansdale channery loam, 12 to 18 percent slopes, eroded (LcD2).	Soil features favorable; moderately steep slopes.	Severe: moderately steep slopes; depth to bedrock 3½ to 6 feet.	Severe: moderately steep slopes.
Lansdale very stony loam, 0 to 12 percent slopes (LdC). Lansdale very stony loam, 12 to 30 percent slopes (LdE).	Very stony; gentle and strong slopes; well drained; depth to bedrock 3½ to 6 feet.	Severe: very stony; depth to bedrock 3½ to 6 feet.	Severe: very stony; slopes moderately steep or steep in LdE.
Lawrenceville and Mount Lucas silt loams, 0 to 2 percent slopes (LeA). Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes (LeB). Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, eroded (LeB2). awrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded (LeC2).	Seasonal water table moderately high; profile silty.	Severe: water table moderately high.	Moderate: water table moderately high; slopes strong in LeC2.

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Slight for streets, moderate for parking lots where slopes are 2 to 5 percent.	Moderate: loamy sand surface soil.	Moderate: loamy sand surface soil.	Severe: ground water pollution hazard.	Slight.
Severe: seasonal water table high.	Severe: seasonal water table high.	Severe: water table high.	Severe: seasonal water table high.	Severe: water table high.
Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.
Slight for streets, moderate for parking lots where slopes are 2 to 5 percent.	Severe: loose surface soil.	Severe: loose surface soil.	Severe: ground water pollution hazard.	Slight.
Moderate for streets, severe for parking lots: strong slopes.	Severe: strong slopes; loose surface soil.	Severe: loose surface soil.	Severe: ground water pollution hazard.	Slight: erosion hazard.
Slight for streets, moderate for parking lots where slopes are 2 to 5 percent.	Moderate: loamy sand surface soil.	Moderate: loamy sand surface soil.	Severe: ground water pollution hazard.	Slight.
Slight for streets, moderate for parking lots where slopes are 2 to 6 percent.	Slight for 0 to 2 percent slopes; moderate for 2 to 5 percent slopes.	Slight	Severe: ground water pollution hazard.	Slight.
Moderate: water table moderately high.	Moderate: water table moderately high.	Slight	Severe: seasonal water table moderately high; ground water pollution hazard.	Severe: seasonal water table moderately high.
Severe: depth to bedrock ½ to 1½ feet; slopes strong, moderately steep, or steep.	Severe: depth to bedrock ½ to 1½ feet; slopes strong, moderately steep, or steep.	Moderate for KsC: strong slopes. Severe for KsE: moderately steep or steep.	Severe: depth to bedrock ½ to 1½ feet.	Severe: depth to bedrock ½ to 1½ feet.
Slight for streets, moderate for parking lots: gentle slopes.	Moderate: gentle slopes	Slight	Severe: depth to bedrock 3½ to 6 feet.	Moderate: depth to bedrock 3½ to 6 feet.
Moderate for streets, severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Severe: depth to bedrock 3½ to 6 feet.	Moderate: depth to bedrock 3½ to 6 feet.
Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: depth to bedrock 3½ to 6 feet; slopes moderately steep.	Severe: moderately steep slopes; depth to bedrock 3½ to 6 feet.
Moderate for LdC: strong slopes; very stony. Severe for LdE: moderately steep or steep slopes.	Severe: very stony	Moderate for LdC: very stony; slopes gentle and strong. Severe for LdE: slopes moderately steep or steep.	Severe: very stony; slopes moderately steep or steep in LdE.	Severe: very stony; slopes moderately steep or steep in LdE.
Severe: frost action potential high.	Severe: water table moderately high; strong slopes in LeC2.	Moderate: water table moderately high.	Severe: water table moderately high.	Severe: water table moderately high.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Legore gravelly loam, 6 to 12 percent slopes (LgC)	Hard bedrock at depth of 4 to 6 feet; strong slopes.	Moderate: strong slopes; bedrock at depth of 4 to 6 feet.	Moderate: strong slopes; gravel content about 15 percent.
Legore gravelly loam, 12 to 18 percent slopes (LgD). Legore gravelly loam, 18 to 30 percent slopes (LgE).	Hard bedrock at depth of 4 to 6 feet; slopes moderately steep in LgD, steep in LgE.	Severe: bedrock at depth of 4 to 6 feet; slopes moderately steep in LgD, steep in LgE.	Severe: slopes moderately steep in LgD, steep in LgE.
Lehigh silt loam, 0 to 6 percent slopes (LhB). Lehigh silt loam, 2 to 6 percent slopes, eroded (LhB2). Lehigh silt loam, 6 to 12 percent slopes, eroded (LhC2).	Seasonal water table moderately high; bedrock at depth of 2 to 4 feet.	Severe: depth to bedrock 2 to 4 feet; water table moderately high.	Moderate: water table moderately high; depth to bedrock 2 to 4 feet.
Lenoir-Keyport silt loams (Lk)	Subsoil clayey and slowly permeable; seasonal water level moderately high.	Severe: slow permeability; water level moderately high.	Moderate: water level moderately high.
Made land, dredged river materials (Mf)	Well drained; permeable materials.	Slight: ground water pollution hazard.	Severe: low fertility; low available water capacity.
Matapeake loam, 0 to 2 percent slopes (MoA). Matapeake loam, 2 to 5 percent slopes (MoB).	Soil features favorable	Slight to severe: slow permeability where substratum is clayey.	Slight
Matapeake loam, 5 to 10 percent slopes, eroded (MoC2).	Soil features favorable; strong slopes.	Moderate: strong slopes.	Moderate: strong slopes.
Mattapex and Bertie loams (Mq)	Seasonal water table moderately high; highly silty profile.	Severe: water table moderately high.	Moderate: water table moderately high.
Mount Lucas very stony silt loam, 0 to 6 percent slopes (MvB). Mount Lucas very stony silt loam, 6 to 12 percent slopes (MvC).	Seasonal water table moderately high; very stony.	Severe: very stony; water table moderately high.	Severe: very stony
Neshaminy silt loam, 0 to 6 percent slopes (NeB)	Most soil features favorable; hard bedrock at depth of 5 to 10 feet.	Slight	Slight
Neshaminy silt loam, 6 to 12 percent slopes (NeC). Neshaminy silt loam, 6 to 12 percent slopes, eroded (NeC2).	Most soil features favorable; hard bedrock at depth of 5 to 10 feet.	Moderate: strong slopes; bedrock at depth of 5 to 10 feet.	Moderate: strong slopes.
Neshaminy very stony silt loam, 0 to 12 percent slopes (NhC). Neshaminy very stony silt loam, 12 to 30 percent slopes (NhE).	Very stony; depth to hard bedrock 5 to 10 feet; slopes strong in NhC, moderately steep or steep in NhE.	Severe: very stony; slopes moderately steep or steep in NhE.	Severe: very stony; slopes moderately steep or steep in NhE.
Othello silt loam (Ot)	Seasonal water table high; silty soil profile.	Severe: high water table.	Severe: high water table.

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Moderate for streets: strong slopes; frost action potential moderately high. Severe for parking lots: strong slopes.	Severe: strong slopes.	Moderate: strong slopes.	Severe: depth to bedrock 4 to 6 feet.	Moderate: depth to bedrock 4 to 6 feet.
Severe: slopes moderately steep in LgD, steep in LgE.	Severe: slopes moderately steep in LgD, steep in LgE.	Severe: slopes moderately steep in LgD, steep in LgE.	Severe: depth to bedrock 4 to 6 feet; slopes moderately steep in LgD, steep in LgE.	Severe: slopes moderately steep in LgD, steep in LgE.
Severe: frost action potential high.	Severe: water table moderately high; strong slopes in LhC2.	Moderate: water table moderately high; slopes strong in LhC2.	Severe: bedrock depth 2 to 4 feet.	Severe: bedrock depth 2 to 4 feet.
Severe: frost action potential high.	Severe: water level moderately high.	Moderate: water level moderately high.	Severe: water level moderately high.	Severe: water level moderately high.
Slight	Severe: loose sand or gravelly sand.	Severe: loose sand	Severe: ground water pollution hazard.	Severe: loose sand; low fertility.
Moderate: frost action potential moderately high.	Slight for MoA. Moderate for MoB: gentle slopes.	Slight	Slight	Slight.
Moderate for streets: frost action potential moderately high; strong slopes. Severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Moderate: strong slopes.	Slight.
Severe: frost action potential high.	Severe: water table moderately high.	Moderate: water table moderately high.	Severe: water table moderately high.	Severe: water table moderately high.
Severe: frost action potential high.	Severe: very stony; water table moderately high.	Moderate: very stony; water table moderately high.	Severe: water table moderately high.	Severe: water table moderately high.
Moderate: frost action potential moderately high.	Slight to moderate: slight for 0 to 2 percent slopes, moderate for 2 to 5 percent slopes.	Slight	Moderate: depth to hard bedrock 5 to 10 feet.	Slight.
Moderate for streets: frost action potential moderately high; strong slopes. Severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Moderate: depth to hard bedrock 5 to 10 feet.	Slight.
Moderate for streets in NhC. Severe for parking lots in NhC and NhE: slopes strong, moderately steep, or steep.	Severe: very stony	Moderate for NhC, severe for NhE: slopes moderately steep or steep.	Severe: very stony; slopes moderately steep or steep in NhE.	Severe: very stony.
Severe: high water table; frost action potential high.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Penn shaly silt loam, 0 to 6 percent slopes (PeB). Penn shaly silt loam, 6 to 12 percent slopes (PeC).	Rippable bedrock at depth of 1½ to 2½ feet; well drained.	Severe: bedrock at a depth of 1½ to 2½ feet.	Severe: bedrock at a depth of 1½ to 2½ feet; strong slopes in PeC.
Penn shaly silt loam, 12 to 18 percent slopes (PeD)	Rippable bedrock at depth of 1½ to 2½ feet: well drained.	Severe: bedrock at a depth of 1½ to 2½ feet.	Severe: bedrock at a depth of 1½ to 2½ feet; slopes moderately steep.
Pits (Pg)	Soil features favorable in most places; water table is a limitation in a few pits.	Variable: ground water pollution hazard.	Severe: low fertility; low available water capacity.
Plummer sandy loam (Pu). Plummer sandy loam, very wet (Pv).	Seasonal water table high; soil profile dominantly sand.	Severe: water table high	Severe: water table high
Portsmouth silt loam, thin surface variant (Pw)	Seasonal water table high; soil profile dominantly silty.	Severe: water table high	Severe: water table high
Quakertown silt loam, 0 to 6 percent slopes (QkB). Quakertown silt loam, 2 to 6 percent slopes, eroded (QkB2).	Well drained; bedrock at depth of 3 to 5 feet; gentle slopes.	Moderate to severe: permeability moderately slow; bedrock at depth of 3 to 5 feet.	Slight
Quakertown silt loam, 6 to 12 percent slopes (QkC). Quakertown silt loam, 6 to 12 percent slopes, eroded (QkC2).	Well drained; bedrock at depth of 3 to 5 feet; strong slopes.	Moderate to severe: permeability moderately slow; bedrock at depth of 3 to 5 feet.	Moderate: strong slopes
Quakertown channery silt loam, 2 to 6 percent slopes (QuB).	Well drained; bedrock at depth of 3 to 5 feet.	Moderate to severe: permeability moderately slow; bedrock at depth of 3 to 5 feet.	Slight
Quakertown channery silt loam, 6 to 12 percent slopes (QuC). Quakertown channery silt loam, 6 to 12 percent slopes, eroded (QuC2).	Well drained; depth to bedrock 3 to 5 feet; strong slopes.	Moderate to severe: permeability moderately slow; depth to bedrock 3 to 5 feet; strong slopes.	Moderate: strong slopes
Quakertown channery silt loam, 12 to 18 percent slopes, eroded (QuD2).	Well drained; depth to bedrock 3 to 5 feet; moderately steep slopes.	Severe: moderately steep slopes.	Severe: moderately steep slopes.
Readington and Abbottstown silt loams, 0 to 2 percent slopes (RaA). Readington and Abbottstown silt loams, 2 to 6 percent slopes (RaB). Readington and Abbottstown silt loams, 2 to 6 percent slopes, eroded (RaB2).	Moderately high water table; rippable bedrock at depth of 3 to 4 feet.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.	Slight to moderate: moderately high water table.
Readington and Abbottstown silt loams, 6 to 12 percent slopes, eroded (RaC2).	Moderately high water table; rippable bedrock at depth of 3 to 4 feet.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.	Moderate: strong slopes; moderately high water table.

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Moderate for PeB: depth to bedrock 1½ to 2½ feet; frost action potential moderately high. Severe for parking lots in PeC: strong slopes.	Moderate for PeB: bedrock at depth of 1½ to 2½ feet; gentle slopes. Severe for PeC: strong slopes.	Slight for PeB. Moderate for PeC: strong slopes.	Severe: bedrock at depth of 1½ to 2½ feet.	Severe: bedrock at depth of 1½ to 2½ feet.
Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: bedrock at depth of 1½ to 2½ feet; moderately steep slopes.	Severe: bedrock at depth of 1½ to 2½ feet.
Slight to severe: surface grade lines are low in many places; water table a limitation in places.	Severe: low fertility; low available water capacity.	Severe: loose sand; surface in many places is below grade of adjacent land.	Severe: ground water pollution hazard.	Severe: most sites are below grade of adjacent land.
Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.
Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.	Severe: water table high.
Moderate: frost action potential moderately high.	Moderate: gentle slopes.	Slight.	Severe: bedrock at depth of 3 to 5 feet.	Moderate: bedrock at depth of 3 to 5 feet.
Moderate for streets: strong slopes; severe for parking lots: frost action potential moderately high.	Severe: strong slopes.	Moderate: strong slopes.	Severe: bedrock at depth of 3 to 5 feet.	Moderate: bedrock at depth of 3 to 5 feet.
Moderate: frost action potential moderately high.	Moderate: gentle slopes.	Slight.	Severe: bedrock at depth of 3 to 5 feet.	Moderate: bedrock at depth of 3 to 5 feet.
Moderate for streets; strong slopes; frost action potential moderately high.	Severe: strong slopes.	Moderate: strong slopes.	Severe: bedrock at depth of 3 to 5 feet.	Moderate: bedrock at depth of 3 to 5 feet.
Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: moderately steep slopes.	Severe: bedrock at depth of 3 to 5 feet.	Severe: moderately steep slopes.
Severe: high potential for frost action.	Moderate to severe: moderately high water table.	Slight to moderate: moderately high water table.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.
Severe: high potential for frost action.	Severe: strong slopes; moderately high water table.	Moderate: strong slopes; moderately high water table.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.	Severe: moderately high water table; depth to bedrock 3 to 4 feet.

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TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Reaville silt loam, 0 to 2 percent slopes (ReA). Reaville silt loam, 2 to 6 percent slopes (ReB). Reaville silt loam, 2 to 6 percent slopes, eroded (ReB2).	Rippable bedrock at depth of 1½ to 3½ feet; seasonal water table moderately high.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.	Moderate to severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.
Reaville silt loam, 6 to 12 percent slopes, eroded (ReC2).	Rippable bedrock at depth of 1½ to 3½ feet; seasonal water table moderately high.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.	Moderate to severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.
Rowland silt loam (Ro)	Frequent stream overflow; soil profile dominantly silty.	Severe: frequent stream overflow.	Severe: frequent stream overflow.
Sandy and silty land, strongly sloping (SdD)	Moderately steep slopes; well drained.	Severe: moderately steep slopes.	Severe: moderately steep slopes; low available water capacity in sandy areas.
Sandy and silty land, steep (SdE)	Steep slopes; well drained.	Severe: steep slopes	Severe: steep sl pes.
Sassafras sandy loam, 0 to 2 percent slopes (SrA)	Soil features favorable	Slight	Slight
Sassafras sandy loam, 2 to 5 percent slopes (SrB). Sassafras gravelly sandy loam, 2 to 5 percent slopes (SsB).	Soil features favorable	Slight	Slight
Sassafras sandy loam, gently undulating, (SrC). Sassafras sandy loam, 5 to 10 percent slopes (SrC2).	Strong slopes; some depressions where water table is seasonally moderately high.	Moderate: strong slopes; moderately high water table in depressions.	Moderate: strong slopes
Sassafras sandy clay loam, 5 to 10 percent slopes, severely eroded (StC3).	Strong slopes	Moderate: strong slopes	Severe: severely eroded; strong slopes.
Sassafras-Woodstown sandy loams, gently undulating (SyB).	Seasonal water table moderately high in about 30 to 50 percent of area.	Moderate: water table moderately high in 30 to 50 percent of area.	Slight
Tinton loamy sand, 2 to 5 percent slopes (TnB)	Soil features favorable	Slight: but hazard of ground water pollution.	Severe: available water capacity low; natural fertility low.
Tioga fine sandy loam (To)	Stream overflow hazard once in 5 to 10 years.	Moderate: stream overflow hazard once in 5 to 10 years.	Slight
Urban land, Galestown material (Ug)	Soil features favorable	Slight: but hazard of ground water pollution.	Severe: available water capacity low; natural fertility low.
Urban land, Sassafras material (Us)	Soil features favorable	Slight	Slight
Very stony land, Mount Lucas and Neshaminy materials, 0 to 12 percent slopes (VmC).	Very stony	Severe: very stony; seasonal water table moderately high.	Severe: very stony

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Severe: high potential for frost action; moderately high water table.	Moderate to severe: moderately high water table.	Slight to moderate: moderately high water table.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.
Severe: high potential for frost action; moderately high water table.	Severe: slope limitation; moderately high water table.	Moderate: strong slopes; moderately high water table.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.	Severe: bedrock at depth of 1½ to 3½ feet; moderately high water table.
Severe: frequent stream overflow.	Severe: frequent stream overflow.	Moderate: frequent stream overflow.	Severe: frequent stream overflow.	Severe: frequent stream overflow.
Severe: moderately steep slopes; moderately high frost action potential for silty areas.	Severe: moderately steep slopes.	Severe: moderately steep slopes.	Moderate: moderately steep slopes.	Moderate: moderately steep slopes.
Severe: steep slopes; moderately high frost action potential for silty areas.	Severe: steep slopes	Severe: steep slopes	Severe: steep slopes	Severe: steep slopes.
Slight	Slight	Slight	Slight	Slight.
Slight for streets, moderate for parking lots: gentle slopes.	Moderate: gentle slopes	Slight	Slight	Slight.
Moderate for streets, severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Moderate: strong slopes.	Slight: moderately high water table in depressions.
Moderate for streets, severe for parking lots: strong slopes.	Severe: strong slopes	Moderate: strong slopes.	Moderate: strong slopes.	Moderate: severely eroded; strong slopes.
Moderate: water table moderately high in 30 to 50 percent of area.	Moderate: water table moderately high in 30 to 50 percent of area; gentle slopes.	Slight	Severe: water table moderately high in 30 to 50 percent of area.	Severe: water table moderately high in 30 to 50 percent of area.
Slight for streets, moderate for parking lots: gentle slopes.	Severe: loose, sandy; available water capacity low; natural fertility low.	Severe: loose sand	Severe: ground water pollution hazard.	Slight: low available water capacity; low natural fertility.
Moderate: stream overflow hazard.	Moderate: stream overflow hazard.	Moderate: stream overflow hazard.	Severe: stream overflow hazard.	Severe: stream overflow hazard.
Slight	Severe: loose sand; available water capacity low; natural fertility low.	Severe: loose sand	Severe: ground water pollution hazard.	Slight: low available water capacity; low natural fertility.
Slight	Moderate: gentle slopes.	Slight	Slight to severe: filter material may be insufficient.	Slight.
Severe: very stony; frost action potential high; seasonal water table moderately high.	Severe: very stony; slope limitation.	Moderate: very stony	Severe: very stony; water table moderately high.	Severe: very stony; water table moderately high.

TABLE 8.—*Soil properties and limitations*

Soil and map symbol	Soil properties affecting foundations of dwellings with basement	Estimated degree of limitation for—	
		Disposal of sewage effluent (onsite)	Lawns and landscaping (homesites)
Very stony land, Neshaminy material, 12 to 30 percent slopes (VnE).	Very stony; moderately steep or steep.	Severe: moderately steep or steep; very stony.	Severe: moderately steep or steep; very stony.
Very stony land, Watchung material (Vw)	High water table; very stony.	Severe: high water table; very stony.	Severe: high water table; very stony.
Watchung silt loam (Wc)	High water table	Severe: high water table.	Severe: high water table.
Woodstown-Fallsington sandy loams, gently undulating (WfB).	Seasonal water table moderately high in about 50 percent of area and high in 25 percent of area.	Severe: water table moderately high or high.	Severe: water table moderately high or high.

Listed in the following paragraphs are the uses for which the soils are rated in table 8 and the major soil properties affecting the uses.

Foundations of dwellings with basement.—Important soil properties include slope, natural soil drainage, depth to and kind of bedrock, and flood hazard.

Disposal of sewage effluent.—Important soil properties are percolation rate, depth to seasonally high water, slope, amount of stone, depth to and kind of bedrock, and flood hazard. Permeable soils having a moderately high water table are rated moderate, assuming that the water table can be lowered by drainage or the surface raised by filling. Pollution of streams or wells is a hazard in rapidly permeable soils, but this property was not included in these interpretations. Requirements of the State Department of Health (*7*) were followed in preparing these interpretations. It is not intended that the ratings eliminate the need for percolation tests. The soil map and the ratings give a basis for making and interpreting the tests. The soil map shows, for example, the areas in which ground water is likely to prevent free drainage of a septic field during part of the year. In such an area, a percolation test in summer, when the water table is deep, does not give the information needed to judge the site.

Lawns and landscaping (homesites).—The primary factors in rating the limitations for landscaping (primarily for ornamental plants and lawns) are natural fertility, available water capacity, depth to bedrock, natural drainage, and slope.

Streets and parking lots.—The primary factors for rating the limitations of soils for streets and parking lots are the depth to water table, natural drainage, slope, depth to bedrock, and flood hazard.

Athletic fields.—The primary factors in rating the limitations of soils for athletic fields are slope, natural drainage, texture, and depth to bedrock.

Parks and picnic areas.—Parks and picnic areas are listed together because they have similar soil requirements. The primary factors in rating the limitations of soils for these uses are depth to the water table, slope, natural drainage, and texture.

Sanitary land fill.—The primary factors in rating limitations of soils for this use are slope, natural drainage, depth to bedrock, hazard of flooding, texture and firmness of the soil, and stoniness. Deep onsite investigations are needed to determine limitations below 5 feet. Soils that are rapidly permeable have poor filtering properties and are rated severe because of stream and well pollution hazard.

Cemeteries.—The primary factors in rating limitations of soils for cemeteries are the depth to bedrock, natural drainage, hazard of flooding, slope, stoniness, and clay content.

Formation and Classification of the Soils

This section consists of three parts. In the first part, the factors of soil formation are discussed as they relate to the formation of soils in Mercer County. The second part discusses morphology of the soils in the county. In the third part, each soil series represented in the county is placed in its respective family, subgroup, and order of the new system of classifying soils and is also placed in its respective great soil group of the old system of classification (*2*). The soil orders of the new classification that are represented in the county are briefly defined.

Factors of Soil Formation

Soils are the products of soil-forming processes acting on materials that were deposited or accumulated by geologic agencies. The factors that contribute to the differences among soils are climate, parent material, topography, plant and animal life, and time. Climate and plant and animal life, particularly vegetation, are the active factors of soil formation. Their effects on parent material are modified by topography and by the time the parent material has been in place. The relative importance of each factor differs from place to place. In extreme in-

affecting community developments—Continued

Estimated degree of limitation for—Continued				
Streets and parking lots	Athletic fields	Parks and picnic areas	Sanitary land fill	Cemeteries
Severe: moderately steep or steep; very stony.	Severe: moderately steep or steep; very stony.	Severe: moderately steep or steep; very stony.	Severe: moderately steep or steep; very stony.	Severe: moderately steep or steep; very stony.
Severe: high water table; very stony; frost action potential high.	Severe: high water table; very stony.	Severe: high water table; very stony.	Severe: high water table; very stony.	Severe: high water table; very stony.
Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.	Severe: high water table.
Severe: water table moderately high or high.	Severe: water table moderately high or high.	Moderate: water table moderately high or high.	Severe: water table moderately high or high.	Severe: water table moderately high or high.

stances one factor dominates in the formation of a soil and determined most of its properties, but normally the interaction of all factors determines the kind of soil that develops in any given place.

Climate

The soils of Mercer County have developed under a warm, moist climate. The prevailing temperature and rainfall are given in table 11, page 104, in the section "General Nature of the County."

Although this county is only about 30 miles from the Atlantic Ocean, its climate is largely continental, chiefly as a result of the predominance of winds that blow from the interior of North America. Most storms originate in the west, but some coastal storms move in from the southeast. These coastal storms are most common during the cool season.

Because the climate is moderate and the rainfall sufficient, physical and chemical weathering have been moderately rapid. The abundant rainfall has caused soluble materials to be leached from the soils and some of the less soluble materials to be moved downward in the soil profiles.

No free carbonates are present in the soils of the county, and a large part of the bases has been leached away. All the soils of the county are naturally acid, and some are strongly acid. Most of the soils have a low supply of plant nutrients, but some have a moderate supply.

From the position, extent, and distribution of the silty soils, it is postulated that wind velocities were high and that a considerable amount of silt was moved by wind soon after the silty materials were deposited by glacial waters.

Parent material

The soils of Mercer County developed from two general kinds of parent material. The first kind consists of material that was weathered from rocks in place. The second consists of sand, silt, clay, and rock fragments that were transported by water, wind, or gravity, or by a combination of these agencies. Table 9 shows the relationships of parent material to soil series in the county.

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The residual material was derived from several different kinds of rocks. About 30 to 35 percent of the county is underlain by sedimentary rocks. The red shale, sandstone, and argillite in the northern part of the county are sedimentary rocks of Triassic age. The Penn, Klinesville, Readington, Abbottstown, and Quakertown soils were formed in materials weathered from these rocks.

Igneous rocks, chiefly diabase, underlie the highest ridges in the northern part of the county. Among the main soils underlain by these rocks are the Neshaminy, Mount Lucas, Legore, and Watchung.

Very small areas of Pre-Triassic quartzite, gneiss, and schist outcrop in the Delaware River, in a few places east of Trenton, and along the beds of a few small streams in the Coastal Plain section of the county.

The transported material consists of alluvium that was deposited on flood plains and terraces. The soils in these materials are young because the parent material has not remained in place long enough for distinct profiles to be formed. Rowland and Bowmansville soils of the flood plains developed in the most recent alluvial deposits. The Birdsboro soils of the terraces developed in older deposits.

There is evidence that some of the finer grained material was transported by wind (*10*). A silty mantle covers some parts of the county, both in the Coastal Plain and in the Piedmont section. Evidence of windblown material is particularly clear in the Bucks soils of the Piedmont and in the Matapeake soils of the Coastal Plain.

Coastal Plain sediments occupy the southern part of the county. The parent materials of soils in this section consist of water-deposited clay, silt, sand, and gravel. Clay weathers to form clayey soils, such as the Keyport soils. Sand forms sandy soils, which have low fertility and low available water capacity, such as the Evesboro soils. Fortunately, most soils of the Coastal Plain in the county were formed in mixed materials and contain considerable amounts of sand, silt, and clay. Examples are the Sassafras, Woodstown, and Dragston soils.

TABLE 9.—*Relationships of the soil series according to physiographic position, parent material, and drainage*

Position and parent material	Well drained and excessively drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Piedmont section—					
Residuum from underlying rock:					
Red shale and sandstone	Klinesville, Penn	Reaville	Reaville		
Diabase (traprock)	Legore, Neshaminy	Mount Lucas	Mount Lucas	Watchung	
Argillite (dense sandstone) and silty surficial sediments		Chalfont	Chalfont		
Metamorphosed shale		Lehigh	Lehigh		
Yellowish-brown sandstone	Lansdale				
Fine-grained sandstone (or shale)	Quakertown	Quakertown			
Silty mantle		Lawrenceville	Lawrenceville	Doylestown	
Silty mantle and residuum from shale	Bucks	Readington	Abbottstown		
Old alluvium (terraces):					
Silty over sandy material	Birdsboro				
Sandy material	Tioga				
Recent alluvium		Rowland	Rowland	Bowmansville	
Coastal Plain section (unconsolidated deposits)—					
Old gravelly deposits	Aura				
Silty and loamy mantle	Matapeake	Mattapex	Bertie	Othello	Portsmouth.
Sandy material	Sassafras	Woodstown	Dragston	Fallsington	
Sandy mantle and old gravelly sediments	Downer				
Very sandy, nonglauconitic material	Evesboro, Galestown, Fort Mott.	Klej	Klej	Plummer	
Clayey material		Keyport	Lenoir	Elkton	
Very sandy, glauconitic material	Tinton				

Topography

Mercer County lies almost equally in the Piedmont and the Coastal Plain physiographic provinces. Elevations above sea level range from 0 to 350 feet. The Coastal Plain section comprises mostly nearly level or gently sloping areas; only small knolls or slopes beside streams have slopes greater than 5 percent.

The Piedmont section of the county is made up of gently undulating and moderately sloping plains, narrow flood plains along the major streams, and a steep ridge that crosses the northern part of the county in an east-west direction. Blufflike escarpments occur adjacent to the main streams and especially beside the Delaware River. On many of these steep slopes, erosion removes soil about as fast as it is formed. The soils on these steep slopes are characterized by faint horizons or shallow depth to rock, or both.

Plant and animal life

Plants, micro-organisms, earthworms, and other forms of life that live on and in the soil are active in the soil-forming processes. The changes they bring about depend mainly on the kind of life processes peculiar to each. The kinds of plants and animals are determined by the climate, parent material, age of the soil, and by other organisms.

Most of the soils in Mercer County were formed under forests of hardwood trees. The principal trees now growing in the area consist of various kinds of oaks, hickories, birches, basswood, beech, ash, elm, yellow-poplar, sweetgum, red maple, and redcedar. Similar trees probably made up the original forests.

In soils formed under forests, organic matter is added to the soil in the form of decayed leaves, twigs, roots, and entire plants. Most of this material accumulates on the surface. There it is acted on by micro-organisms, earthworms, termites, and other forms of life, and by direct chemical reactions brought about by the effects of climate. The plant nutrients released by this decomposition are available for the new growth of plants.

In the Coastal Plain, especially in the sandy soils, the content of organic matter is low, and organic matter remains concentrated in the upper few inches until the soils are plowed. Earthworms are rare in undisturbed sandy soils.

Land clearing, cultivation, the introduction of new plants, and artificial drainage affect the development of soils. So far, the most apparent widespread results of these activities of man are accelerated erosion, alteration of the surface soil by tillage, reduction of acidity, and raising of the fertility level by additions of lime and fertilizers.

In some local areas, man has made drastic changes in the soils. He has removed the original soil or so mixed it in the process of recent construction that soil formation is now beginning in the rearranged materials.

Time

The time that soil parent material has been in place and exposed to the active factors of climate and vegetation is reflected by the degree of soil profile development. A soil profile is influenced, however, by other factors as well as by time. A mature soil is one that has well-defined, genetically related horizons; an immature soil is one that shows little or no horizonation. In this county, the deep soils that have a clayey subsoil indicate that the soil material has been in the same place and subject to soil-forming processes for thousands of years. The clayey subsoil has been formed by movement of clay particles out of the surface layer and into the subsoil by the action of water during a long time. The young soils on the flood plains do not have such a characteristic clayey subsoil because they have not been in place nearly so long, and they are constantly being altered by deposition of fresh sediment.

Morphology of the Soils

The combined action of the soil-forming factors produces soils that have horizons. Some of the horizons are contrasting enough to be readily recognized, and others are faint.

The differentiation of soil horizons is the result of several soil-forming processes. The most important of these are: accumulation of organic matter; leaching of carbonates and of salts more soluble than calcium carbonate; chemical weathering of the primary minerals of the rocks and parent materials and formation of silicate clay minerals; movement of silicate clay minerals from one horizon to another; and chemical changes in iron compounds along with transfer of iron compounds from one horizon to another.

All of these processes have taken place and are now taking place in the soils of Mercer County. The degree of activity or the strength of each process, however, varies from soil to soil.

Probably the first change that occurs in a soil is the accumulation of organic matter near the surface to form an A1 horizon. The A1 horizon loses its identity when a soil is plowed and cultivated. Plowing commonly mixes underlying material with the A1 horizon to form an Ap horizon. The quantity of organic matter accumulated varies from very little to very much. Evesboro and Galestown soils contain very little organic matter, but Portsmouth, Doylestown, and Watchung soils contain considerable amounts.

All of the soils have been deeply leached of carbonates and salts. As a result of leaching, all the soils of the county are naturally either strongly acid or extremely acid.

Chemical weathering of the primary minerals and formation of silicate clay minerals has taken place in most soils in the county. The clays are composed dominantly of kaolinite, illite, chlorite, vermiculite, and quartz, whether the parent material was shale, sandstone, or diabase of the Piedmont or the clay, silt, and sand deposits of the Coastal Plain.

The movement of silicate clay minerals from one horizon to another has contributed to the development of almost all the soils except those consisting of recent alluvium. It is one of the most important processes in differentiation of horizons in the older soils of the county. The A horizon of many of the soils shows strong eluviation (removal of clay), and more clay is in the B horizon than in the A horizon. Clay films or coats on ped faces and in many former root channels are evidence of much movement of silicate clay from the A horizon into the B horizon. The Quakertown, Neshaminy, and Mount Lucas soils show evidence of a fairly high degree of translocation of silicate clays. Evidence of eluviation of clay is less distinct in Galestown soils and is not apparent in Evesboro and Klej soils.

Eluviation of iron compounds and concentration of them in the subsoil is normal in most soils of the county. Reduction and some degree of transfer of iron have occurred in the soils that have impeded drainage. In many naturally wet soils in this county, the reduction of iron compounds has been important in horizon differentiation. This reduction is called gleying when it is intense enough to form reduced, gray compounds of iron. Gleying has particularly affected the Fallsington, Doylestown, Plummer, and Portsmouth soils. Iron has been segregated in certain horizons of some soils to form yellowish-red, strong-brown, or yellowish-brown mottles.

Classification of the Soils

Soils are classified so that we may more easily remember their significant characteristics. Classification enables us to assemble knowledge about soils and to apply this knowledge to develop principles that help us understand their behavior and response to management. Through classification and the use of maps, we can put this knowledge to use in the management of soils. The uses of soils are many. If soil maps are to be useful to farmers, planners, engineers, foresters, developers, and others, they need to be made in detail, and the soils then need to be classified into broad groups for special purposes.

Two systems of natural classification of soils are now in use in the United States. In table 10 the soil series in the county are classified in some categories of the comprehensive system that was placed in use by the Soil Conservation Service in 1965 (*9*, *11*). Listed also are the great soil groups in the classification system of 1938 (*2*).

Under the comprehensive system, all soils are classified in six categories, which are levels or steps in the system. The categories are the order, suborder, great group, subgroup, family, and series. The criteria for classification are measurable or observable properties of the soils. The properties are so chosen that soils of similar properties are grouped together.

In the broadest category, the order, there are 10 classes. Only four of these 10 orders are represented in Mercer County. They are Entisols, Inceptisols, Alfisols, and Ultisols.

Entisols are mineral soils in which there has been little or no formation of soil horizons from the geologic material.

Inceptisols (from the Latin inceptum, beginning) are mineral soils in which formation of horizons has begun.

Alfisols are mineral soils in which horizons have been formed and are still being formed, but they do not have special characteristics that distinguish several of the other orders.

Ultisols (from the Latin ultimus, last) are soils that are in an advanced stage of development.

Names of classes in the system at each level above the series have been chosen and defined to indicate certain characteristics of the class and also the level of that class in the system. The name of each subgroup, for example, consists of the name of the great group and a descriptive

TABLE 10.—*Soil series classified according to the comprehensive system and the system of 1938*

Series	Comprehensive classification			Great soil group of the classification of 1938
	Family	Subgroup	Order	
Abbottstown	Fine-loamy, mixed, mesic	Aeric Fragiaqualfs	Alfisols	Gray-Brown Podzolic soils.
Aura	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Bertie	Fine-loamy, mixed, thermic [1]	Aquic Hapludults	Ultisols	Low-Humic Gley soils intergrading toward Red-Yellow Podzolic soils.
Birdsboro	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Birdsboro, sandy subsoil variants.	Coarse-loamy, mixed, mesic	Ochreptic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Birdsboro, gravelly solum variants.	Coarse-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Bowmansville	Fine-loamy, mixed, nonacid, mesic.	Aeric Fluvaquents	Entisols	Low-Humic Gley soils.
Bucks	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Chalfont	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Downer	Coarse-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Regosols.
Doylestown	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols	Low-Humic Gley soils.
Dragston	Coarse-loamy, siliceous, thermic.[1 2]	Aquic Hapludults	Ultisols	Low-Humic Gley soils.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Evesboro	Mesic, coated	Typic Quartzipsamments	Entisols	Regosols.
Evesboro, sandy loam subsoil variants.	Coarse-loamy, siliceous, acid, mesic.	Typic Udorthents	Entisols	Gray-Brown Podzolic soils intergrading toward Regosols.
Fallsington	Fine-loamy, siliceous, mesic [3]	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Fort Mott	Loamy, siliceous, mesic	Arenic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Galestown	Sandy, siliceous, mesic	Psammentic Hapludults	Ultisols	Sols Bruns Acides.
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Klej, sandy loam subsoil variants.	Coarse-loamy, siliceous, acid, mesic.	Aquic Udorthents	Entisols	Regosols.
Klinesville	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols	Lithosols intergrading toward Sols Bruns Acides.
Lansdale	Coarse-loamy, mixed, mesic	Typic Hapludults	Utisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Lawrenceville	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils.
Legore	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Lithosols.
Lehigh	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Planosols.
Lenoir	Clayey, mixed, thermic [1]	Aeric Paleaquults	Ultisols	Low-Humic Gley soils intergrading toward Red-Yellow Podzolic soils.
Matapeake	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Mattapex	Fine-silty, mixed, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Mount Lucas	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.
Neshaminy	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Red-Yellow Podzolic soils intergrading toward Reddish-Brown Lateritic soils.

See footnotes at end of table.

TABLE 10.—*Soil series classified according to the comprehensive system and the system of 1938*—Continued

Series	Comprehensive classification			Great soil group of the classification of 1938
	Family	Subgroup	Order	
Othello	Fine-silty, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Penn	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Lithosols.
Plummer	Loamy, siliceous, thermic[1]	Grossarenic Paleaquults	Ultisols	Low-Humic Gley soils.
Portsmouth	Fine-loamy, siliceous, thermic.[1]	Typic Umbraquults	Ultisols	Humic Gley soils.
Quakertown	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Readington	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Reaville	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols	Gray-Brown Podzolic soils intergrading toward Lithosols.
Reaville, wet variant.	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Rowland	Fine-loamy, mixed, mesic	Aquic Fluventic Dystrochrepts.	Inceptisols	Alluvial soils.
Sassafras	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.
Tinton	Loamy, mixed, mesic	Arenic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Tioga	Coarse-loamy, mixed, mesic	Dystric Fluventic Eutrochrepts.	Inceptisols	Alluvial soils.
Watchung	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols	Planosols.
Woodstown	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils intergrading toward Red-Yellow Podzolic soils.

[1] The temperature in this county is a few degrees lower than normal for thermic families. The thermic soils are not extensive.
[2] The texture of these soils in some places is fine-loamy.
[3] The texture of these soils in some places is coarse-loamy.

modifier. Each name of a great group is a word made up of three parts, of which the first is a descriptive prefix and the other two indicate the order and suborder. Soil families within subgroups are differentiated on the basis of texture, coarse fragments, mineralogy, mean annual temperature, and sometimes other factors, for example, acidity. Names of families are based on those characteristics. Further discussion of the classification is not appropriate here. It should be pointed out that a few of the soil series in this county have been placed in thermic families, which are characteristic soils of a warm or hot zone, and that most of the soil series are in mesic families, which are characteristic of a medium temperature zone.

Table 10 shows the placement of each soil series in its family, subgroup, and order. As just mentioned, the name of each subgroup shows also the great group and the suborder. Table 10 also shows for each soil series the great soil group in which it is placed in the classification of 1938.

Placement of soil series in the comprehensive system of classification is still somewhat tentative, particularly the placement in soil families. The classification may be changed as more information becomes available.

General Nature of the County

This section describes the climate, physiography, water supply, and history of the county.

Climate[3]

The climate of Mercer County is humid and temperate. Although the county is near the ocean, its climate is continental and is not greatly influenced by the ocean. Data on temperature and precipitation from the station of the National Weather Service in Trenton are given in table 11. Data on freezing temperatures from the cooperative weather station at George School in Bucks County, Pennsylvania, are given in table 12. The temperature data from George School are more applicable to farming conditions in Mercer County than the data from Trenton, since the Trenton station is located in the heart of the city.

The temperature in summer rarely exceeds 100° F., but a temperature in the middle or upper 90's occurs frequently. The temperature in winter generally is not below 10° for long periods, but it is low enough that drain tile must be placed at least 40 inches deep for protection against freezing.

The average annual precipitation is about 44 inches. The monthly averages show that precipitation generally is well distributed through the year. During nearly every year, however, there are periods when the rainfall is not enough for crops of high value. As a result, the acreage of irrigated land has increased considerably in recent years, especially during the drought of 1961–66. Rainfall is heaviest during July and August.

[3] This section supplied by DONALD V. DUNLAP, State climatologist, National Weather Service, Department of Commerce.

TABLE 11.—*Temperature and precipitation data*

[All data from Trenton, Mercer County, New Jersey]

Month	Temperature				Precipitation			Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
	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—			
			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	40	26	56	11	3.25	1.6	4.8	6	3
February	40	25	60	12	3.14	1.6	4.8	6	4
March	50	33	68	20	3.84	1.6	5.6	3	3
April	61	42	77	32	3.43	1.3	5.3	(1)	2
May	72	52	87	43	3.55	1.1	5.0	0	
June	80	61	93	52	3.59	1.3	6.0	0	
July	85	66	95	59	4.67	1.1	8.0	0	
August	83	65	93	56	5.00	1.2	7.4	0	
September	76	58	89	46	3.67	1.3	7.6	0	
October	66	48	81	37	3.14	1.3	4.7	(1)	1
November	53	38	69	26	3.26	1.1	5.2	(1)	2
December	42	28	60	14	3.24	1.2	4.7	4	3
Year	62	45	[2] 97	[3] 6	43.78	32.8	48.1	19	3

[1] Less than 0.5 day.
[2] Average annual highest maximum.
[3] Average annual lowest minimum.

Much of the rain in the summer months comes as thunderstorms. There are, on the average, about 33 thunderstorms each year. Occasionally the rainfall is intense. The maximum amount on record is 2.9 inches in one hour, 5.3 inches in 24 hours, and 10 to 14 inches in one month.

The average length of the growing season is about 173 days. The average date of the last killing frost in spring is April 24, and that of the first in fall is October 14. The probabilities of damaging temperatures after given dates in spring and before given dates in fall are presented in table 12.

As a rule, the temperature in winter is not low enough to keep the soils frozen for the entire season. Rain during winter frequently warms the soils enough to thaw them. Heavy rain on partly thawed soil is likely to cause severe erosion.

Hailstorms do not occur frequently, but one can cause severe damage to a crop of high value. Cloudy days occur frequently. The record for 34 years shows an annual average of 148 days cloudy, 116 days partly cloudy, and 101 days clear. Rain or snow falls on an average of about 120 days each year. Snow amounting to 1 inch or more falls on an average of 7 days each year.

Physiography and Relief

Mercer County lies in the northern parts of the Piedmont and the Coastal Plain physiographic provinces. The

TABLE 12.—*Probabilities of last freezing temperature in spring and first in fall*

[All data from George School in Bucks County, Pennsylvania]

Season and probability	Dates for given probability and temperature of—				
	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	March 23	April 2	April 10	April 28	May 8
2 years in 10 later than	March 16	March 26	April 4	April 22	May 3
5 years in 10 later than	March 5	March 15	March 24	April 12	April 24
Fall:					
1 year in 10 earlier than	November 23	November 13	October 28	October 17	September 29
2 years in 10 earlier than	November 28	November 19	November 5	October 23	October 5
5 years in 10 earlier than	December 7	November 27	November 11	October 31	October 14

northwestern part of the county, about 43 percent of the total area, is in the Piedmont lowland. In this section many of the rocks are of Triassic age, and the section is also called the Triassic lowland. The other 57 percent of the county is in the Coastal Plain province. In a small, narrow area along the boundary between the two sections, a mantle of Coastal Plain sediments overlies materials of the Piedmont lowland.

In the Piedmont lowland, the elevation ranges from 60 to 350 feet above sea level. The underlying rocks consist mainly of Triassic shale, sandstone, and argillite. A small part of the Piedmont lowland is underlain by igneous rocks, mainly diabase. The relief in the Piedmont lowland generally consists of undulating ridges and nearly level to gentle slopes. There are some low hills and ridges underlain by diabase.

The principal streams that drain the western part of the Piedmont lowland are Moore Creek, Fiddlers Creek, Jacobs Creek, and Shipetaukin Creek. They flow into the Delaware River. Stony Brook, in the eastern part of this section, flows into the Millstone River.

In the Coastal Plain section, the elevation ranges from about 10 to 150 feet above sea level. The geologic materials in this section consist mostly of sand, silt, clay, and gravel of marine or fluvial origin. There is, however, a ridge of pre-Triassic quartzite, gneiss, and schist. It crops out in the Delaware River, where it forms the falls at Trenton. It extends eastward, at or very near the surface, as far as Princeton Junction. Except for outcrops in the Delaware River, along the beds of some of the creeks, and at one or two other places, the crystalline rocks of this ridge are covered by a veneer of Pleistocene sediments of the Coastal Plain (*5*). The surface of the entire Coastal Plain section is, for the most part, nearly level or gently sloping.

The western two-thirds of the Coastal Plain section is drained by Assunpink Creek, Miry Run, and Crosswicks Creek. They flow into the Delaware River. The remaining one-third is drained by Big Bear Brook and Rocky Brook, which flow into the Millstone River.

Water Supply

Water for the cities, towns, and industries in Mercer County is obtained from both surface and underground sources. Most of the water for Trenton and its suburbs comes directly from the Delaware River. Water from the river is supplied to other communities and to industries through the Delaware-Raritan Canal, which now serves as an aqueduct from Trenton to New Brunswick. Princeton obtains water from the canal and also a large amount from deep wells. Hightstown obtains most of its water from Rocky Brook, a branch of the Millstone River, which is being developed as a source of water. Nearly all the other communities in the county obtain their water from wells.

A few impoundments of surface water have been built, mainly in the Bucks-Penn-Readington soil association of the Piedmont section and in the Sassafras-Dragston association of the Coastal Plain section. These impoundments are used mainly as a source of water for irrigation. In the Sassafras-Dragston association, ponds dug below the level of the shallow water table are much more common than those formed by building embankments. In the Bucks-Penn-Readington association and also in the Quakertown-Chalfont-Doylestown association, most of the ponds have been formed by embankments. No impoundments have been built in the hilly Neshaminy-Mount Lucas-Lehigh soil association.

The rest of this discussion deals with the occurrence and recharge of ground water in different parts of the county.

Runoff generally is more rapid, and the amount is greater, on soils of the Piedmont section than on those of the Coastal Plain. Most soils of the Piedmont section are silty, and their permeability is moderate to slow. Those of the Coastal Plain section, in general, are sandy or gravelly, and their permeability is moderate to rapid. Local flash floods are much more common in the Piedmont than in the Coastal Plain.

Because runoff is greater, there is less opportunity for recharge of ground water in the Piedmont section than in the Coastal Plain. Ground water in the Piedmont is stored in small fissures and cavities in the weathered zone of the rock, generally less than 200 feet below the surface (*6*). The amount of water stored depends on the number and width of the fractures and varies with the kind of rock. The amount stored also fluctuates with the seasons. The coarse, lower part of the Stockton sandstone (*5*) is the best water-bearing formation in the Triassic lowland. The fractured red silty shale of the Brunswich Formation is next, and the hard massive beds of the Lockatong argillite yield little water to wells. The diabase ridges of the Piedmont section do not yield much water, because of their high position and dense rocks.

Moderate to slow permeability of soils in the Piedmont lowland slows the recharge of ground water. Permeability of the Quakertown soils, which are underlain by sandstone, and of the main soils of the Bucks-Penn-Readington association, is for the most part moderate or moderately slow. Permeability of the Lehigh and Doylestown soils is moderate to slow, and that of the Chalfont soils is slow. Permeability of the Mount Lucas subsoil is moderately slow, and that of the Neshaminy subsoil is moderate or moderately slow. These two soils are underlain by diabase.

In the areas that are underlain by red shale, recharge of ground water can be increased by impoundments in valleys and over the fracture zones. The fracture zones allow water to move laterally for some distance. There is danger, therefore, that effluent from septic tanks might contaminate the water supply if drainage fields and wells are closely spaced.

Many drainage fields from septic tanks have been placed in the fractured shale or allowed to drain into the shale through holes dug at intervals. This practice is contrary to standards of the State of New Jersey for construction of septic fields. The percolation rate in the fractured shale generally meets the requirements, but the coarse voids do not provide an adequate filter to remove pollutants. In general, a public water supply and a trunk sewerage system are desirable for most housing developments in the Piedmont section.

Along the border between the Coastal Plain and the Piedmont sections, recharge of water into the underlying Stockton sandstone takes place largely through alluvial sediments that were deposited in a trough parallel to the boundary. The materials in this trough and in several cross troughs are good water-bearing formations. Recharge into these formations takes place through the two types of Alluvial land, especially where the texture is sandy; through the sandy subsoil variants of Birdsboro soils; and through soils of the Galestown-Evesboro association and the Sassafras-Dragston association. Dredging of the soils that consist of recent alluvium should increase recharge of the underlying aquifers.

Most of the Coastal Plain section in the county is covered by soils of the Sassafras-Dragston association and the Galestown-Evesboro association. These soils generally are underlain by beds of slowly permeable silty clay or clay at a depth that ranges to 20 or 30 feet. Interspersed in these beds are some sandy strata that carry water. Recharge of ground water generally takes place into the more recent sediments that lie above the beds of clay. Some recharge into the deep, underlying sands takes places by leakage through the clay (*15*). In the area underlain by clayey formations, the shallow aquifers are filled except in some local areas. As a result, they are discharging into the local streams.

Porous sands lie at the surface along the eastern border of the county and dip toward the east (*14*). The Sassafras and Dragston soils on them allow recharge of the ground water.

The shallow water-bearing formations of the Coastal Plain section can be developed to furnish a considerable amount of water for irrigation or for light industry. The intensive development that is needed includes recharge through the moderately permeable soils and temporary storage of water to meet peak requirements. The hazard of pollution of water in the shallow aquifers is great, and potable water generally must be obtained from deep wells or from treatment plants.

History

The early inhabitants of this part of New Jersey were the Lenape Indians, called by the English the Delawares. They were part of the Algonquian tribes. The first settlement by Europeans in what is now Mercer County was made in 1676. The Delaware and Raritan canal was completed in 1838, and a railroad from Trenton to New Brunswick was built one year later. Rail connections with Philadelphia and with Jersey City were established in 1876.

The amount of land cleared for farming increased until about 1924. In that year there were 1,129 farms, and the land in farms amounted to 92,936 acres, or 64.3 percent of the county. The acreage in farms and the acreage used for crops has declined since 1934. In 1964, about 35 percent of the county was classified as land in farms. In that year, there were 400 farms and the average size was 126 acres.

The farms produce field crops, poultry, dairy products, vegetables, potatoes, fruit, and other products. At the time of the soil survey, more than 4,200 acres of crops were irrigated.

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Glossary

Acidity. See Reaction, soil.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as crumbs, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed water-holding capacity in this survey). The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Catena. A sequence, or "chain", of soils on a landscape, developed from one kind of parent material but having different characteristics because of differences in relief and drainage.

Clay. As a soil separate, the mineral particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

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 and brittle; little affected by moistening.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Glauconite. A dark-green mineral, essentially a potassium iron silicate, that occurs in greensand.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

Gravel. Rounded or angular rock fragments that are not prominently flattened and range in diameter from 2 millimeters (0.079 inch) to 80 millimeters (3 inches).

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

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 some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than in the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state. In engineering, a high liquid limit indicates that the soil has a high content of clay and a low capacity for supporting loads.

Loess. A fine-grained, eolian (wind-blown) deposit of soil material that is unstratified and consists dominantly of silt or very fine sand.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineralogical, and biological properties of the various horizons, and their thickness and arrangement in the soil profile.

Mottled. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Natural soil drainage. Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of a soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Organic matter. A general term for plant and animal material, in or on the soil, in all stages of decomposition. Readily decomposed organic matter is often distinguished from the more stable forms that are past the stage of rapid decomposition. Descriptive terms for amount of organic matter in this publication have the following limits: *very low*—less than 1 percent by volume; *low*—1 to 2 percent; *moderate*—2 to 4 percent; and *high*—more than 4 percent. These ratings were developed with a view that they could be useful generally for soils similar to those described in this publication.

Parent material, soil. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Percolation. The downward movement of water through the soil.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *slow,* less than 0.2 inch per hour; *moderately slow,* 0.2 to 0.63 inch; *moderate,* 0.63 inch to 2.0 inches; *moderately rapid,* 2.0 to 6.3 inches; and *rapid,* more than 6.3 inches per hour. A very slow class and a very rapid class are sometimes recognized, also.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Profile, soil. A vertical section of the soil through all its horizons and extending 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 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	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

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff (hydraulics). The part of the precipitation on a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground and reappears in surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments having diameters ranging from 0.05 millimeter to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which processes of soil formation are active. The solum in a mature soil includes 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 characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. 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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically the part of the soil below the solum. Any layer below the surface layer and subsoil.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 8 to 10 inches in thickness in this area. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay*, and *clay*. The sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Type, soil. A subdivision of the soil series that is made on the basis of differences in the texture of the surface layer.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Variant, soil. A soil having properties sufficiently different from other known soils to justify a new series name but occupying a geographic area so limited that creation of a new series is not believed to be justified.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a woodland group, read the introduction to the section it is in for general information about its management. For information on capability units, read the section "Capability Grouping" beginning on page 50. Other information is given in tables as follows:

Acreage and extent, table 1, p. 7.
Estimated yields, table 2, p. 54.
Suitability of soils for wildlife, table 4, p. 59.
Engineering uses of soils, tables 5, 6, and 7, pp. 64 through 85.
Soil properties and limitations affecting community developments, table 8, p. 86.

Map symbol	Mapping unit	Described on page	Capability unit	Woodland group	
			Symbol	Symbol	Page
Ad	Alluvial land, wet	9	Vw-27	1w1	57
Ae	Alluvial land, very wet	9	VIw-28	1w1	57
AfB	Aura sandy loam, moderately firm, 2 to 5 percent slopes	10	IIe-5	3o1	57
AfC	Aura sandy loam, moderately firm, 5 to 10 percent slopes	10	IIIe-5	3o1	57
BbB	Birdsboro loam, 0 to 6 percent slopes	12	IIe-55	2o1	57
BbB2	Birdsboro loam, 2 to 6 percent slopes, eroded	12	IIe-55	2o1	57
BbC2	Birdsboro loam, 6 to 12 percent slopes, eroded	12	IIIe-55	2o1	57
BdA	Birdsboro silt loam, 0 to 2 percent slopes	12	I-55	2o1	57
BdB	Birdsboro silt loam, 2 to 6 percent slopes	12	IIe-55	2o1	57
BnA	Birdsboro soils, sandy subsoil variants, 0 to 2 percent slopes	13	I-56	2o1	57
BnB	Birdsboro soils, sandy subsoil variants, 2 to 6 percent slopes	13	IIe-56	2o1	57
BnC	Birdsboro soils, sandy subsoil variants, 6 to 12 percent slopes	13	IIIe-56	2o1	57
BoB	Birdsboro soils, gravelly solum variants, 0 to 5 percent slopes	14	IVs-7	2o1	57
Bt	Bowmansville silt loam	14	VIw-86	1w1	57
BuA	Bucks silt loam, 0 to 2 percent slopes	15	I-55	3o1	57
BuB	Bucks silt loam, 2 to 6 percent slopes	15	IIe-55	3o1	57
BuB2	Bucks silt loam, 2 to 6 percent slopes, eroded	15	IIe-55	3o1	57
BuC	Bucks silt loam, 6 to 12 percent slopes	15	IIIe-55	3o1	57
BuC2	Bucks silt loam, 6 to 12 percent slopes, eroded	15	IIIe-55	3o1	57
CdA	Chalfont silt loam, 0 to 2 percent slopes	16	IIIw-70	3w1	58
CdB	Chalfont silt loam, 2 to 6 percent slopes	16	IIIw-70	3w1	58
CdB2	Chalfont silt loam, 2 to 6 percent slopes, eroded	17	IIIw-70	3w1	58
CdC2	Chalfont silt loam, 6 to 12 percent slopes, eroded	17	IIIe-70	3w1	58
CeB	Chalfont very stony silt loam, 0 to 6 percent slopes	17	VIs-75	3w1	58
Cf	Cut and fill land, clayey substratum	17	-------	---	--
Cg	Cut and fill land, gravelly material	17	-------	---	--
Ct	Cut and fill land, rock substratum	17	-------	---	--
Cu	Cut and fill land, stratified substratum	17	-------	---	--
Df	Downer fine sandy loam, gravelly clay loam substratum	18	IIe-5	3o1	57
DgA	Doylestown silt loam and Reaville silt loam, wet variant, 0 to 2 percent slopes	19	IVw-80	3w2	58
DgB	Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes	19	IVw-80	3w2	58
DgB2	Doylestown silt loam and Reaville silt loam, wet variant, 2 to 6 percent slopes, eroded	19	IVw-80	3w2	58
DgC	Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes	19	VIw-80	3w2	58
DgC2	Doylestown silt loam and Reaville silt loam, wet variant, 6 to 12 percent slopes, eroded	19	VIw-80	3w2	58
DwB	Dragston and Woodstown sandy loams, 0 to 4 percent slopes	20	IIw-14	2w1	57
Ek	Elkton silt loam	21	IIIw-18	2w1	57
EvB	Evesboro loamy sand, 0 to 5 percent slopes	21	IVs-7	3o2	58
EwB	Evesboro soils, sandy loam subsoil variants, 0 to 5 percent slopes	22	IIs-6	3o2	58
Fd	Fallsington sandy loam	23	IIIw-21	2w1	57
Fm	Fresh water marsh	23	VIIIw-29	---	--

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit	Woodland group	
			Symbol	Symbol	Page
FrB	Fort Mott loamy sand, 0 to 5 percent slopes	23	IIIs-6	3o2	58
FrC	Fort Mott loamy sand, 5 to 10 percent slopes	23	IIIe-6	3o2	58
GaB	Galestown loamy sand, 0 to 5 percent slopes	24	IVs-7	3o2	58
GeB	Galestown sandy loam, 0 to 6 percent slopes	25	IIs-6	3o2	58
Km	Klej soils, sandy loam subsoil variants	26	IIIw-16	3o2	58
KsC	Klinesville shaly loam, 6 to 12 percent slopes	27	IVe-66	4d1	58
KsE	Klinesville shaly loam, 12 to 30 percent slopes	27	VIe-66	4d1	58
LaB	Lansdale sandy loam, 2 to 6 percent slopes	27	IIe-58	3o1	57
LcC2	Lansdale channery loam, 6 to 12 percent slopes, eroded	27	IIIe-58	3o1	57
LcD2	Lansdale channery loam, 12 to 18 percent slopes, eroded	28	IVe-58	3o1	57
LdC	Lansdale very stony loam, 0 to 12 percent slopes	28	VIs-61	3o1	57
LdE	Lansdale very stony loam, 12 to 30 percent slopes	28	VIIs-61	3r1	58
LeA	Lawrenceville and Mount Lucas silt loams, 0 to 2 percent slopes	29	IIw-71	2w1	57
LeB	Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes	29	IIw-71	2w1	57
LeB2	Lawrenceville and Mount Lucas silt loams, 2 to 6 percent slopes, eroded	29	IIw-71	2w1	57
LeC2	Lawrenceville and Mount Lucas silt loams, 6 to 12 percent slopes, eroded	29	IIIe-71	2w1	57
LgC	Legore gravelly loam, 6 to 12 percent slopes	30	IIIe-58	3o1	57
LgD	Legore gravelly loam, 12 to 18 percent slopes	30	IVe-58	3o1	57
LgE	Legore gravelly loam, 18 to 30 percent slopes	30	VIe-58	3r1	58
LhB	Lehigh silt loam, 0 to 6 percent slopes	30	IIIw-70	3w1	58
LhB2	Lehigh silt loam, 2 to 6 percent slopes, eroded	31	IIIw-70	3w1	58
LhC2	Lehigh silt loam, 6 to 12 percent slopes, eroded	31	IIIe-70	3w1	58
Lk	Lenoir-Keyport silt loams	31	IIIw-11	2w1	57
Mf	Made land, dredged river materials	32	-------	---	--
MoA	Matapeake loam, 0 to 2 percent slopes	33	I-4	3o1	57
MoB	Matapeake loam, 2 to 5 percent slopes	33	IIe-4	3o1	57
MoC2	Matapeake loam, 5 to 10 percent slopes, eroded	33	IIIe-4	3o1	57
Mq	Mattapex and Bertie loams	34	IIIw-13	3w1	58
MvB	Mount Lucas very stony silt loam, 0 to 6 percent slopes	35	VIs-75	2w1	57
MvC	Mount Lucas very stony silt loam, 6 to 12 percent slopes	35	VIs-75	2w1	57
NeB	Neshaminy silt loam, 0 to 6 percent slopes	36	IIe-55	2o1	57
NeC	Neshaminy silt loam, 6 to 12 percent slopes	36	IIIe-55	2o1	57
NeC2	Neshaminy silt loam, 6 to 12 percent slopes, eroded	36	IIIe-55	2o1	57
NhC	Neshaminy very stony silt loam, 0 to 12 percent slopes	36	VIs-61	2o1	57
NhE	Neshaminy very stony silt loam, 12 to 30 percent slopes	36	VIIs-61	3r1	58
Ot	Othello silt loam	37	IIIw-20	3w1	58
PeB	Penn shaly silt loam, 0 to 6 percent slopes	37	IIe-65	3o1	57
PeC	Penn shaly silt loam, 6 to 12 percent slopes	37	IVe-65	4d1	58
PeD	Penn shaly silt loam, 12 to 18 percent slopes	38	VIe-65	4d1	58
Pg	Pits	38	-------	---	--
Pu	Plummer sandy loam	38	IVw-22	3w2	58
Pv	Plummer sandy loam, very wet	38	IVw-22	3w2	58
Pw	Portsmouth silt loam, thin surface variant	39	IIIw-24	2w1	57
QkB	Quakertown silt loam, 0 to 6 percent slopes	40	IIe-55	2o1	57
QkB2	Quakertown silt loam, 2 to 6 percent slopes, eroded	40	IIe-55	2o1	57
QkC	Quakertown silt loam, 6 to 12 percent slopes	40	IIIe-55	2o1	57
QkC2	Quakertown silt loam, 6 to 12 percent slopes, eroded	40	IIIe-55	2o1	57
QuB	Quakertown channery silt loam, 2 to 6 percent slopes	40	IIe-55	2o1	57
QuC	Quakertown channery silt loam, 6 to 12 percent slopes	40	IIIe-55	2o1	57
QuC2	Quakertown channery silt loam, 6 to 12 percent slopes, eroded	40	IIIe-55	2o1	57
QuD2	Quakertown channery silt loam, 12 to 18 percent slopes, eroded	40	IVe-55	3o1	57
RaA	Readington and Abbottstown silt loams, 0 to 2 percent slopes	41	IIIw-71	3o1	57
RaB	Readington and Abbottstown silt loams, 2 to 6 percent slopes	41	IIIw-71	3o1	57

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit	Woodland group	
			Symbol	Symbol	Page
RaB2	Readington and Abbottstown silt loams, 2 to 6 percent slopes, eroded	41	IIIw-71	3o1	57
RaC2	Readington and Abbottstown silt loams, 6 to 12 percent slopes, eroded	42	IIIe-71	3o1	57
ReA	Reaville silt loam, 0 to 2 percent slopes	42	IIIw-76	3w1	58
ReB	Reaville silt loam, 2 to 6 percent slopes	42	IIIw-76	3w1	58
ReB2	Reaville silt loam, 2 to 6 percent slopes, eroded	43	IIIw-76	3w1	58
ReC2	Reaville silt loam, 6 to 12 percent slopes, eroded	43	IIIe-76	3w1	58
Ro	Rowland silt loam	44	Vw-78	1w1	57
SdD	Sandy and silty land, strongly sloping	44	VIe-5	2o1	57
SdE	Sandy and silty land, steep	44	VIIe-5	3r1	58
SrA	Sassafras sandy loam, 0 to 2 percent slopes	45	I-5	2o1	57
SrB	Sassafras sandy loam, 2 to 5 percent slopes	45	IIe-5	2o1	57
SrC	Sassafras sandy loam, gently undulating	45	IIIe-5	2o1	57
SrC2	Sassafras sandy loam, 5 to 10 percent slopes, eroded	46	IIIe-5	2o1	57
SsB	Sassafras gravelly sandy loam, 2 to 5 percent slopes	46	IIe-5	2o1	57
StC3	Sassafras sandy clay loam, 5 to 10 percent slopes, severely eroded	46	IVe-5	2o1	57
SyB	Sassafras-Woodstown sandy loams, gently undulating	46	IIIw-14	2o1	57
TnB	Tinton loamy sand, 2 to 5 percent slopes	47	IIIs-6	3o2	58
To	Tioga fine sandy loam	48	I-56	2o1	57
Ug	Urban land, Galestown material	48	-------	---	--
Us	Urban land, Sassafras material	48	-------	---	--
VmC	Very stony land, Mount Lucas and Neshaminy materials, 0 to 12 percent slopes	48	VIIs-67	2w1	57
VnE	Very stony land, Neshaminy material, 12 to 30 percent slopes	48	VIIs-67	3r1	58
Vw	Very stony land, Watchung material	48	VIIs-90	2w1	57
Wc	Watchung silt loam	49	Vw-80	2w1	57
WfB	Woodstown-Fallsington sandy loams, gently undulating	50	IIIw-14	2w1	57

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