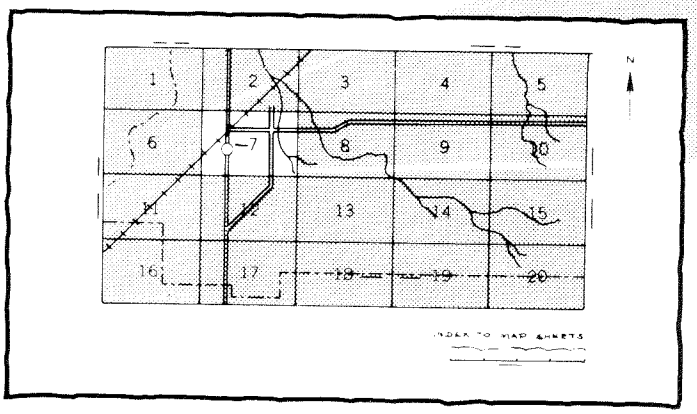
Soil Survey of

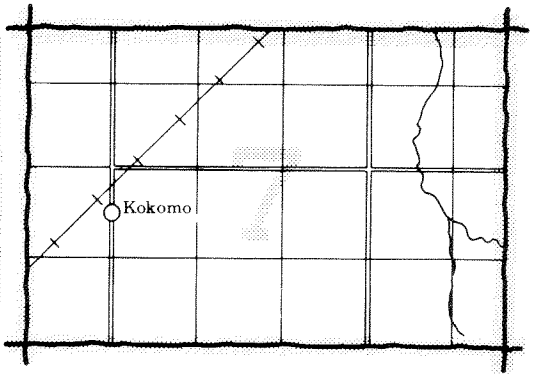
OCEAN COUNTY, NEW JERSEY

United States Department of Agriculture, Soil Conservation Service
in cooperation with
New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University
and the
New Jersey Department of Agriculture, State Soil Conservation Committee

HOW TO USE

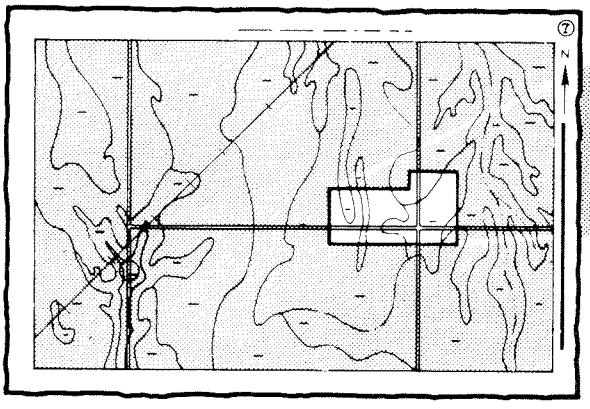
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

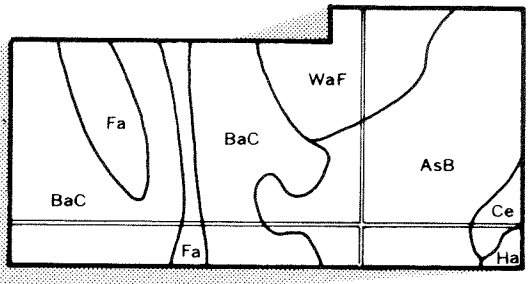




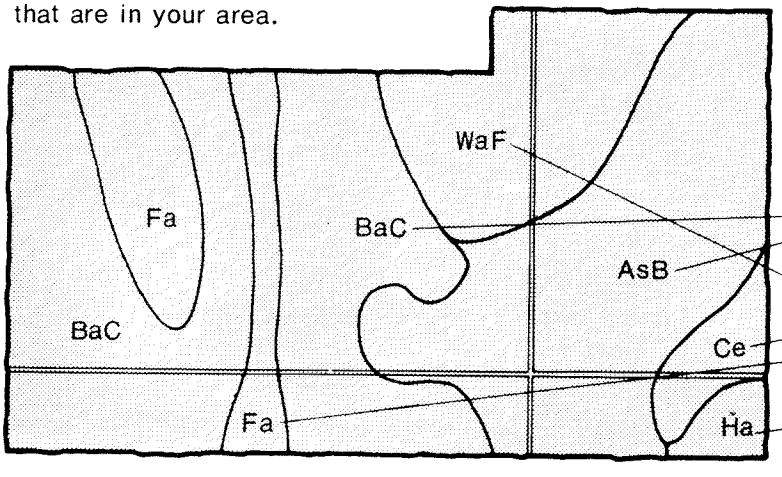
2. Note the number of the map sheet and turn to that sheet.

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





4. List the map unit symbols that are in your area.



Symbols

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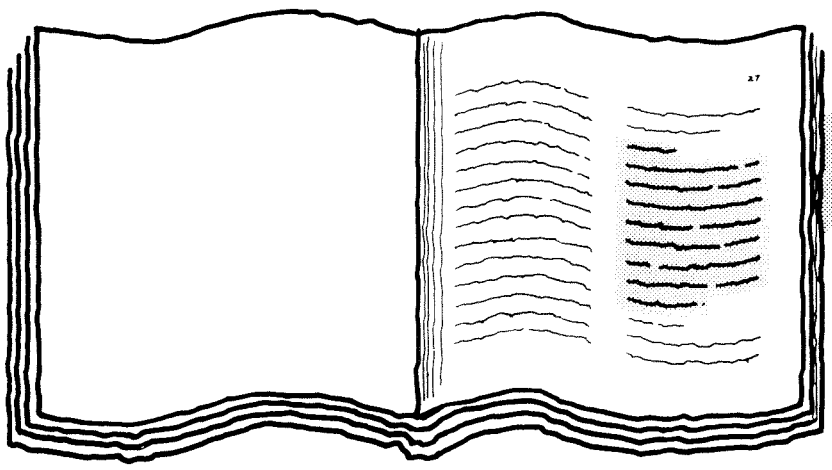
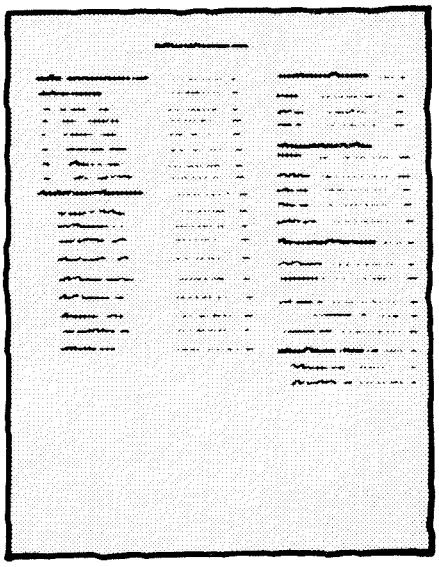
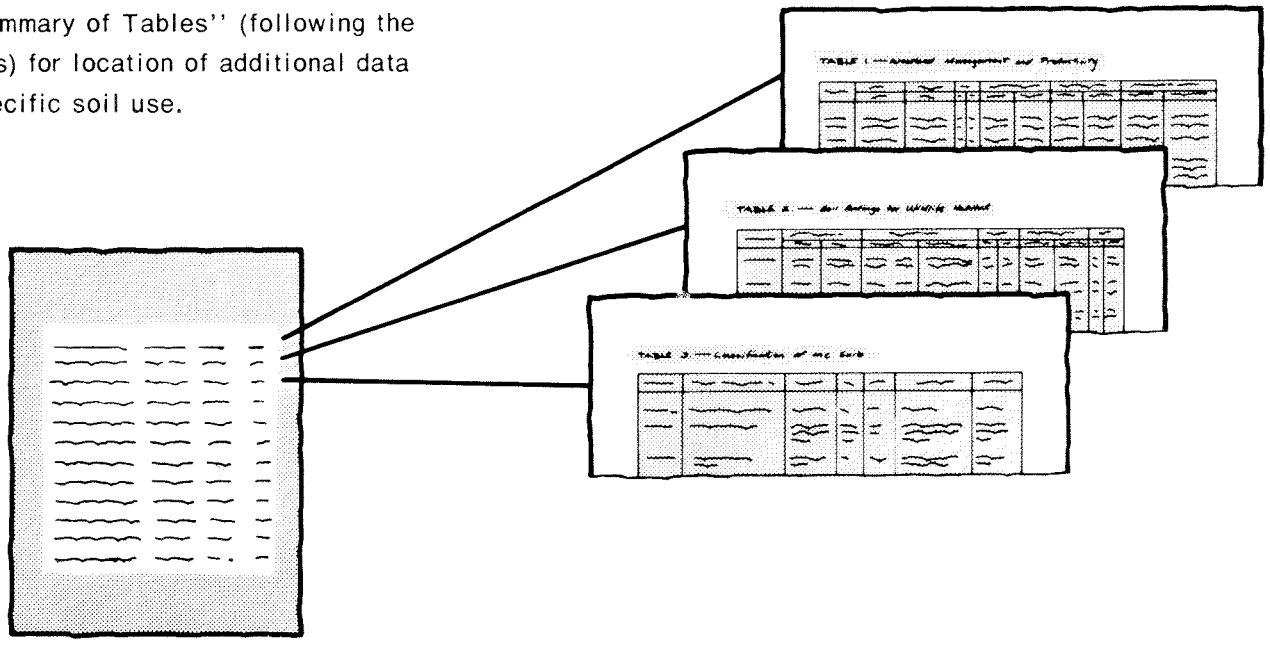
THIS SOIL SURVEY

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





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



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

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

Major fieldwork for this soil survey was completed in the period 1970-77. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1977. This survey was made cooperatively by the Soil Conservation Service and the New Jersey Agricultural Experiment Station, Cook College, Rutgers, the State University, and the New Jersey Department of Agriculture, State Soil Conservation Committee. Others who contributed to the survey were the Ocean County Board of Chosen Freeholders and the Ocean County Soil Conservation District. The survey is part of the technical assistance furnished to the Ocean County Soil Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps can cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

Cover: Bayberry shrubs cover this coastal area of Fripp fine sand, 2 to 10 percent slopes.

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Issued April 1980

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Summary of tables

Foreword

The Soil Survey of Ocean County contains much information useful in any land-planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and homebuyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

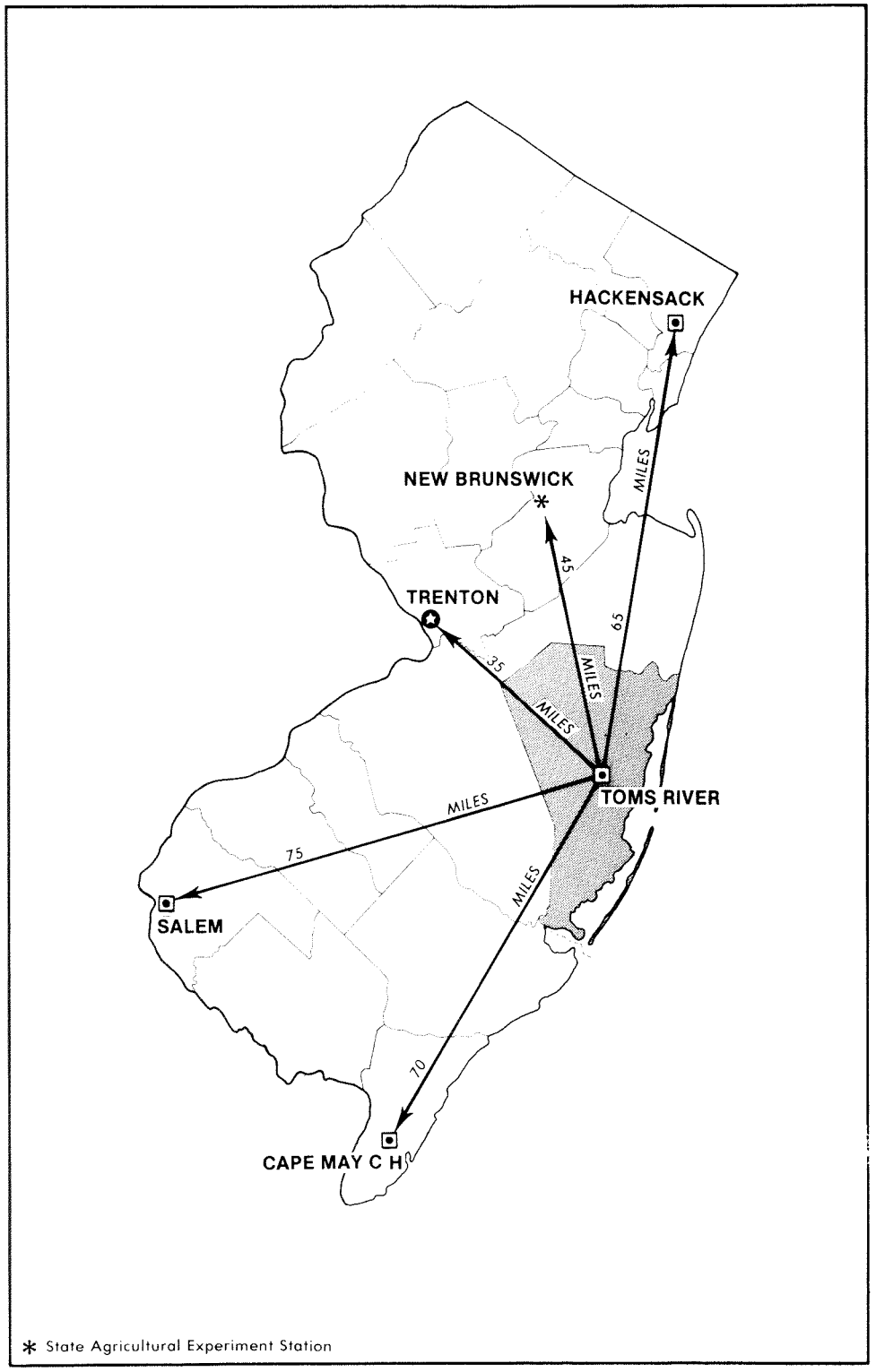
Great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

This soil survey can be useful in the conservation, development, and productive use of soil, water, and other resources.

Warren J. Fitzgerald

Warren J. Fitzgerald
State Conservationist
Soil Conservation Service



Location of Ocean County in New Jersey

SOIL SURVEY OF OCEAN COUNTY, NEW JERSEY

By Thornton J.F. Hole, Soil Conservation Service,
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Fieldwork by Thomas A. Drewes, Andre Gingus, Clarence F. Jablonski, and John H. Johnson,
Soil Conservation Service, and Steven Cleck, New Jersey Department of Agriculture

United States Department of Agriculture, Soil Conservation Service; in cooperation with
New Jersey Agricultural Experiment Station, Cook College, Rutgers, The State University;
and the New Jersey Department of Agriculture, State Soil Conservation Committee

OCEAN COUNTY is in the east-central part of New Jersey and has an area of 411,000 acres. The Oswego, Manasquan, Meteconk, Toms, and Forked Rivers and Cedar, Oyster, Mill, and Westecunk Creeks are the major waterways in the county. They flow to the Atlantic Ocean. The northwest corner of the county is in the Delaware River Basin.

The winter population of Ocean County in 1970 was approximately 210,000. It is concentrated in the northeastern part of the county and along a strip east of the Garden State Parkway. Toms River is the county seat and has a population of 15,000.

Providing services for vacationers and tourists is a major industry in the county. Other major industries include the manufacture of chemicals and plastics and the mining of ilmenite and sand and gravel. Most farms are in Plumstead Township and produce truck crops, grain, poultry, horses, and dairy products. Some acreage is in blueberries and cranberries. The pine-oak woodland areas support limited harvesting of pulpwood.

Nearly all of Ocean County is in an area called the Pine Barrens. Over one-quarter of the county is in public ownership and includes county parks, State parks, State forests, State hunting and fishing areas, and Fort Dix and the Lakehurst Naval Air Station. Included in the Pine Barrens is an area called the Plains. Other public areas in the county are the tidal wetlands in the Brigantine and Barnegat National Wildlife Refuges and Island Beach State Park on the barrier island.

The county is 73 percent woodland, 16 percent urbanized, 8 percent tidal marshes and coastal beaches, and 3 percent farmland.

Climate

Ocean County is hot in summer and rather cold in winter. Precipitation is well distributed throughout the year and is normally adequate for all crops. Winter precipitation frequently occurs as snow, but the ground does not usually stay covered for more than a few days at a time.

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Toms River, New Jersey, for the period 1960 to 1975. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 33 degrees F, and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Toms River on February 2, 1961, is -14 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occured on July 4, 1966, is 103 degrees.

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

Of the total annual precipitation, 24 inches, or 52 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than

21 inches. The heaviest 1-day rainfall during the period of record was 4.9 inches at Toms River on July 9, 1964. Thunderstorms occur on about 25 days each year, and most occur in summer.

Average seasonal snowfall is 17 inches. The greatest snow depth at any one time during the period of record was 13 inches. On the average, 1 day has at least 1 inch of snow on the ground, but the number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 56 percent. Humidity is higher at night, and the average at dawn is about 81 percent. The percentage of possible sunshine is 60 in summer and 45 in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in March.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; and 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, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

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

The areas shown on a soil map are called soil map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil material at all. Map units are discussed in the section "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken as needed for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified as necessary during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and information available from state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soil.

But only part of a soil survey is done when the soils have been named, described, interpreted, and delineated on aerial photographs and when the laboratory data and other data have been assembled. The mass of detailed information then needs to be organized so that it is readily available to different groups of users, among them farmers, managers of woodland, engineers, planners, developers and builders, homebuyers, and those seeking recreation.

General soil map for broad land use planning

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

The general soil map provides a broad perspective of the soils and landscapes in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The kinds of soil in any one association differ from place to place in slope, depth, drainage, or other characteristics that affect their management.

General soil map descriptions

1. Lakehurst-Lakewood-Evesboro association

Nearly level to sloping, somewhat poorly drained to excessively drained, sandy soils on uplands

This association makes up about 31 percent of the county. The association is about 40 percent Lakehurst

soils, 35 percent Lakewood soils, 10 percent Evesboro soils, and 15 percent minor soils (fig. 1).

Nearly level Lakehurst soils are on broad areas adjacent to streams and depressions. The soils are moderately well drained and somewhat poorly drained. They have a surface layer and subsoil of sand and have light gray mottles below a depth of 2 feet. This mottling is caused by a fluctuating water table.

Nearly level to sloping Lakewood soils are on divides at high landscape positions and on broad side slopes. The soils are excessively drained. They have a surface layer, subsurface layer, and subsoil of sand.

Nearly level Evesboro soils are on broad intermediate positions. The soils are excessively drained. They have a surface layer and subsoil of sand.

The minor soils in this association are the Woodmansie, Atsion, Klej, Downer, and Manahawkin soils. The Atsion, Klej, and Manahawkin soils have a fluctuating water table.

This association is dominated by a pine or oak woodland. Very little is farmed. Droughtiness, very low fertility, rapid permeability, and the hazard of wildfires are the main limitations for land use.

2. Downer-Evesboro association

Nearly level and gently sloping, well drained and excessively drained, loamy and sandy soils on uplands

This association makes up about 33 percent of the county. The association is about 60 percent Downer soils, 10 percent Evesboro soils, and 30 percent minor soils (fig. 2).

Nearly level and gently sloping Downer soils are on high and intermediate landscape positions. The soils are well drained. They have a surface layer of loamy sand or sandy loam and a subsoil of sandy loam.

Nearly level Evesboro soils are on broad, high and intermediate positions. The soils are excessively drained. They have a surface layer and subsoil of sand.

The minor soils in the association are the Hammonton, Woodmansie, Klej, and Manahawkin soils and Psamments, nearly level. The Woodmansie soils are well drained. The Hammonton and Klej soils are at intermediate positions and have a fluctuating seasonal water table. They are moderately well drained or somewhat poorly drained. The Manahawkin soils are at the lowest position and have a high water table, low strength, and a flood hazard. They are poorly drained. The Psamments, nearly level, are areas that were wet and have been filled with sandy material.

Most of this association is in an oak-pine woodland, but vegetable farming is a major enterprise in some areas.

3. Shrewsbury-Collington-Tinton association

Nearly level to sloping, poorly drained and well drained, loamy and sandy soils on uplands

This association makes up about 1 percent of the county. The association is about 30 percent Shrewsbury soils, 25 percent Collington soils, 25 percent Tinton soils, and 20 percent minor soils (fig. 3).

Nearly level Shrewsbury soils are on broad, low flats and wide depressional areas. The soils are poorly drained. They have a surface layer of fine sandy loam and a subsoil of sandy loam or sandy clay loam with dark yellowish brown mottles. The soils have a seasonal high water table.

Gently sloping to sloping Collington soils are generally on divides and side slopes. The soils are well drained. They have a surface layer of fine sandy loam and a subsoil of sandy clay loam.

Gently sloping to sloping Tinton soils are generally on broad divides and side slopes. The soils are well drained. They have a surface layer of sand and a subsoil of heavy fine sandy loam.

The minor soils in this association are areas of moderately well drained to somewhat poorly drained, gently sloping, loamy Pemberton soils on low divides and side slopes and areas of moderately well drained to somewhat poorly drained, loamy Adelphia soils on low divides and wide depressions.

Most of this association is used for general farming and irrigated truck crops. The drainage required for farming the Shrewsbury soils is restricted in places by a lack of suitable outlets.

4. Sulfaquents-Sulfihemists association

Nearly level, poorly drained, mineral and organic soils on tidal flats

This association makes up about 9 percent of the county. The association is about 70 percent Sulfaquents and Sulfihemists and 30 percent minor soils.

Sulfaquents and Sulfihemists are in broad areas that are subject to daily tidal flooding. The mineral material is dominant in these soils. The soils are underlain by sand.

The minor soils in this association are poorly drained Atsion sand, tide flooded, on slightly higher elevations than the tidal flats; Psamments, sulfidic substratum, which consist of sandy fill over the tidal flats; and very poorly drained loamy Mullica soils and sandy Berryland soils.

Most of this association has a cover of salt-tolerant grasses. Small areas are mowed to produce salt-hay. The main use of the association is for wetland wildlife habitat. Extensive areas along the coast have been developed for residential use.

5. Urban land-Fripp association

Urban land and nearly level and gently sloping, excessively drained, sandy soils; on the barrier islands

This association makes up about 2 percent of the county. The association is about 50 percent Urban land, 35 percent Fripp soils, and 15 percent minor soils.

Urban land in this association consists of areas of Fripp soils that have been put in residential and commercial uses. The buildings, streets, and pavement occupy more than 40 percent of the Urban land. The rest is leveled Fripp soils and other fill areas.

Fripp soils are on sand dunes mainly in Island Beach State Park. The foredunes have a sparse grass and shrub cover, and their shape is continually changed by the wind. The backdunes are more stable and have a cover of trees.

The minor soils are Psamments, sulfidic substratum, and Sulfaquents and Sulfihemists. The Psamments, sulfidic substratum, are tidal flats that have been filled with 2 to 4 feet of sand. The underlying material is sulfidic and becomes extremely acid when excavated. The Sulfaquents and Sulfihemists are small areas of tidal flats composed of mineral or organic material.

6. Woodmansie-Downer association

Nearly level to sloping, well drained, sandy and loamy soils on uplands

This association makes up about 8 percent of the county. The association is about 60 percent Woodmansie soils, 20 percent Downer soils, and 20 percent minor soils (fig. 4).

Gently sloping to sloping Woodmansie soils are on divides and side slopes at high landscape positions. The soils have a surface layer of sand and a subsoil of sandy loam.

Nearly level or gently sloping Downer soils are at high and intermediate positions. The soils have a surface layer of loamy sand or sandy loam and a subsoil of sandy loam.

The minor soils in this association are moderately well drained to somewhat poorly drained, sandy Lakehurst soils in low positions; excessively drained, sandy Lakewood soils on side slopes in intermediate positions; well drained, loamy Aura and Sassafras soils on divides at the highest positions; and poorly drained, nearly level, sandy Atsion soils in low positions.

This association is dominated by a pine or oak woodland, but frequent wildfires have reduced the woodland production capacity. Large tracts of the association are owned and managed by the State as wildlife habitat or forests.

7. Manahawkin-Atsion-Berryland association

Nearly level, very poorly drained and poorly drained, organic and sandy soils on lowlands

This association makes up 16 percent of the county. The association is about 35 percent Manahawkin soils, 35 percent Atsion soils, 20 percent Berryland soils, and 10 percent minor soils (fig. 5).

Manahawkin soils are generally in submerged valleys adjacent to streams. The soils are very poorly drained. They have a surface layer and subsoil of decomposed woody deposits more than 16 inches thick. The substratum is sand.

Atsion soils are on broad flats at slightly higher elevations than the Manahawkin soils. The soils are poorly drained. They have a surface layer and subsurface layer of sand and a subsoil of loamy sand or sand.

Berryland soils are in wide depressional areas and on broad flats. The soils are very poorly drained. The soils have a layer of decomposed organic matter less than 16 inches thick over a surface layer and subsoil of sand.

The minor soils in this association are nearly level, very poorly drained Mullica soils and moderately well drained to somewhat poorly drained, sandy Lakehurst soils on low divides.

This association is dominated by Atlantic white-cedar or lowland pine. Cleared areas are used for blueberries and cranberries.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have a profile that is almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Lakewood series, for

example, was named for the town of Lakewood in Ocean County.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Downer sandy loam, 2 to 5 percent slopes, is one of several phases within the Downer series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes, soil associations, and undifferentiated groups.

A *soil complex* consists of areas of two or more soils that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Urban land-Fripp complex is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Sulfaquents and Sulfihemists is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

The acreage and proportionate extent of each map unit are given in table 4, and additional information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

Map unit descriptions

AdA—Adelphia fine sandy loam, 0 to 3 percent slopes. This nearly level to gently sloping, moderately well drained and somewhat poorly drained soil is in depressions and on low divides. The areas are irregular in shape and range from about 5 to 50 acres.

Typically, the surface layer is dark grayish brown fine sandy loam about 11 inches thick. The upper part of the subsoil is 11 inches of light olive brown fine sandy loam. The middle part is 6 inches of olive sandy clay loam with strong brown mottles. The lower part is 6 inches of light olive gray sandy clay loam with reddish yellow mottles. The substratum extends to a depth of 60 inches or more. It is olive loamy sand and yellowish brown sandy clay loam with light gray mottles.

Included with this soil in mapping are areas of Collington, Kresson, Pemberton, and Shrewsbury soils. The Collington soils are better drained than this Adelphia soil, and the Kresson soils have a higher content of clay in the subsoil. The Shrewsbury soils are not as well drained as this Adelphia soil and have a darker surface layer, and the Pemberton soils are more sandy. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate. Available water capacity is high. The seasonal high water table is 1.5 to 4 feet below the surface. During seasons of normal rainfall, the water table starts to rise in October and is nearest to the surface in early January. It starts to drop in April and is at a depth of 5 feet or more by June. Organic matter content of the soil is moderate, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is farmed. A few acres are used for pasture, and some are in woodland.

The soil is suited to corn, soybeans, vegetables, small grain, hay, pasture, and commercial sod. It has a slight erosion hazard, which can be controlled by planting cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Wetness limits the soil for some crops.

This soil is well suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major pasture management practices used on the soil.

This soil is well suited to trees. Red oak, black oak, white oak, scarlet oak, hickory, beech, ash, yellow-poplar, and sweetgum generally are the common species, but pin oak and willow oak are common in lower areas and sweetgum dominates abandoned fields.

The seasonal high water table limits this soil as a site for houses with basements and for septic tank absorption fields. It also limits use of the soil as a site for sanitary landfills.

This soil is in capability subclass IIw.

At—Atsion sand. This nearly level, poorly drained soil is in depressional areas and on broad flats. The areas are mainly irregular in shape and range from about 10 to 200 acres. Some areas are long and narrow.

Typically, the surface layer is black sand about 5 inches thick. The subsurface layer is light gray sand 13 inches thick. The subsoil is dark reddish brown loamy sand 6 inches thick. The substratum is light gray sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Berryland, Lakehurst, Mullica, and Manahawkin soils. The Berryland soils are very poorly drained. The Lakehurst soils

are somewhat poorly drained or moderately well drained. The Mullica soils have more clay in the surface layer and subsoil than this Atsion soil. The Manahawkin soils have 16 to 51 inches of organic material over a sandy substratum. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderately rapid. If the soil is drained, available water capacity is low, but water is available to plants from the water table. The seasonal high water table is between the surface and a depth of 1 foot from November to June. Some areas have water ponded on the surface. In summer the water table is at a depth of 2 to 3 feet but is as deep as 5 feet in places during extended dry periods. Areas adjacent to perennial streams are subject to rare to occasional flooding. Organic matter content of the soil is moderate, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is very slow. Tilth is good, and the soil is easily worked when drained.

Most of the acreage of this soil is used for woodland. A few acres are in pasture.

This soil is well suited to such special crops as cranberries and blueberries. Wetness limits most other types of crop production. Land smoothing is needed for blueberries and cranberries. Controlling the level of the water table is needed for blueberry production, and cranberry production requires a carefully designed system of dikes and control of the water table to permit rapid flooding and drainage.

This soil is poorly suited to commercial woodland production. Pitch pine, red maple, blackgum, swamp white oak, sweetgum, and willow oak are the common tree species. The seasonal high water table limits the harvesting of trees during the winter and spring.

The seasonal high water table limits this soil for most urban uses, especially for making excavations.

This soil is in capability subclass Vw.

Aw—Atsion sand, tide flooded. This nearly level, poorly drained soil is in positions in the tidal marsh that are subject to flooding when tides are abnormally high. The areas are irregular in shape and range from about 5 to 130 acres.

Typically, the surface layer is black sand about 6 inches thick. The subsurface layer is light gray sand 7 inches thick. The upper part of the subsoil is 4 inches of black loamy sand. The middle part is 5 inches of light brownish gray sand with yellowish brown mottles. The lower part is 6 inches of dark brown sand. The substratum extends to a depth of 60 inches or more. It is gray sandy loam to a depth of 32 inches and light gray sand at a depth of more than 32 inches.

Included with this soil in mapping are areas of Sulfaquents, Sulfihemists, and Fripp soils. Sulfaquents and Sulfihemists consist of organic material over a sandy substratum. Fripp soils are excessively drained and are on dunes. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderately rapid. Available water capacity is low. The seasonal high water table is between the surface and a depth of 3 feet. It is at a greater depth in soils at high positions where tidal flooding occurs the least. Organic matter content of the soil is moderate, and natural fertility is low. The soil is very strongly acid or strongly acid throughout. Runoff is very slow.

Most of the acreage of this soil is used for wildlife habitat. The remaining acreage is used for salt hay production, and only grasses and shrubs with some salt tolerance will grow on this soil. The soil is poorly suited to farming, pasture, and woodland production. Tidal flooding and the high water table make the soil poorly suited to urban uses.

This soil is in capability subclass VIIIw.

AxB—Aura sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on divides and side slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 40 to 900 acres.

Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsurface layer is yellowish brown sandy loam 13 inches thick. The subsoil is firm, yellowish red sandy clay loam and sandy loam 34 inches thick. The substratum is yellowish red loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Downer, Woodmansie, and Sassafras soils. The Downer soils have less clay in the subsoil than this Aura soil, and the Sassafras soils do not have the firm subsoil. The Woodmansie soils have a subsurface layer of gray sand. Included soils make up about 20 percent of this map unit.

The permeability of this soil is moderately slow to moderate in the subsoil and moderately slow to moderately rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Unless the soil has been limed, it is extremely acid or very strongly acid. Runoff is medium. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland and wildlife habitat. A few acres are in pasture.

The soil is suited to corn, soybeans, vegetables, small grains, and hay. It has a moderate erosion hazard, which can be controlled by planting cover crops and farming on the contour. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

This soil is suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major management practices used on this soil.

The soil is suited to trees. Pitch pine, black oak, scarlet oak, white oak, and chestnut oak are the common

species. Controlled burning is a major forest management practice.

This soil is generally suitable for most urban uses, but slope limits its use for playgrounds and the moderately slow permeability of the subsoil is a limitation for septic tank sewage disposal fields.

This soil is in capability subclass IIs.

Be—Berryland sand. This nearly level, very poorly drained soil is in depressional areas and on broad, low flats. The areas mainly are adjacent to tidal marshes and are generally irregular in shape. They range from about 25 to 300 acres. Some areas that are adjacent to streams are long and narrow.

Typically, the surface layer is black sand about 11 inches thick. The subsurface layer is gray sand 4 inches thick. The upper part of the subsoil is very dark brown loamy sand 9 inches thick, and the lower part is light brownish gray sand 11 inches thick. The substratum is light gray sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Berryland soils with a mucky surface layer; areas of Berryland sand, frequently flooded; and areas of Atsion, Manahawkin, Lakehurst, and Mullica soils. The Atsion soils have a thinner surface layer than this Berryland soil and are poorly drained. The Manahawkin soils have 16 to 51 inches of organic material over a sandy substratum. The Lakehurst soils have a yellowish brown subsoil and are somewhat poorly drained or moderately well drained. The Mullica soils have more clay in the surface layer and subsoil than this Berryland soil. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderately rapid. If the soil is drained, available water capacity is low, but water is available to plants from the water table. The seasonal high water table is at the surface from November to June, and some areas have water ponded on the surface. In summer, the water table is commonly at a depth of 1 to 2 feet but is as deep as 4 feet in places during extended dry periods. Areas adjacent to perennial streams are subject to occasional flooding. Organic matter content of the soil is high, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is very slow. Tilth is good, and the soil is easily worked when drained.

This soil is well suited to crops such as cranberries and blueberries. Wetness limits most other types of crop production. Land smoothing is needed for blueberries and cranberries, and control of the water table is needed for blueberry production. Cranberries require a carefully designed system of dikes and control of the water table to permit rapid flooding and draining.

This soil is suited to trees, but growth is slow. Most of the acreage is wooded. Pitch pine, Atlantic white-cedar, blackgum, red maple, and sweetgum are the common tree species. The seasonal high water table limits the harvesting of trees during the winter and spring.

The seasonal high water table limits this soil for most urban uses.

This soil is in capability subclass Vw.

BF—Berryland sand, frequently flooded. This nearly level, very poorly drained soil is on flood plains adjacent to large streams. The areas are generally long and narrow and range from about 5 to 200 acres.

Typically, the surface layer is black sand about 12 inches thick. The subsurface layer is light gray sand 3 inches thick. The subsoil is dark reddish brown loamy sand 7 inches thick. The substratum is light gray sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Manahawkin soils, Berryland sand, and Atsion soils. The Manahawkin soils have 16 to 51 inches of organic material over a sandy substratum. The Atsion soils are poorly drained. Included soils make up about 20 percent of this map unit.

The permeability of this soil is moderately rapid. If the soil is drained, available water capacity is low, but water is available to plants from the water table. The seasonal high water table is at the surface from November to June, and some areas have water on the surface. In summer, the water table is commonly at a depth of 1 to 2 feet, but it is as deep as 3 feet in places during extended dry periods. Areas of this soil are subject to frequent flooding. Organic matter content of the soil is high, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is very slow. Tilth is good, and the soil is easily worked when drained.

Most of the acreage of this soil is used for woodland.

The soil is well suited to crops such as cranberries and blueberries. Wetness limits most other types of crop production. Land smoothing is needed for blueberries and cranberries. Control of flooding and the level of the water table is needed for blueberry production. Cranberry production requires a carefully designed system of dikes and control of the water table to permit rapid flooding and draining.

This soil is suited to trees, but growth is slow. Pitch pine, red maple, Atlantic white-cedar, blackgum, sweetgum, and willow oak are the common tree species. The seasonal high water table and flooding limit the harvesting of trees during winter and spring.

The frequent flooding and the seasonal high water table limit this soil for all urban uses.

This soil is in capability subclass Vw.

CoA—Collington fine sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on divides. Slopes are convex and range from 100 to 400 feet in

length. The areas are irregular in shape and range from about 10 to 100 acres.

Typically, the surface layer is dark brown fine sandy loam about 12 inches thick. The subsurface layer is brown fine sandy loam 3 inches thick. The upper part of the subsoil is dark brown sandy clay loam 13 inches thick, and the lower part is brown sandy loam 14 inches thick. The substratum is stratified olive yellow sand and sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Adelphia soils, gently sloping Collington fine sandy loam, and Tinton sand that make up about 15 percent of this unit.

The permeability of this soil is moderately slow in the subsoil and moderate in the substratum. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is farmed (fig. 6). A few acres are in pasture and woodland.

This soil is suited to most cultivated crops, especially to corn, soybeans, vegetables, small grains, commercial sod, and hay. The erosion hazard can be controlled by planting cover crops, and tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. The included Adelphia soils generally need to be drained to prevent crop losses.

The soil is well suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major management practices used on this soil.

This soil is suited to trees, mainly red oak, black oak, white oak, yellow-poplar, hickories, ash, and beech. Pines are common in some abandoned fields. The soil has few or no limitations for most urban uses.

This soil is in capability class I.

CoB—Collington fine sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on side slopes, divides, and toe slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from 20 acres to more than 70 acres.

Typically, the surface layer is dark brown fine sandy loam about 10 inches thick. The subsurface layer is brown fine sandy loam 5 inches thick. The upper part of the subsoil is dark brown sandy clay loam 12 inches thick, and the lower part is brown sandy loam 17 inches thick. The substratum extends to a depth of more than 60 inches. It is light olive brown loamy sand to a depth of 48 inches and light olive brown sandy loam and olive sand at a depth of more than 48 inches.

Included with this soil in mapping are areas of Adelphia soils, nearly level Collington fine sandy loam, and Tinton sand that make up about 10 percent of this map unit.

The permeability of this soil is moderate. Available water capacity is high. Organic matter content is moderate, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is farmed. A few acres are in pasture and woodland.

The soil is well suited to cultivated crops such as corn, soybeans, vegetables, small grains, and hay. This soil has a moderate erosion hazard, which can be controlled by planting cover crops and farming on the contour. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. The included Adelphia soils generally need to be drained to prevent crop losses.

The soil is well suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major management practices used on this soil.

This soil is well suited to trees. Red oak, white oak, black oak, yellow-poplar, hickories, ash, and beech are the common species. Pines are common in some abandoned fields.

This soil is generally suitable for most urban uses, but slope is a limitation for playgrounds.

This soil is in capability subclass IIe.

CoC—Collington fine sandy loam, 5 to 10 percent slopes. This sloping, well drained soil is on side slopes. Slopes are convex and range from 100 to 200 feet in length. The areas are long and narrow and range from about 10 to 50 acres.

Typically, the surface layer is dark brown fine sandy loam about 10 inches thick. The upper part of the subsoil is dark brown sandy clay loam 11 inches thick, and the lower part is brown sandy loam 12 inches thick. The substratum is light olive brown sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Collington fine sandy loam that has slopes of less than 5 percent and more than 10 percent and small areas of severely eroded soils. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate. Available water capacity is high. Organic matter content is low, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid or very strongly acid. Runoff is medium. Tilth is good, and the soil is easily worked.

About half the acreage of this soil is farmed. The rest is used for woodland and pasture.

This soil is suited to corn, soybeans, small grains, and hay if erosion is controlled. The hazard of erosion is moderately severe, and in places this soil receives runoff from adjacent higher areas. Erosion can be controlled by

planting cover crops, farming on the contour, installing diversions where necessary, and using a crop rotation that includes grasses and legumes. Tilth and organic matter can be maintained by controlling erosion, planting cover crops, plowing under crop residue, and using a rotation containing sod.

The soil is well suited to pasture. Proper seeding, proper stocking rates, and rotation of pastures are the major practices used on this soil. If the pasture is overgrazed, runoff and erosion increase.

This soil is suited to trees. Red oak, white oak, black oak, yellow-poplar, hickories, ash, and beech are common species. Pines are common in abandoned fields.

The soil is generally suitable for most urban uses, but slope is a limitation for playgrounds.

This soil is in capability subclass IIIe.

DoA—Downer loamy sand, 0 to 5 percent slopes. This nearly level to gently sloping, well drained soil is on divides and side slopes. Slopes are convex and range from 100 to 400 feet in length. The areas are irregular in shape and range from about 50 to 400 acres.

Typically, in a wooded area the surface layer is grayish brown loamy sand about 2 inches thick. The subsurface layer is brown loamy sand 14 inches thick. The subsoil is yellowish brown sandy loam 15 inches thick. The substratum is brownish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Downer sandy loam and Downer gravelly sandy loam and Evesboro, Woodmansie, Hammonton, and Klej soils. The Hammonton and Klej soils are moderately well drained or somewhat poorly drained. The Evesboro soils are excessively drained. The Woodmansie soils have a gray subsurface layer. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderate or moderately rapid in the subsoil and moderately rapid in the substratum. Available water capacity is low to moderate. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are farmed, and a few are in pasture.

The soil is suited to vegetables and fruit. The soil has a slight water erosion hazard, which can be controlled by planting cover crops. The hazard of wind erosion is severe, and the soil needs windbreak hedges and cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. The included Hammonton and Klej soils generally need to be drained.

This soil is suited to trees (fig. 7). Pitch pine, black oak, white oak, scarlet oak, and chestnut oak are the common species. Pines are more common in abandoned fields. Prescribed burning is used to control wildfires.

This soil is generally suitable for most urban uses. The included Hammonton and Klej soils have a high water table that limits the unit as a site for houses with basements and for septic tank sewage disposal fields. The soil is limited for use as recreational areas by the loose, sandy surface.

This soil is in capability subclass IIs.

DpA—Downer sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on divides. Slopes are convex and range from 100 to 400 feet in length. The areas are irregular in shape and range from about 30 to 150 acres.

Typically, the surface layer is grayish brown sandy loam about 6 inches thick. The subsurface layer is pale brown sandy loam 8 inches thick. The upper part of the subsoil is yellowish brown sandy loam 16 inches thick, and the lower part is yellowish brown loamy sand 7 inches thick. The substratum is brownish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of gently sloping Downer sandy loam and Downer gravelly sandy loam and areas of Hammonton, Sassafras, and Woodmansie soils. Also included, in Jackson and Plumstead Townships, are soils that have a higher proportion of fine sand than this Downer soil. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A small acreage is farmed and used for pasture.

This soil is suited to corn, soybeans, vegetables, small grains, commercial sod, and hay. Planting cover crops controls erosion. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. The included Hammonton soils generally need to be drained to prevent crop losses.

The soil is suited to pasture but is limited by the moderate available water capacity. Proper seeding, proper stocking, and rotation of pastures are the major management practices used on this soil.

This soil is suited to trees and has few limitations for most urban uses. Pitch pine, black oak, scarlet oak, and white oak are the common species. Pines are more common in abandoned fields. Prescribed burning is used to control wildfires.

This soil is in capability class I.

DpB—Downer sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on divides and

side slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 50 to 400 acres.

Typically, the surface layer is grayish brown sandy loam about 4 inches thick. The subsurface layer is yellowish brown sandy loam 10 inches thick. The subsoil is brown sandy loam 14 inches thick. The substratum extends to a depth of 60 inches or more. It is brownish yellow gravelly loamy sand to a depth of 45 inches and brownish yellow sand at a depth of more than 45 inches.

Included with this soil in mapping are areas of Downer loamy sand, nearly level Downer sandy loam, and Downer gravelly sandy loam and areas of Hammonton, Sassafras, and Aura soils. Also included in Jackson and Plumstead Townships are soils that have a higher proportion of fine sand than this Downer soil. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are farmed, and a few are in pasture.

This soil is suited to corn, soybeans, vegetables, small grains, and hay. The soil has a moderate erosion hazard, which can be controlled by planting cover crops and farming on the contour. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. The included Hammonton soils generally need to be drained to prevent crop losses.

The soil is suited to pasture but is limited by the moderate available water capacity. Proper seedings, proper stocking, and rotation of pastures are the major management practices used on this soil.

This soil is suited to trees. Pitch pine, black oak, white oak, scarlet oak, and chestnut oak are the common species. Pines are more common in abandoned fields. Controlled burning is used to control wildfires.

This soil is generally suitable for most urban uses, but slope is a limitation for playgrounds.

This soil is in capability subclass IIe.

DrB—Downer gravelly sandy loam, gravelly substratum, 2 to 5 percent slopes. This gently sloping, well drained soil is on divides and side slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 30 to 350 acres.

Typically, the surface layer is grayish brown gravelly sandy loam 4 inches thick. The subsurface layer is pale brown gravelly sandy loam 10 inches thick. The upper part of the subsoil is yellowish brown gravelly sandy loam 12 inches thick, and the lower part is yellowish brown gravelly loamy sand 14 inches thick. The substratum is brownish yellow gravelly sand to a depth of 60 inches and brownish yellow sand at a depth of more than 60 inches.

Included with this soil in mapping are areas of Downer sandy loam and Downer loamy sand that make up about 15 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are farmed.

This soil is suited to corn, soybeans, vegetables, small grains, and hay. It has a moderate erosion hazard, which can be controlled by planting cover crops and farming on the contour. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

The soil is suited to pasture but is limited by the moderate available water capacity. Proper seeding, proper stocking, and rotation of pastures are the major management practices used on this soil.

This soil is suited to trees. Black oak, white oak, scarlet oak, and pine are the common species. Pines are more common in abandoned fields.

The soil is generally suitable for most urban uses, but slope is a limitation for some recreational uses.

This soil is in capability subclass IIe.

EvB—Evesboro sand, 0 to 5 percent slopes. This nearly level to gently sloping, excessively drained soil is on divides and side slopes. Slopes are convex and range from 100 to 500 feet in length. The areas are irregular in shape and range from about 50 to 200 acres.

Typically, the surface layer is grayish brown sand 1 inch thick. The subsurface layer is brown sand 8 inches thick. The subsoil is yellowish brown sand 24 inches thick. The substratum is yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Downer, Klej, Lakehurst, and Lakewood soils that make up about 15 percent of this map unit.

The permeability of this soil is rapid in the subsoil and substratum. Available water capacity is low. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Where irrigation is available, this soil is suited to crops such as vegetables and small fruits. The water erosion hazard can be controlled by planting cover crops. The soil has a severe wind erosion hazard and needs windbreak hedges. Tilth and organic matter content can be

maintained by planting cover crops and plowing under crop residue. The included Klej and Lakehurst soils need to be drained in places.

Most of the acreage of this soil is in woodland, but the soil is not well suited to commercial trees. Pitch pine, chestnut oak, post oak, black oak, and white oak are the common species. Pines are more common in abandoned fields. Controlled burning is the major woodland management practice used to reduce wildfires.

The soil is generally suitable for most urban uses. The loose, sandy surface limits use for recreational areas, and the included Klej and Lakehurst soils are limited as sites for houses with basements and for septic disposal fields because of a seasonal high water table.

This soil is in capability subclass VIIs.

EvC—Evesboro sand, 5 to 10 percent slopes. This sloping, excessively drained soil is on side slopes. Slopes are convex and range from 50 to 200 feet in length. Most areas are long and narrow and range from about 5 to 50 acres. Some small areas are round or oval.

Typically, the surface layer is brown sand about 7 inches thick. The subsoil is yellowish brown sand 20 inches thick. The substratum is yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of gently sloping Evesboro sand and sloping Lakewood sand that make up about 10 percent of this map unit.

The permeability of this soil is rapid in the subsoil and substratum. Available water capacity is low. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is medium. Tilth is good, and the soil is easily worked.

Where irrigation is available this soil is suited to vegetables and fruits. The soil has a moderate erosion hazard, which can be controlled by planting cover crops and farming on the contour. Tilth and organic matter can be maintained by controlling erosion, planting cover crops, and plowing under crop residue.

Although most of the acreage of this soil is wooded, the soil is not well suited to commercial trees. Pitch pine, chestnut oak, post oak, blackjack oak, white oak, and black oak are the common species. Controlled burning is the major woodland management practice used to control wildfires.

Slope and the loose, sandy surface limit the soil for urban uses, especially for playgrounds and recreation areas.

This soil is in capability subclass VIIs.

EvD—Evesboro sand, 10 to 15 percent slopes. This moderately steep, excessively drained soil is on side slopes. Slopes are convex and range from 100 to 200 feet in length. Most areas are long and narrow and range from about 5 to 50 acres. Some small areas are round or oval.

Typically, the surface layer is grayish brown sand about 5 inches thick. The subsoil is yellowish brown sand 23 inches thick. The substratum is yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Evesboro sand that has slopes of less than 10 percent, areas of Downer soils, and areas of sloping Lakewood sand. included soils make up about 10 percent of this map unit.

The permeability of this soil is rapid in the subsoil and substratum. Available water capacity is low. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is rapid. Tilth is good, and the soil is easily worked.

A severe hazard of erosion makes this soil unsuitable for cultivated crops. In places the soil receives runoff from adjacent higher areas. Keeping the soil in permanent cover such as trees, grass, or shrubs is needed to control erosion.

Most of the acreage of this soil is in woodland. The common trees are pitch pine, chestnut oak, white oak, and black oak.

Slope and the loose, sandy surface limit this soil for urban uses.

This soil is in capability subclass VIIs.

FtB—Fripp fine sand, 2 to 10 percent slopes. This gently undulating to rolling, excessively drained soil is on divides and side slopes of coastal dunes on the barrier islands. Slopes are convex and range from 20 to 100 feet in length. The areas are irregular in shape and range from about 50 to 1,000 acres. The elevation of the areas ranges from sea level to 20 feet above sea level. Most areas are subject to flooding from the ocean during severe storms.

Typically, the surface layer is light brownish gray fine sand about 3 inches thick. The substratum is very pale brown and white fine sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of foredunes, beaches, and Atsion sand, tide flooded. The foredunes are neutral in reaction, and their shape is continually being changed by the wind. Atsion sand, tide flooded, is poorly drained. Included soils make up about 10 percent of this map unit.

The permeability of this soil is rapid. Available water capacity is very low. Organic matter content and natural fertility are low. Unless the soil has been limed, reaction ranges from strongly acid to slightly acid. Runoff is slow. Tilth is good, and the soil is easily worked. The soil is subject to severe erosion in unvegetated areas.

Because of their proximity to the ocean, most areas of this soil are used for recreation and wildlife habitat.

Flooding, low fertility, low available water capacity, erosion, and salt spray from the ocean make the soil unsuitable for most other uses. The wind erosion hazard is severe but can be controlled by maintaining the present plant cover and planting a cover such as American beachgrass on bare areas.

This soil is in capability subclass VIIs.

HaA—Hammonton loamy sand, 0 to 5 percent slopes. This nearly level to gently sloping, moderately well drained and somewhat poorly drained soil is in slightly depressed areas and on low divides. The areas are oval and range from about 10 to 300 acres.

Typically, the surface layer is dark grayish brown loamy sand about 14 inches thick. The upper part of the subsoil is 9 inches of yellowish brown sandy loam. The lower part is 6 inches of yellowish brown loamy sand with light brownish gray mottles. The substratum extends to a depth of 60 inches or more. To a depth of 33 inches it is brownish yellow sand with light gray mottles. At a depth of more than 33 inches it is light gray sand with brownish yellow mottles.

Included with this soil in mapping are areas of Downer, Hammonton, Klej, and Mullica soils. The Mullica soils are very poorly drained and generally are shown on the soil map by a wet-spot symbol. Also included, in Jackson and Plumstead Townships, are areas of soils with a surface layer of loamy fine sand, a subsoil of fine sandy loam, and a substratum of loamy fine sand and fine sand. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. If the soil is drained, available water capacity is moderate, but water is available to plants early in the season from the water table. The seasonal high water table is at a depth of 1-1/2 to 4 feet from December to May. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in January. It starts to drop in April and is at a depth of 5 feet or more by June. Organic matter content of the soil is low, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are farmed, and a few are used for pasture.

This soil is suited to corn, soybeans, vegetables, small grain, and hay. It has a slight erosion hazard, which can be controlled by planting cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Wetness is a limitation for some crops on this soil, and some areas need to be drained.

This soil is suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major pasture management practices used on the soil.

The soil is well suited to trees. Black oak, white oak, and pitch pine are the common species. Pines are more common in abandoned fields.

The high water table limits this soil for most urban uses, including sites for houses with basements, septic disposal fields, recreation areas, and sanitary landfills.

This soil is in capability subclass IIw.

HcA—Hammonton sandy loam, 0 to 3 percent slopes. This nearly level, moderately well drained or somewhat poorly drained soil is in depressed areas and on low divides. The areas are oval and range from about 10 to 150 acres.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The upper part of the subsoil is 18 inches of yellowish brown sandy loam; the lower part is 7 inches of yellowish brown loamy sand with light brownish gray mottles. The substratum extends to a depth of 60 inches or more. It is brownish yellow and light gray sand with light gray and brownish yellow mottles.

Included with this soil in mapping are areas of Downer, Hammonton, Klej, and Mullica soils. The Mullica soils are very poorly drained and are generally shown on the soil maps by a wet-spot symbol. Also included, in Jackson and Plumstead Townships, are areas of soils with surface layer and subsoil of fine sandy loam and a substratum of loamy fine sand and fine sand. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderate to moderately rapid in the substratum. If the soil is drained, available water capacity is moderate, but water is available to plants early in the season from the water table. The seasonal high water table is at a depth of 1-1/2 to 4 feet from December to May. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in January. It starts to drop in April and is at a depth of 5 feet or more by June. Organic matter content of the soil is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are farmed, and a few are used for pasture.

This soil is suited to corn, soybeans, vegetables, small grain, hay, and commercial sod. It has a slight erosion hazard, which can be controlled by planting cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Wetness is a limitation for some crops on this soil.

The soil is suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major pasture management practices used on this soil.

This soil is well suited to trees. Black oak, white oak, and pitch pine are the common species. Pines are common in abandoned fields.

The seasonal high water table limits this soil for most urban uses, including sites for houses with basements, septic tank disposal fields, sanitary landfills, and roads and streets.

This soil is in capability subclass IIw.

HU—Humaquepts, frequently flooded. This unit consists of deep, somewhat poorly drained to very poorly drained soils that have layers of mostly black or gray sandy or loamy material. The soils are on flood plains along permanent and intermittent streams and are flooded several times each year, mainly in spring. Slopes generally range from 0 to 2 percent.

Included with these soils in mapping are small areas of Mullica, Berryland, Atsion, and Manahawkin soils that make up about 15 percent of this map unit.

The permeability of the soils in this unit is moderately rapid. Available water capacity is high. The seasonal high water table is between the surface and a depth of 2 feet. It is nearest to the surface from November to June in the very poorly drained parts of this unit and from January to May in the somewhat poorly drained parts. Organic matter content in the soil is high, and the natural fertility is medium. Unless limed, the soils are extremely acid or very strongly acid. Runoff is slow. Tilth is good, and the soils are easily worked.

These soils are suitable for farming, pasture, and trees. They are poorly suited to urban uses.

The soils are in capability subclass Vw.

KeA—Keyport sandy loam, 0 to 4 percent slopes. This nearly level to gently sloping, moderately well drained soil is in depressed areas and on low divides. The areas are irregular in shape and range from about 5 to 40 acres.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The upper part of the subsoil is 6 inches of light yellowish brown loam. The middle part is 6 inches of reddish yellow silty clay loam. The lower part is 27 inches of yellowish brown and light gray silty clay with light gray and strong brown mottles. The substratum to a depth of 62 inches is light gray silty clay with brownish yellow mottles. At a depth of more than 62 inches it is brownish yellow silty clay loam with light gray mottles.

Included with this soil in mapping are areas of Hammonton, Mullica, and Downer soils and areas of loamy Keyport soils. Hammonton, Mullica, and Downer soils have less clay than Keyport soils. Included soils make up about 10 percent of this map unit.

The permeability of this soil is slow. Available water capacity is high. A seasonal high water table is at a depth of 1-1/2 to 4 feet from November to May. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in early December. It starts to drop in April and is at a depth of 5 feet or more by June. Organic matter content of the soil is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Tilth is fair where the soil has good surface drainage, but the period of optimum moisture content for tilling is short. The soil is commonly either too wet or too dry to work easily.

Most of the acreage of this soil is used for woodland. A few acres are used for homesites.

The soil is suited to cultivated crops such as corn, soybeans, small grain, and hay. It has a slight erosion hazard, which can be controlled by planting cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Wetness is a limitation for most crops in depressional areas. Excess water can be controlled in large watersheds by the use of diversion terraces. Surface drains are suitable in nearly level areas.

This soil is suited to pasture. Proper seeding, proper stocking, rotation of pastures, and restricted grazing when the soil is wet are the major pasture management practices.

The soil is well suited to trees. Black oak, white oak, pin oak, and pitch pine are the common species.

The seasonal high water table limits this soil for most urban uses, particularly as sites for dwellings with basements, septic tank filter fields, and some recreation areas. The slow permeability of the soil also limits use for septic tank filter fields.

This soil is in capability subclass IIw.

KlA—Klej loamy sand, 0 to 3 percent slopes. This nearly level, moderately well drained or somewhat poorly drained soil is in depressed areas and on low terraces. The areas are oval and range from about 10 to 150 acres.

Typically, the surface layer is very dark grayish brown loamy sand about 2 inches thick. The subsurface layer is brownish gray loamy sand 3 inches thick. The subsoil is 33 inches of brownish yellow and yellow loamy sand with light gray mottles in the lower part. The substratum, to a depth of 60 inches or more, is light gray sand with yellowish brown mottles.

Included with this soil in mapping are areas of Hammonton, Lakehurst, Downer, and Atsion soils. The Atsion soils are poorly drained, and the small areas are shown on the soil maps by a wet-spot symbol. Also included, in Jackson and Plumstead Townships, are areas of soils that are dominantly fine sand. Included soils make up about 15 percent of this map unit.

The permeability of this soil is rapid. If the soil is drained, available water capacity is low, but water is available to plants early in the season from the water table. The seasonal high water table is at a depth of 1-1/2 to 4 feet. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in January. It starts to drop in April and is at a

depth of 5 feet or more by June. Organic matter content of this soil is low, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland. A few acres are used for pasture.

The soil is suited to cultivated crops such as peaches and vegetables. It has a slight erosion hazard, which can be controlled by planting cover crops. The soil has a moderate wind erosion hazard, and cover crops and windbreak hedges are needed to control this hazard. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Wetness is a limitation for some crops.

The low available water capacity makes this soil poorly suited to pasture. Proper seeding, proper stocking, and rotation of pastures are the major pasture management practices.

This soil is suited to trees. Black oak, white oak, and pitch pine are the common species. Where wildfires have been severe, pitch pine predominates. Trees on this soil grow slowly because of low available water capacity during the growing season.

The seasonal high water table limits this soil for most urban uses, particularly as sites for houses with basements, septic disposal fields, and sanitary landfills. The soil is limited for most recreational uses by the high content of sand.

This soil is in capability subclass IIIw.

KrA—Kresson fine sandy loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is in depressional areas and on low divides and side slopes. The areas are irregular in shape and range from about 5 to 20 acres.

Typically, the surface layer is olive gray fine sandy loam about 11 inches thick. The subsoil is 21 inches of olive and grayish green sandy clay with yellowish red and olive mottles. The substratum extends to a depth of 60 inches or more. It is stratified olive fine sandy loam and mottled, grayish green sandy clay to a depth of 48 inches and mottled, yellowish red sandy clay at a depth of more than 48 inches.

Included with this soil in mapping are areas of Adelphia and Shrewsbury soils. The Adelphia and Shrewsbury soils have less clay than this Kresson soil, and the Shrewsbury soils are more poorly drained. Included soils make up about 10 percent of this map unit.

The permeability of this soil is slow in the subsoil and moderately slow in the substratum. Available water capacity is high. The seasonal high water table is 1/2 foot to 1-1/2 feet below the surface. During years with normal rainfall, undrained areas of this soil have water perched over the subsoil from November to May and after heavy rainfall during the remainder of spring. Organic matter content of the soil is moderate, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid. Runoff is slow. Tilth is fair, and the soil is not easily worked, because the period of optimum moisture content is short.

This soil is suited to corn, soybeans, small grain, and hay, and most of the acreage is farmed. The soil has a slight erosion hazard, which can be controlled by planting cover crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Drainage is needed in areas used for crops.

The soil is well suited to pasture. Proper seeding, proper stocking, rotation of pastures, and restriction of grazing when the soil is wet are the major pasture management concerns.

This soil is suited to trees, but only a very small acreage is used for woodland. Pin oak, white oak, hickories, sweetgum, yellow-poplar, beech, and ash are the common species. Pine and red cedar are common in abandoned fields.

The seasonal high water table and slow permeability of this soil limit use as sites for houses with basements, septic disposal fields, and some recreation areas.

This soil is in capability subclass IIw.

LhA—Lakehurst sand, 0 to 3 percent slopes. This nearly level, moderately well drained or somewhat poorly drained soil is in depressed areas and on low terraces. The areas are irregular in shape and range from about 10 to 500 acres.

Typically, the surface layer is very dark gray sand about 2 inches thick. The subsurface layer is gray sand 10 inches thick. The subsoil is 34 inches of dark brown, yellowish brown, and light yellowish brown sand and has light gray mottles in the lower part. The substratum, to a depth of 60 inches or more, is light gray sand with yellowish brown mottles.

Included with this soil in mapping are areas of Atsion, Lakewood, Berryland, and Klej soils. The Atsion and Berryland soils are poorly drained or very poorly drained, and small areas of these soils are shown on the soil maps by a wet-spot symbol. Also included, in Jackson and Plumstead Townships, are soils mainly composed of fine sand. Included soils make up about 15 percent of this map unit.

The permeability of this soil is rapid in the subsoil and substratum. Available water capacity is low, but water is available to plants early in the season from the water table. The seasonal high water table is 1-1/2 to 4 feet below the surface. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in January. It starts to drop in April and is at a depth of 5 feet or more by June. Organic matter content of the soil is low, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid

and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Because of very low fertility, low available water capacity, and rapid permeability, this soil is not well suited to cultivated crops. If farmed, the soil needs frequent fertilizer applications. Cover crops and windbreak hedges are needed to control a moderate wind erosion hazard. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

Although most of the acreage is used for trees, the soil is poorly suited to commercial woodland production. Pitch pine, black oak, white oak, and blackgum are the common species. Trees grow slowly because of low available water capacity during the growing season. Woodlands need protection from wildfires.

The seasonal high water table limits the soil as sites for houses with basements, septic disposal fields, and sanitary landfills. The high sand content limits the soil for most recreational uses.

This soil is in capability subclass IVw.

LmA—Lakehurst sand, clayey substratum, 0 to 3 percent slopes. This nearly level, moderately well drained or somewhat poorly drained soil is in depressed areas and on low terraces. The areas are irregular in shape and range from about 20 to 200 acres.

Typically, the surface layer is dark gray sand about 4 inches thick. The subsurface layer is light gray sand 12 inches thick. The subsoil is 25 inches of dark brown and yellowish brown sand and has light gray mottles in the lower part. The substratum extends to a depth of 60 inches or more. To a depth of 47 inches it is brownish yellow sandy clay loam with light gray mottles. At a depth of more than 47 inches it is light gray sandy clay with brownish yellow mottles.

Included with this soil in mapping are areas of Lakewood and Atsion soils and Lakehurst soils that do not have a clayey substratum. The Lakewood soils are excessively drained, and the Atsion soils are poorly drained. Also included are a few areas of soils where the depth to the substratum is less than 40 inches. Included soils make up about 20 percent of this map unit.

The permeability of this soil is rapid to a depth of about 40 inches and slow at a depth of more than 40 inches. Available water capacity is low, but water is available to plants early in the season from the water table. The seasonal high water table is 1-1/2 to 2-1/2 feet below the surface. During years with normal rainfall, the water table starts to rise in October and is nearest to the surface in January. It starts to drop in April and is at a depth of 3 feet or more by June. The water table is perched over the clayey substratum, and it rises rapidly when rainfall is abnormally heavy. Organic matter content in the soil is low, and natural fertility is very low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid or extremely acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Because of the very low fertility, the low available water capacity, and the rapid permeability in the upper 40 inches, this soil is not suited to cultivated crops. Frequent applications of fertilizer are needed on the soil, and cover crops and windbreak hedges are needed to control a moderate wind erosion hazard. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

Although most of the acreage is used for trees, this soil is poorly suited to commercial woodland production. Pitch pine, black oak, white oak, and black gum are most common species. Trees grow slowly on this soil because of the low available water capacity during the growing season.

The seasonal high water table, the slow permeability of the substratum, and the high content of sand limit this soil for most urban uses.

This soil is in capability subclass IVw.

LwB—Lakewood sand, 0 to 5 percent slopes. This nearly level to gently sloping, excessively drained soil is on divides and side slopes. Slopes are convex and range from 100 to 500 feet in length. The areas are irregular in shape and range from about 10 to 1,500 acres.

Typically, the surface layer is black sand 1 inch thick. The subsurface layer is light brownish gray sand 9 inches thick. The subsoil is yellowish brown sand 26 inches thick. The substratum is brownish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Lakehurst soils, more sloping Lakewood sand, Evesboro soils, and Woodmansie soils. The Lakehurst soils are moderately well drained or somewhat poorly drained. The Evesboro soils do not have the distinct light brownish gray subsurface layer typical of this Lakewood soil. The Woodmansie soils have more clay in the subsoil and substratum. Included soils make up about 10 percent of this map unit.

The permeability of this soil is rapid in the subsoil and rapid to moderate in the substratum. Available water capacity is low. Organic matter content is low, and natural fertility is very low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly or extremely acid. Runoff is slow. Tilth is good, and the soil is easily worked.

This soil is poorly suited to crops and pasture because of very low fertility, the low available water capacity, and the rapid permeability in the subsoil. If farmed, the soil must be irrigated and frequently fertilized. Windbreak hedges are needed to control a severe wind erosion hazard. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

Although most of the acreage is wooded, this soil is poorly suited to commercial trees because of low available water capacity and very low fertility. Pitch pine, blackjack oak, post oak, chestnut oak, black oak, and white oak are the common species. Growth is slow, and the woodland needs protection from wildfires.

The soil is generally suitable for most urban uses, but the loose, sandy surface is a limitation for recreational uses and the rapid permeability limits use for sanitary landfills.

This soil is in capability subclass VIIs.

LwC—Lakewood sand, 5 to 10 percent slopes. This sloping, excessively drained soil is on side slopes. Slopes are convex and range from 50 to 200 feet in length. Most areas are long and narrow and range from about 10 to 400 acres. Some small areas are round or oval.

Typically, the surface layer is very dark grayish brown sand 2 inches thick. The subsurface layer is light gray sand 9 inches thick. The subsoil is yellowish brown sand 17 inches thick. The substratum is brownish yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of less sloping Lakewood sand, sloping and moderately steep Evesboro sand, and sloping Woodmansie sand. Some areas of the Evesboro sand have a thinner subsurface layer than this Lakewood soil, and some do not have a subsurface layer. The Woodmansie soils have more clay in the subsoil than this Lakewood soil. Included soils make up about 10 percent of this map unit.

The permeability of this soil is rapid. Available water capacity is low. Organic matter content is low, and natural fertility is very low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid or extremely acid. Runoff is medium. Tilth is good, and the soil is easily worked.

Because of very low fertility, the low available water capacity, and the rapid permeability, this soil is poorly suited to cultivated crops and pasture. The hazard of water erosion is moderate. If farmed, the soil needs irrigation and frequent applications of fertilizer. Tilth and organic matter can be maintained by controlling erosion, planting cover crops, and plowing under crop residue.

Although much of the acreage is wooded, this soil is poorly suited to woodland production. Slow growth is caused by the low available water capacity and very low fertility. Pitch pine, blackjack, post oak, chestnut oak, white oak, and black oak are the common species. The woodlands need protection from wildfires.

The rapid permeability of the soil is a limitation for sanitary landfills.

This soil is in capability subclass VIIs.

Ma—Manahawkin muck. This nearly level, very poorly drained soil is on flood plains adjacent to large streams, is in depressional areas, and is on broad flats. Most areas are long and narrow and range from about 40 to 1,100 acres. Some large areas are oval.

Typically, the surface layer is black muck about 39 inches thick. The substratum extends to a depth of 60 inches or more. It is gray sand to a depth of 43 inches and gray gravelly sand at a depth of more than 43 inches.

Included with this soil in mapping are areas of Berryland, Atsion, and Mullica soils, none of which has the surface layer of muck typical of this Manahawkin soil. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderately slow to moderately rapid in the subsoil and moderately rapid in the substratum. Dry areas of this soil absorb water very slowly. Available water capacity is high. A seasonal high water table is at the surface from November to June, and some areas have water ponded on the surface. During the summer, the water table is generally at a depth of 1 to 2 feet but is as deep as 3 feet in places during extended dry periods. Areas of this soil are subject to frequent flooding. Organic matter content of the soil is high, and natural fertility is low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is very slow. This soil is easily worked when drained, and tilth is good, but the soil subsides when drained.

This soil has limited potential for cranberry and blueberry production. The areas need protection from flooding. Some need drainage ditches, and most need to be sanded for cranberries. Construction of dikes requires mineral soil material from the uplands.

The soil is suited to trees, though growth is slow. Most of the acreage of the soil is used for woodland and wildlife habitat. Nearly pure stands of Atlantic white-cedar make up the dominant forest. In some places where Atlantic white-cedar has been harvested, red maple, sweetgum, blackgum, and pitch pine seed in. The seasonal high water table, low strength for access roads, and flooding limit harvesting of the trees during the winter and spring.

This soil is limited for most urban uses by flooding, the seasonal high water table, and subsidence of the surface layer.

This soil is in capability subclass VIIw.

Mr—Mullica fine sandy loam, loamy substratum. This nearly level, very poorly drained soil is in depressional areas and on broad flats. The areas are irregular in shape and range from about 50 to 200 acres.

Typically, the surface layer is black fine sandy loam about 11 inches thick. The subsurface layer is very dark gray fine sandy loam 6 inches thick. The upper part of the subsoil is 8 inches of light brownish gray fine sandy loam. The lower part is 5 inches of light brownish gray

loamy fine sand with light olive brown mottles. The substratum extends to a depth of more than 60 inches. It is stratified grayish brown loamy fine sand, gray fine sandy loam, and black silt loam to a depth of 53 inches and dark gray fine sand at a depth of more than 53 inches.

Included with this soil in mapping are areas of Hammonton, Manahawkin, Klej, and Lakehurst soils and poorly drained, loamy soils. This Mullica soil has a thicker surface layer than the Klej, Lakehurst, or Hammonton soils and does not have the muck layers common to the Manahawkin soils. Included soils make up 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and substratum. If the soil is drained, available water capacity is moderate. A seasonal high water table is at the surface from November to June, and some areas have water ponded on the surface. In summer, the water table is normally at a depth of 2 to 3 feet but is as deep as 4 feet in places during extended dry periods.

Areas of the soil that are adjacent to perennial streams are subject to occasional flooding. Organic matter content is high, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Large amounts of water run off the soil because of the long period of saturation. Tilth is good, and the soil is easily worked when drained.

Most of the acreage of this soil is farmed. A few acres are in pasture, and some are wooded.

If drained, this soil is suited to corn, soybeans, hay, blueberries, and late-season vegetables. Wetness is a severe hazard to most crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

This soil is suited to pasture. Restricted grazing when the soil is wet, drainage, proper seeding, proper stocking, and rotation of pastures are the major pasture management practices on this soil.

This soil is well suited to marketable timber. Blackgum, sweetgum, red maple, bay magnolia, pin oak, willow oak, pitch pine, swamp white oak, southern red oak, and holly are the common species. The seasonal high water table limits harvesting during the winter and spring and limits the soil for most urban uses.

This soil is in capability subclass IIIw.

Mu—Mullica sandy loam. This nearly level, very poorly drained soil is in depressional areas and on broad flats. The areas are irregular in shape and range from about 15 to 150 acres.

Typically, the surface layer is black sandy loam about 12 inches thick. The subsoil is 13 inches of grayish brown and light brownish gray sandy loam and has light olive brown mottles in the lower part. The substratum extends to a depth of 60 inches or more. It is light brownish gray loamy sand to a depth of 36 inches and light brownish gray sand at a depth of more than 36 inches.

Included with this soil in mapping are areas of Berryland, Atsion, Manahawkin, and Hammonton soils. This Mullica soil has more clay than the Berryland or Atsion soils. It does not have the thick muck layer common to the Manahawkin soils and is not as well drained as the Hammonton soils. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. If the soil is drained, available water capacity is moderate, but water is available to plants from the water table. The seasonal high water table is at the surface from November to June. Some areas have water ponded on the surface. In summer, the water table generally is at a depth of 2 to 3 feet but is as deep as 5 feet in places during extended dry periods. Areas adjacent to perennial streams are subject to occasional flooding. Organic matter content of the soil is high, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is very slow. Tilth is good, and the soil is easily worked when drained.

Most of this soil is used for woodland. A few acres are in pasture, and some are wooded.

If drainage and land smoothing are used, this soil is suited to cultivated crops such as blueberries and late-season vegetables. Wetness is a severe hazard to most other crops. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

This soil is suitable for pasture if drainage, proper seeding, proper stocking, and pasture rotation are used.

The soil is suited to trees. Blackgum, sweetgum, red maple, bay magnolia, pin oak, willow oak, pitch pine, swamp white oak, Atlantic white-cedar, southern red oak, and holly are the common species. The seasonal high water table limits harvesting during the winter and spring.

The high water table also limits the soil for most urban uses, especially for making excavations. Sidewalls of excavations in this soil collapse when saturated.

This soil is in capability subclass IIIw.

PeA—Pemberton sand, 0 to 5 percent slopes. This nearly level to gently sloping soil is on low divides. The areas are moderately well drained or somewhat poorly drained, but most are moderately well drained. They are irregular in shape and range from 5 acres to more than 75 acres.

Typically, the surface layer is dark grayish brown sand about 10 inches thick. The subsurface layer is light olive brown sand 12 inches thick. The subsoil is mottled, yellowish brown fine sandy loam 14 inches thick. The substratum extends to a depth of 60 inches or more. It is stratified pale olive sand and sandy loam with dark brown mottles.

Included with this soil in mapping are areas of Tinton, Adelphia, and Collington soils. The Tinton and Collington soils are better drained than this Pemberton soil, and the Adelphia soils are not as sandy. Included soils make up about 15 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate, but plants obtain water early and late in the season from the water table. Organic matter content of the soil is low, and natural fertility is medium. Unless limed, this soil is extremely acid in the surface layer and very strongly acid in the lower layers. Runoff is slow. The soil warms early in the season and is easily worked. The seasonal high water table is 1-1/2 to 4 feet below the surface. During years with normal rainfall, the water table starts to rise in late October and is nearest to the surface in January. It starts to drop in April and is generally at a depth of 5 feet or more from June to September.

This soil is suitable for some vegetables, and about half the acreage is farmed. The high sand content makes the soil poorly suited to pasture. The main limitations for crops are the hazard of wind erosion and the restricted rooting depth caused by the seasonal high water table. Windbreak hedges and cover crops control the wind erosion hazard. Cover crops help maintain the organic matter content, and plowing under crop residue helps maintain tilth.

The seasonal high water table limits the soil as a site for houses with basements and septic disposal fields. The loose, sandy surface layer is a limitation for recreational uses and provides poor trafficability.

This soil is in capability subclass IIIw.

PhB—Phalanx loamy sand, 2 to 5 percent slopes. This gently sloping, well drained soil is on divides and side slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 5 to 150 acres.

Typically, the surface layer is dark brown loamy sand about 2 inches thick. The subsurface layer is reddish brown loamy sand 4 inches thick. The upper part of the subsoil is red sandy loam 16 inches thick. The middle part is red channery sandy loam 10 inches thick. The lower part is red flaggy or channery loamy sand 14 inches thick. The substratum is yellowish red sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of more sloping Phalanx soils and Evesboro, Lakewood, and Downer soils that make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is low. The organic matter content is low, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked. Stones in the subsoil, which in places make up as much as 75 percent of the subsoil, restrict rooting.

The soil is poorly suited to cultivated crops. The main limitation is the stone content in the subsoil. The hazard of erosion is moderate, and planting cover crops and farming on the contour help to control erosion. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

Root restriction in the subsoil makes the soil poorly suited to pasture. Proper seedings, proper stocking, and rotation of pastures are major management practices.

This soil is suited to trees. Pitch pine, chestnut oak, black oak, scarlet oak, and white oak are the common species.

The stones in the subsoil limit excavations in this soil for urban uses.

This soil is in capability subclass IVs.

PhC—Phalanx loamy sand, 5 to 10 percent slopes. This sloping, well drained soil is on side slopes and divides. Slopes are dominantly convex and range from 50 to 100 feet in length. The areas are long and narrow and range from about 10 to 50 acres.

Typically, the surface layer is brown loamy sand about 5 inches thick. The subsurface layer is yellowish red loamy sand 7 inches thick. The subsoil is yellowish red channery sandy loam 30 inches thick. The substratum is yellowish red loamy sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of Phalanx soils that have slopes of less than 5 percent or more than 10 percent and areas of sloping Evesboro and Lakewood soils. The Evesboro and Lakewood soils do not have ironstone fragments in the subsoil, which are common in this Phalanx soil. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is low. Organic matter content is low, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is medium. Ironstone fragments make up 35 to 75 percent of the subsoil and restrict rooting depth in the soil.

This soil is poorly suited to cultivated crops. Root growth restriction and the low available water capacity are the main limitations.

The soil is suited to trees, and most of the acreage is wooded. Pitch pine, chestnut oak, scarlet oak, and white oak are the common species.

Slope limits the soil for most recreational uses. The ironstone in the subsoil is a limitation for making excavations.

This soil is in capability subclass IVs.

Pm—Pits, sand and gravel. This unit consists of deep, excessively drained to very poorly drained soil material that is dominantly made up of the spoil in a borrow pit, sand pit, gravel pit, or clay pit during mining or after mining has taken place. In some pits the spoil has been smoothed to form a uniform surface. In others it occurs as scattered mounds. Slopes range from nearly level bottoms to vertical walls around the excavation.

Included with this unit in mapping are areas of Aura, Woodmansie, Downer, Evesboro, and Hammonton soils.

Areas of this unit are mostly idle, but some have been planted with trees, and some are used for sanitary landfill or as residential, industrial, or commercial sites.

The soil material in this unit is dominantly sandy and is 5 to 35 percent gravel. The material is mostly strongly acid. Permeability is variable; it is moderately rapid or rapid in borrow areas and sand and gravel pits, and it is slow in clay pits. Available water capacity is low in sandy areas and moderate in clayey areas. Organic matter content is low, and natural fertility is low. Most areas receive moderate to large amounts of water from the areas adjacent to the pits. The water table is between the surface and a depth of more than 5 feet.

Because of the variability of characteristics, these areas need onsite investigations for reliable interpretation.

This unit is not assigned to a capability subclass.

PN—Psamments, nearly level. This unit consists of excessively drained to well drained soils that are dominantly made up of mainly yellowish brown, sandy fill placed in low, poorly drained or very poorly drained areas. The surface has been smoothed, and the areas are nearly level. The thickness of the fill ranges from 24 to 48 inches but is dominantly 36 inches. The material has a gravel content that ranges from 0 to 50 percent but is typically 5 to 20 percent.

Included with this unit in mapping are areas of Sulfaquents and Sulfihemists and Atsion, Berryland, and Mullica soils that make up about 20 percent of the unit.

The permeability of the fill material is rapid. Available water capacity is low. Organic matter content is low, and the reaction is mostly very strongly acid.

Because of the variation in the amount of fill and the nature of the filled area, onsite investigation is needed to make reliable interpretations for this unit.

This unit is not assigned to a capability subclass.

PO—Psamments, sulfidic substratum. This unit consists of deep, moderately well drained and somewhat poorly drained, sandy fill material over Sulfaquents and Sulfihemists. The surface of the areas has been smoothed, and most areas are nearly level. They are used for residential, commercial, and industrial sites.

The thickness of the fill material ranges from 24 to 48 inches but is typically 30 to 40 inches. The composition and texture of the fill depend on its sources. The material is rapidly permeable. Available water capacity, organic matter content, and natural fertility are low. Reaction is generally very strongly acid.

Before being filled, these sites were subject to daily tidal flooding. Sufficient fill has been added to prevent the normal tidal flooding, but the areas are subject to flooding during storms. Because of this storm flooding hazard and the variability in kinds and amounts of fill, onsite investigation of the areas is needed to make reliable interpretations for any use.

This unit is not assigned to a capability subclass.

PW—Psamments, waste substratum. This unit consists of areas where about 2 feet of sandy fill has been placed over a sanitary landfill. The surface in most places has been smoothed and compacted, and the areas are nearly level or gently sloping. The areas are generally rectangular and range from 40 to 60 acres. Included with this unit in mapping are areas used as sanitary landfills. They make up about 5 percent of the unit.

The refuse material buried in most places includes garbage, paper, plastic, glass, metal, rubber, building debris, and many other kinds of refuse. The thickness of the fill material ranges from 2 to 4 feet, and the thickness of the refuse is 10 to 20 feet.

The permeability of the areas is moderate or moderately rapid in the upper 2 feet and variable below a depth of 2 feet. Available water capacity is low in the fill material.

This unit is subject to subsidence and uneven settling, and decomposition of the refuse causes liquid and gas formation. Onsite investigation of the areas is needed for any use.

This unit is not assigned to a capability subclass.

SaB—Sassafras sandy loam, 2 to 5 percent slopes. This gently sloping, well drained soil is on divides and side slopes. Slopes are dominantly convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 20 to 300 acres.

Typically, the surface layer is very dark grayish brown sandy loam about 3 inches thick. The subsurface layer is yellowish brown sandy loam 3 inches thick. The upper part of the subsoil is brown sandy loam 6 inches thick. The middle part is brown heavy loam 5 inches thick. The lower part is yellowish brown sandy clay loam 24 inches thick. The substratum extends to a depth of 60 inches or more. It is reddish yellow loamy coarse sand to a depth of 54 inches and brownish yellow sand at a depth of more than 54 inches.

Included with this soil in mapping are areas of Downer and Hammonton soils and a few small areas of Sassafras gravelly sandy loam. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water

capacity is moderate. Organic matter content is moderate, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is medium. Tilth is good, and the soil is easily worked.

This soil is suited to cultivated crops such as soybeans, corn, vegetables, and small grain, and much of the acreage is used for crops. It has a slight water erosion hazard, which can be controlled by planting cover crops. The hazard of wind erosion is severe, and windbreak hedges are needed. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue.

The soil is suitable for pasture. Proper seeding, proper stocking, and rotation of pastures are the major pasture management practices on this soil.

This soil is suited to trees. Black oak, white oak, chestnut oak, and pitch pine are the common species. Pine is common in abandoned fields.

This soil is generally suitable for most urban uses. Extensive areas have been urbanized.

This soil is in capability subclass IIe.

Sh—Shrewsbury fine sandy loam. This nearly level, poorly drained soil is in depressional areas and on broad flats. The areas are irregular in shape and range from about 5 to 75 acres.

Typically, the surface layer is very dark gray fine sandy loam about 10 inches thick. The subsurface layer is 3 inches of olive gray fine sandy loam with dark yellowish brown mottles. The upper part of the subsoil is 12 inches of olive gray sandy clay loam with dark brown mottles. The lower part is 10 inches of light olive gray fine sandy loam with dark yellowish brown mottles. The substratum extends to a depth of 60 inches or more. It consists of stratified olive fine sandy loam and light olive gray sand with dark yellowish brown mottles.

Included with this soil in mapping are areas of somewhat poorly drained or moderately well drained Adelphia and Pemberton soils that make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and substratum. Available water capacity is high. A seasonal high water table is between the surface and a depth of 1 foot from November to June. Some areas have water ponded on the surface (fig. 8). In summer the water table is generally at a depth of 2 to 4 feet but is as deep as 5 feet in places during extended dry periods. Areas adjacent to perennial streams are occasionally flooded. Organic matter content of the soil is moderate, and natural fertility is high. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. The runoff rate is very slow, but large amounts of water run off the soil because of the long period of saturation. Tilth is good, and the soil is easily worked if drained.

Most of the acreage of this soil is farmed. A few acres are in pasture, and a few are in woodland.

If drained, this soil is suited to cultivated crops such as corn, soybeans, small grain, hay, pasture, blueberries, and late-season vegetables. Tilth and organic matter content can be maintained by planting cover crops.

This soil is suited to pasture. Restricted grazing when the soil is wet, drainage, proper seeding, proper stocking, and rotation of pastures are the major pasture management practices on this soil.

This soil is suitable for marketable timber. Willow oak, pin oak, swamp white oak, ash, beech, hickories, sweetgum, blackgum, and red maple are the common species. The seasonal high water table limits harvesting during the winter and spring.

The high water table limits the soil for most urban uses, especially for making excavations. Sidewalls of excavations in this soil collapse when saturated.

This soil is in capability subclass IIIw.

SS—Sulfaquents and Sulfihemists, frequently flooded. This unit consists of deep, poorly drained or very poorly drained soils and areas of organic material underlain by mineral material. The soils are in tidal marsh areas and are subject to tidal flooding (fig. 9). The natural vegetation on this soil is salt meadow cordgrass, smooth cordgrass, and other grasses that withstand daily tidal flooding. The areas have numerous shallow ponds.

Included with this unit in mapping are areas of Atsion sand, tide flooded; Berryland, Mullica, Klej, Fripp, and Hammonton soils; and Psamments, sulfidic substratum. Included soils make up about 5 percent of this map unit.

The permeability of this unit is moderate, and available water capacity is high. The tidal depth ranges from 1 to 6 feet, but the average is 2 to 3 feet. The water table is near the surface of the unit and fluctuates very little. Organic matter content of the unit is high, and most of the roots are in the upper foot of the soil. Salt and sulfur content are variable from place to place. Reaction of the moist areas is strongly acid to neutral and is extremely acid in dry areas. Runoff is very slow.

Most of the acreage of this unit is used for wildlife habitat. A small acreage is used for salt-hay production. The unit is not suitable for use as farmland, pasture, or woodland.

The unit is suited to salt-hay production. The high water table, low strength of the surface, and tidal flooding limit the harvesting of salt-hay.

This unit is limited for urban uses by flooding and the high water table.

This unit is in capability subclass VIIIw.

TnB—Tinton sand, 0 to 5 percent slopes. This nearly level to gently sloping, deep, well drained soil is on divides and side slopes. Slopes are convex and range from 100 to 300 feet in length. The areas are irregular in shape and range from about 20 to 100 acres.

Typically, the surface layer is grayish brown sand about 12 inches thick. The subsurface layer is yellowish brown sand 13 inches thick. The subsoil is dark yellowish brown fine sandy loam 17 inches thick. The substratum consists of stratified light olive brown sand and sandy loam to a depth of 60 inches or more.

Included with this soil in mapping are areas of Collington, Evesboro, and Pemberton soils that make up about 15 percent of this map unit.

The permeability of this soil is moderate or moderately rapid in the subsoil and moderately rapid in the substratum. Available water capacity is low in the upper sandy 20 to 30 inches and moderate in the loamy subsoil. Organic matter content is low, and natural fertility is medium. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

About half the acreage of this soil is farmed. Most of the rest is used for woodland.

This soil is suited to corn, soybeans, vegetables, small grains, and hay. The hazard of erosion is moderate and can be controlled by planting cover crops and farming on the contour. Tilth and organic matter content are maintained by planting cover crops and plowing under crop residue.

This soil is suited to pasture, but the low to moderate available water capacity is a limitation. Proper seedings, proper stocking, and rotation of pastures are the major management practices on this soil.

The soil is suited to trees. Black oak, white oak, scarlet oak, chestnut oak, and pitch pine are the common species.

This soil is generally suitable for most urban uses, but slope is a limitation for playgrounds.

This soil is in capability subclass IIIs.

UL—Urban land. This unit consists of areas where more than 80 percent of the surface is covered by asphalt, concrete, buildings, or other impervious surfaces. Examples are parking lots, shopping centers, airports, industrial parks, and schools. These areas are throughout the survey area, but are more common in the northern part of the county and east of the Garden State Parkway. The areas generally range from 10 to 100 acres and are nearly level or gently sloping.

Included with this unit in mapping are areas of Downer, Evesboro, Klej, and Lakehurst soils. The proportion of these included areas ranges from almost none in the urban centers to 15 percent in less developed areas.

Onsite investigation is needed to determine the suitability of this unit for any proposed use.

The unit is not assigned to a capability subclass.

UP—Urban land-Fripp complex. This complex consists of areas of Urban land and excessively drained Fripp soils in urbanized areas of the coastal dunes on the barrier islands. The Fripp soils have been altered by grading for housing developments, shopping centers, and recreational uses. Each of the two areas of this complex is about 2,000 acres. The areas are nearly level to gently sloping. The Urban land and Fripp soils are in such an intricate pattern that it was not practical to map them separately.

About 70 percent of the complex is Urban land, where the soils are largely covered by concrete, asphalt, and buildings.

About 20 percent of the complex is Fripp soils. Typically, these areas have a surface layer of light brownish gray fine sand 3 inches thick. The substratum is very pale brown and white fine sand to a depth of 60 inches or more.

Included in this complex in mapping are beaches; Psamments, nearly level; and Sulfaquents and Sulfihemists, frequently flooded. Included areas make up about 10 percent of this complex.

Permeability is rapid in areas of this complex where the soils are relatively undisturbed, and it is variable in areas dominated by cuts, fills, and Urban land. Available water capacity is low, and runoff is slow. Most unlimed areas are strongly acid.

The proximity of this complex to the ocean makes it suitable for recreation. Most other proposed uses require onsite investigation.

This complex is not assigned to a capability unit.

WoB—Woodmansie sand, 0 to 5 percent slopes. This nearly level to gently sloping, well drained soil is on divides and side slopes mostly in the area called the Plains. Slopes are convex and range from 100 to 400 feet in length. The areas are irregular in shape and range from about 10 to 500 acres.

Typically, the surface layer is black sand about 4 inches thick. The subsurface layer is gray sand 6 inches thick. The next layer is yellowish brown and pale yellow loamy sand 10 inches thick. The upper part of the subsoil is light yellowish brown sandy clay loam 9 inches thick. The lower part is light yellowish brown sandy loam 13 inches thick. The substratum extends to a depth of 60 inches or more. It is light gray sand stratified with layers of strong brown to very pale brown sandy loam 1 to 12 inches thick.

Included with this soil in mapping are areas of Downer and Lakewood soils, more sloping Woodmansie gravelly sand, and Lakehurst and Aura soils. Also included are Woodmansie soils with a surface layer more than 4 inches thick. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid in the substratum. Available water capacity is moderate. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and sub-

stratum are strongly acid to very strongly acid. Runoff is slow. Tilth is good, and the soil is easily worked.

Most of the acreage of this soil is used for woodland and wildlife habitat. A few acres are farmed.

Because of the low natural fertility, this soil is poorly suited to cultivated crops. The soil has a slight water erosion hazard, which can be controlled by planting cover crops. It has a severe wind erosion hazard, and windbreak hedges are needed. Tilth and organic matter content can be maintained by planting cover crops and plowing under crop residue. Irrigation is needed for most crops.

This soil is poorly suited to pasture. The low fertility and moderate available water capacity are the main limitations.

The soil is suited to trees. Pitch pine, black oak, white oak, and chestnut oak are the common species. Where wildfires have been severe, the vegetation is a dwarf forest of pitch pine, blackjack oak, and scrub oak. Controlling fires is the major management concern.

The soil is generally suitable for most urban uses. The loose, sandy surface is a limitation for recreational areas.

This soil is in capability subclass IVs.

WoC—Woodmansie sand, 5 to 10 percent slopes. This sloping, well drained soil is on side slopes. Slopes are convex and range from 100 to 600 feet in length. Most areas are long and narrow and range from about 10 to 250 acres.

Typically, the surface layer is black sand 1 inch thick. The subsurface layer is gray sand 8 inches thick. The upper part of the subsoil is yellowish brown sand 6 inches thick. The middle part is brown gravelly sandy loam 9 inches thick. The lower part of the subsoil is yellowish brown loamy sand 10 inches thick. The substratum is yellow sand to a depth of 60 inches or more.

Included with this soil in mapping are areas of sloping Lakewood soils and areas of Woodmansie soils that are more sloping or less sloping than this soil, or that are gravelly. Included soils make up about 10 percent of this map unit.

The permeability of this soil is moderate in the subsoil and moderately rapid to rapid in the substratum. Available water capacity is low. Organic matter content and natural fertility are low. Unless the soil has been limed, the surface layer is extremely acid and the subsoil and substratum are strongly acid to very strongly acid. Runoff is medium.

Because of low natural fertility, this soil is not suited to cultivated crops or pasture. The soil has a moderate water erosion hazard, and some areas receive runoff from adjacent higher areas.

Although much of the acreage is used for woodland, this soil is poorly suited to trees. Pitch pine, black oak, white oak, scarlet oak, and chestnut oak are the common species. Growth is slow as a result of frequent severe wildfires, and controlling fires is a major management concern.

Slope and the sandy surface limit the soil for some urban uses.

This soil is in capability subclass IVs.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 5 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 5 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 5 in the standard terms used by the U.S. Department of Agriculture (*10*). These terms are defined according to percentages of sand, silt,

and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified soil classification system (Unified) (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*2*).

The *Unified* system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines. At the other extreme, in group A-7, are fine-grained soils. Highly organic soils are classified in group A-8 on the basis of visual inspection.

When laboratory data are available, the A-1, A-2, and A-7 groups are further classified as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The estimated classification, without group index numbers, is given in table 5. Also in table 5 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in both the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and plasticity index are estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterburg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 6 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils (*12*).

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also

influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.

Soil and water features

Table 7 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of deep, well drained to excessively drained sands or gravels. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils that have a layer that impedes the downward movement of water or soils that have moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clay soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 7 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground

installations will function. Also, a seasonal high water table affects ease of excavation.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible. Frost action is less severe along the coast, where temperatures are moderated by the ocean.

Risk of corrosion pertains to the potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock, wetness, or very firm soil horizons that cause difficulty in excavation.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops

The major management concerns in the use of the soils for crops are described in this section. In addition, the crops best suited to the soil are discussed; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

About half of the cropland in the county, mainly the heavier soils in Plumstead Township, is used for corn, hay, soybeans, wheat, and pasture. The balance is in specialty crops such as other vegetables, blueberries, cranberries, and cultivated sod. Except for sod, these crops are mostly grown on the sandier textured soils, and nearly all are irrigated.

Fertility. Most soils in the county require additions of lime and fertilizer. The amounts depend on the natural content of lime and plant nutrients, past cropping and level of management, the need of the crop, and the desired yield. Information on the amount of lime and

fertilizer needed is available at the local office of the Agricultural Extension Service and at Cook College, Rutgers, the State University.

The soils of Ocean County range from low to high in organic-matter content. This content can be maintained or increased through proper management of residue, which includes plowing in cover crops, growing a sod crop in the cropping sequence, using manure, and returning crop residue to the soil. Commercial fertilizer is beneficial to all crops. On soils subject to rapid leaching, fertilizer is more effective if added in more than one application during the growing season.

Tillage is needed to prepare a seedbed and control weeds, but tilling too often tends to break down the structure of the soil. Adding organic matter and growing sod crops, cover crops, and green-manure crops help prevent the breakdown of structure.

Erosion. All of the sloping soils in the county are susceptibe to water erosion, and the farmed soils are susceptible to loss of organic matter and plant nutrients from the surface layer. Most erosion occurs while the cultivated crop is growing or soon after the crop has been harvested. Practices that help prevent this erosion are contour cultivating, terracing, stripcropping, providing diversions and grassed waterways, minimum tillage, properly using crop residue, planting cover crops, and applying fertilizer and lime when needed.

Because many of the soils of Ocean County are sandy, they are subject to wind erosion if they are left bare in winter. Cover crops, windbreaks, and windstrips can be used to reduce this hazard.

Wetness. In Ocean County many of the soils are wet because they receive runoff from adjacent areas, they have a slowly permeable subsoil, they have a fluctuating water table, or a combination of these.

Some of the wet soils in the county are the Hammonton, Humaquepts, Keyport, Klej, Kresson, Lakehurst, and Manahawkin soils and Sulfaquents and Sulfihemists. Wetness in most of these soils is caused when the water table fluctuates through a permeable soil. The Keyport and Kresson soils are slowly permeable and have a water table perched above a clayey subsoil. Sulfaquents and Sulfihemists are flooded by tides and have little opportunity to drain.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are 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 that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering purposes.

In the capability system, all kinds of soil are grouped at two levels: capability class and subclass (*11*). These levels are defined in the following paragraphs. A survey area may not have soils of all classes.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is droughty, and *c*, used in only some parts of the United States, 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 contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 8. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 9. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil or that a given crop is not commonly irrigated.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay yields were estimated for the most productive varieties of legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 9.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

Crops other than those shown in table 9 are grown in the survey area, but estimated yields are not included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Ornamental plantings

Trees and shrubs of different species vary widely in their suitability for different soils and site conditions. In planning the use of ornamental trees and shrubs, consideration should be given to the nature, height, and shape of the plants, the need for sun, acidity needs, protection from wind, and how the plant will be used. Consideration should also be given to seasonal variations of colors and the ability of the plant to provide food for wildlife.

The shrubs and trees listed in table 10 have been selected for their suitability to the normal available water capacity of the soils and for the tolerance of the plants to soils with a high water table. The plants selected are hardy to the area and have minimum susceptibility to disease and insects. Many of the plants serve the dual purpose of landscaping and providing food and cover for wildlife.

Woodland management and productivity

Table 11 contains information useful to woodland owners or forest managers planning use of soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *d*, restricted root depth; and *s*, sandy texture. The letter *o* indicates insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, d, and s.

In table 11 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

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

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

Seedling mortality ratings indicate the degree that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted

seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by commonly occurring winds; *moderate*, that some trees are blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. The trees listed are those that woodland managers generally favor in intermediate or improvement cuttings and those that commonly grow on the soil (*4, 5, 7*).

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

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 12, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and determining the intensity of management needed for each element of the habitat (*1*).

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of wildlife are very severe, and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

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

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, barley, and soybeans.

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of native plants are oak, poplar, cherry, sweetgum, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are honeysuckle, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or

cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, wildrice, saltgrass, and cordgrass and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Recreation

The soils of the survey area are rated in table 13 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

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

The information in table 13 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 15, and interpretations for dwellings without basements and for local roads and streets, given in table 14.

Camp areas require such site preparation as shaping and leveling for tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils for this use have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that will increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They should have moderate slopes and have few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers and ranchers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. Where pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational uses; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures (9). Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 14 shows, for each kind of soil, the degree and kind of limitations for building site development; table 15, for sanitary facilities; and table 17, for water management. Table 16 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

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

Building site development

The degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping are indicated in table 14. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitation is minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils rated severe, such costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of very firm, dense soil layers, bedrock, or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 14 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and without basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, potential frost action, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 14 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock or hardpan to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills (*9*). The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 15 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, or *poor*, which, respectively, mean about the same as the terms *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Shallowness to bedrock interferes with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the sea-

sonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 15 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 16 by ratings of good, fair, or poor (*9*). The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction materials. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 5 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential, low potential frost action, and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 16 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 5.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in

preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result at the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are low in soluble salts that can limit or prevent plant growth. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel, stones, or soluble salt; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey (*9*). In table 17 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water control structures.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of a soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 17 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Irrigation is affected by such features as slope, susceptibility to flooding, hazards of water erosion and soil blowing, texture, presence of salts and alkali, depth of root zone, rate of water intake at the surface, permeability of the soil below the surface layer, available water capacity, need for drainage, and depth to the water table.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Formation of the soils

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This section discusses the factors of soil formation as they exist in Ocean County, the processes by which soil layers develop, and the major layers in the soils of the county.

Factors of soil formation

The action and interaction of parent material, climate, relief, plant and animal life, and time affect the process of soil formation and determine the resulting morphological differences between the soils in Ocean County. The relative influence of each of these five major factors varies from one location to another. The number of interactive combinations is limited to several generalized patterns, causing similiar soil development or morphology at a number of different locations. The distinguishing features of the soils serve as the basis for classification.

Parent material

Most of the mineral soils of Ocean County formed in unconsolidated parent material composed of quartzose sand (*6*). In isolated areas the parent material has a high clay content, and near New Egypt the parent material contains various amounts of glauconite. The unconsolidated deposits were laid down in a succession of ocean and river deposits and then tilted to the southeast. The elevation of the land rises toward the northwest from the Atlantic Ocean to the drainage divide near the western edge of the county. West of the divide the elevation declines towards the Delaware River.

The Aura and Woodmansie soils are highly weathered soils that formed in a once nearly continuous layer of the Beacon Hill Formation. However, the meltwater of glaciers and rising waters of the ocean eroded this deposit until only remnants on isolated hills and drainage divides remain. The material in this deposit contained a small percentage of feldspar that has weathered to form clay in the subsoil of the soils.

On slightly lower elevations, the Downer, Hammonton, and Sassafras soils formed in a mixture of a thin layer of the Beacon Hill Formation and the underlying Cohansey Sand Formation. This mixture was caused by the action of wind and water.

Further erosion of the ocean deposits exposed coarse sands of the Cohansey Sand Formation to weathering and to the soil forming factors. These sands are the parent material of the Lakewood, Lakehurst, Evesboro, Atsion, and Berryland soils.

In the extreme northwestern corner of the county, near New Egypt, a small outcrop of highly glauconitic material is the parent material for the Kresson soils. Other outcrops in this area are the parent material for the small acreage of Collington, Adelphia, and Shrewsbury soils in the county.

The Manahawkin soils formed in decaying woody and herbaceous organic deposits that overlie the mineral deposits of most geologic formations of the county. These soils are extremely acid and are in swamps at the lowest landscape positions.

Climate

In Ocean County, climate has affected the physical, chemical, and biological properties of soil primarily through the influence of rainfall, temperature, and wind. The climate in the county has ranged from the cold, dry, and windy glacial period to the present temperate, moist period. The climate is moderated by the ocean but is classified as contintental. The warm temperature and high rainfall have caused extensive leaching and translocation of the finer particles to the subsoil. Most of the basic minerals such as sodium, potassium, calcium, and magnesium originally in the soil have been leached into the ground water. As a result, most of these soils are strongly acid and extremely low in plant nutrients.

The high winds during the glacial retreat moved and redeposited the parent materials, thus forming sandy dune deposits. Currently, winds blow much of the year, reworking and redepositing sandy material from those areas exposed after the removal of vegetation.

Relief

Natural differences in elevation and the shape of land surfaces commonly cause differences in drainage between soils formed in the same type of parent material. Soils in low landscape positions such as depressions or low lying flats are usually wet. In depressions in intermediate positions, the soil formation process is affected by water percolating through the soil. In low lying flats the soils have a high water table several months of the year. Soils that are wet for long periods accumulate a thick, dark organic mat at the surface. The low rate of organic decay and lack of biological activity of these wet soils prevent incorporatation of this organic matter into the soil.

Plant and animal life

The native vegetation of most of the county is a pitch pine-oak forest. Growth is slow because of the infertile soils and low available water capacity. What organic matter is produced is not normally incorporated into the soil because earthworms are not common in these soils. Most organic matter is deposited at the surface, where it is consumed by ants and termites or is burned off by forest fires.

In low lying areas organic deposits become saturated and lack aeration, causing slow decay of the organic material.

Time

Most of the soils in the county have developed in the material exposed by erosion since the glacial waters and oceans receded. Most of the soluble bases have leached from the soils. As the time that the soil material is exposed to the factors of weathering increases, clay formation and translocation to the subsoil become more advanced. The older soils in the county, for example, Aura and Woodmansie soils, show the greatest degree of weathering and clay movement.

Soil horizons

The cumulative effects of the action and interaction of the soil forming factors result in the different properties of the soil profile. The soil profile usually consists of the surface layer (A horizon), the subsoil (B horizon), and the substratum, or parent material, (C horizon). The A and B horizons combined make up the solum. Beneath the solum is the parent material, which has not been altered appreciably by the soil forming processes but may show the effects of geologic weathering. Some soils have a

surface layer of accumulated organic material, known as the O horizon, overlying the mineral A horizon. In most soils the O horizon is about an inch thick; in others it is thicker, and in muck soils such as Manahawkin soils it is as much as 2 or 3 feet thick.

The A horizon is known as the zone of eluviation, where the maximum leaching and translocation of particles result in the removal of the components of the soil matrix. When a small amount of black humidified organic matter becomes incorporated at the surface of the mineral soil, it forms a dark-colored A1 horizon. The light color of the A2 horizon just beneath shows the effects of the removal of clay, iron, aluminum, and other compounds.

The B horizon is known as the zone of illuviation, where many components removed from the surface layer accumulate. The top of the B horizon can usually be distinguished by a change in color or texture, or both, from the A horizon.

The most common B horizon is one of clay accumulation (Bt). Others are humic acids (Bh), iron oxides (Bir), and combinations of humic acids and iron oxides (Bhir). The relationship between natural drainage and the subsoil textures is shown in table 18.

The lower boundary of the B horizon can often be identified by a change to a lighter color and a coarser material in the C horizon. The C horizon is made of the parent material and does not show direct effects of soil forming processes.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*10*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Adelphia series

The soils of the Adelphia series are fine-loamy, mixed, mesic Aquic Hapludults. These deep, moderately well drained or somewhat poorly drained soils formed in acid, loamy Coastal Plain sediments containing 10 to 40 percent glauconite. Adelphia soils are in depressional areas and on low divides and side slopes. Slope ranges from 0 to 3 percent. The native vegetation includes red oak, white oak, scarlet oak, black oak, hickories, beech, ash, yellow-poplar, sweetgum, and pin oak.

Typical pedon of Adelphia fine sandy loam, 0 to 3 percent slopes, in Plumstead Township, 0.8 mile south of the intersection of County Road 537 and Hornerstown Road, 800 feet east of Hornerstown Road:

Ap—0 to 11 inches, dark grayish brown (2.5Y 4/2) fine sandy loam; weak fine granular structure; friable; many fine roots; less than 10 percent glauconite; slightly acid; abrupt smooth boundary.

B1—11 to 22 inches, light olive brown (2.5 5/6) fine sandy loam; weak fine subangular blocky structure; friable; slightly plastic; common fine roots; less than 10 percent glauconite; strongly acid; clear smooth boundary.

B21t—22 to 28 inches, olive (5Y 5/6) sandy clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable, sticky and plastic; common fine roots; sand grains bridged with clay; 20 percent glauconite; very strongly acid; clear smooth boundary.

B22t—28 to 34 inches, light olive gray (5Y 6/2) sandy clay loam; many medium prominent reddish yellow (7.5YR 6/8) mottles; moderate medium subangular blocky structure; firm, sticky and plastic; few fine roots; sand grains bridged with clay; 25 percent glauconite; very strongly acid; clear smooth boundary.

C—34 to 60 inches, stratified olive (5Y 4/4) loamy sand and yellowish brown (10YR 5/6) sandy clay loam; common medium prominent light gray (2.5Y 7/2) mottles; single grain or massive; loose or firm; 35 percent glauconite; very strongly acid.

The solum thickness ranges from 28 to 40 inches. Coarse fragments of rounded quartzose gravel make up less than 5 percent of the profile. Unless the soil has been limed, reaction is extremely acid in the A horizon and strongly to very strongly acid in the B and C horizons.

The Ap horizon has hue of 2.5Y or 10YR, value of 3 or 4, and chroma of 2.

The B horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 4 or 6. Mottles have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 or 8. In some pedons the lower part of the B horizon has olive gray matrix colors. The B horizon is fine sandy loam and sandy clay loam.

The C horizon has hue of 5Y, value of 4 or 5, and chroma of 4. Mottles mainly have hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 6 or 8. Some mottles have hue of 2.5Y or 5Y, value of 6 or 7, and chroma of 2. In most places, the C horizon consists of strata of loamy sand, sandy loam, and sandy clay loam 1/2 inch to 2 inches thick.

Atsion series

The soils of the Atsion series are sandy, siliceous, mesic Aeric Haplaquods. These poorly drained soils formed in acid, sandy Coastal Plain sediments. Atsion soils are in depressional areas and on broad flats. Slopes are less than 2 percent. The natural vegetation consists of pitch pine, red maple, blackgum, swamp white oak, sweetgum, and willow oak and a dense understory of highbush blueberry, sheep laurel, sweet pepperbush, inkberry, and greenbrier. There are a few holly plants where fires are not common.

Typical pedon of Atsion sand, in Jackson Township, 1-1/2 miles northwest of the intersection of Fish and Frank Applegate Roads, 1,500 feet southwest of Frank Applegate Road:

A1—0 to 5 inches, black (10YR 2/1) sand; very weak medium granular structure; very friable; many fine and medium roots; extremely acid; abrupt wavy boundary.

A2—5 to 18 inches, light gray (10YR 7/1) sand; single grain; loose; common fine and medium roots; extremely acid; clear smooth boundary.

B2h—18 to 24 inches, dark reddish brown (5YR 3/2) loamy sand; massive; firm; weakly cemented; few medium roots; very strongly acid; clear smooth boundary.

Cg—24 to 60 inches, light gray (10YR 6/1) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 20 to 40 inches. Depth to the Bh horizon ranges from 16 to 24 inches. In some pedons there is more than one Bh horizon. Coarse fragments of rounded quartzose gravel make up 0 to 10 percent of the profile. Unless the soil has been limed, reaction ranges from extremely acid to very strongly acid throughout the profile.

The A1 and A2 horizons have hue of 10YR or 2.5Y. The A1 horizon has value of 2 or 3 and chroma of 0 or 1. The A2 horizon has value of 6 or 7 and chroma of 1 or 2. Where present, the Ap horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 1 or 2.

The Bh horizon has hue of 5YR or 7.5YR, value of 2 or 3, and chroma of 2 or 3. It is loamy sand or sand.

The C horizon has hue of 10YR, value of 5 to 7, and chroma of 1 or 2. It is dominantly sand or loamy sand, but at a depth of more than 40 inches it is sandy loam and sandy clay loam stratified with the sandier textures.

Aura series

The soils of the Aura series are fine-loamy, mixed, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments. The Aura soils are on divides and side slopes at high positions on the landscape. Slopes range from 2 to 5 percent. The natural vegetation consists of black oak, white oak, scarlet oak, chestnut oak, and pitch pine and an understory of scrub oak, mountain laurel, and lowbush blueberry.

Typical pedon of Aura sandy loam, 2 to 5 percent slopes, in Union Township, 0.8 mile northeast of the intersection of N.J. route 72 and County route 532, 100 feet south of route 532:

A1—0 to 1 inch, dark grayish brown (10YR 4/2) sandy loam; weak medium granular structure; very friable; many fine roots; 5 percent quartzose gravel; extremely acid; abrupt smooth boundary.

A2—1 to 3 inches, grayish brown (10YR 5/2) sandy loam; weak medium granular structure; very friable; many fine and medium roots; 5 percent quartzose gravel; extremely acid; abrupt smooth boundary.

A3—3 to 16 inches, yellowish brown (10YR 4/6) sandy loam; weak medium subangular blocky structure; friable; common medium roots; 10 percent quartzose pebbles; extremely acid; clear smooth boundary.

IIB21t—16 to 21 inches, yellowish red (5YR 5/6) sandy clay loam; weak coarse subangular blocky structure; very firm; few medium roots; thick clay bridges; 5 percent quartzose pebbles; very strongly acid; gradual smooth boundary.

IIB22t—21 to 36 inches, yellowish red (5YR 5/6) sandy clay loam; massive; very firm; roots confined mainly to vertical cracks; thick clay bridges; 5 percent quartzose pebbles; very strongly acid; clear smooth boundary.

IIIB23t—36 to 50 inches, yellowish red (5YR 5/8) sandy loam; massive; firm; roots confined mainly to vertical cracks; clay bridging; 5 percent quartzose pebbles; very strongly acid; clear smooth boundary.

IIIC—50 to 72 inches, yellowish red (5YR 5/8) loamy sand; single grain; loose; 5 percent quartzose pebbles; very strongly acid.

The solum thickness ranges from 40 to 70 inches. Depth to the subsoil ranges from 15 to 30 inches and averages about 25 inches. Coarse fragments of quartzose gravel make up about 5 to 20 percent of the solum and 5 to 30 percent of the C horizon. Unless limed, the profile is extremely acid or very strongly acid.

All parts of the A horizon have hue of 10YR or 7.5YR. The A1 horizon has value of 3 or 4 and chroma of 2. The A2 horizon has value of 5 and chroma of 2 or 3. Where present, the Ap horizon has value of 3 or 4 and chroma of 2.

The B2t horizon has hue of 10YR to 5YR, value of 5, and chroma of 6 or 8. It is sandy loam, sandy clay loam, gravelly sandy loam, or gravelly sandy clay loam. Consistence is firm to extremely firm when moist and very hard to extremely hard when dry.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 5 or 6, and chroma of 6 or 8. It is sand, loamy sand,

sandy loam, gravelly sand, gravelly loamy sand, and gravelly sandy loam.

Berryland series

The soils of the Berryland series are sandy, siliceous, mesic Typic Haplaquods. These very poorly drained soils formed in acid, sandy Coastal Plain sediments. Berryland soils are in wide, depressional areas and on broad flats that are at the lowest position on the landscape. The soils are subject to rare to frequent flooding. Slopes are less than 2 percent. The natural vegetation consists of pitch pine, Atlantic white-cedar, blackgum, red maple, and sweetgum and a dense understory of holly, sweet pepperbush, highbush blueberries, sweet bay, and inkberry.

Typical pedon of Berryland sand, in Jackson Township, 2.75 miles south of Cassville, on County road 571, 1 mile northeast along power line:

A1—0 to 11 inches, black (10YR 2/1) sand; weak medium granular structure; very friable; 5 percent quartzose pebbles; extremely acid; clear smooth boundary.

A2g—11 to 15 inches, gray (10YR 5/1) sand; single grain; loose; 5 percent quartzose pebbles; very strongly acid; abrupt smooth boundary.

B2h—15 to 24 inches, very dark brown (10YR 2/2) loamy sand; massive; slightly firm, weakly cemented; common roots; 5 percent quartzose pebbles; very strongly acid; abrupt smooth boundary.

B3g—24 to 35 inches, light brownish gray (10YR 6/2) sand; single grain; loose; few roots; 5 percent quartzose pebbles; very strongly acid; clear smooth boundary.

Cg—35 to 60 inches, light gray (10YR 7/2) sand; single grain; loose; 10 percent quartzose pebbles; very strongly acid.

The solum thickness ranges from 28 to 40 inches. Depth to the Bh horizon ranges from 10 to 16 inches. Some pedons have more than one Bh horizon. Coarse fragments of rounded quartzose gravel make up 0 to 10 percent of the solum. In some pedons, parts of the C horizon are as much as 20 percent coarse fragments. Unless the soil has been limed, reaction is extremely acid in the A horizon and strongly acid to very strongly acid in the B and C horizons.

The A1 and A2 horizons have hue of 10YR. The A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 5 or 6 and chroma of 1. Some pedons do not have an A2 horizon.

The Bh horizon has hue of 5YR to 10YR, value of 2 or 3, and chroma of 2. Consistence is firm or very firm when moist and hard when dry. The horizon is loamy sand or sand. The B3 horizon has hue of 10YR, value of 5 or 6, and chroma of 2.

The C horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. It is mainly sand or gravelly sand. Below a depth of 40 inches it is sandy loam and sandy clay loam commonly stratified with the sandier textures.

Collington series

The soils of the Collington series are fine-loamy, mixed, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments generally containing substantial amounts of glauconite. Collington soils are on divides and side slopes. Slope ranges from 0 to 10 percent. The native vegetation is red oak, black oak, white oak, yellow-poplar, hickories, ash, and beech and an understory of viburnums.

Typical pedon of Collington fine sandy loam, 0 to 2 percent slopes, in Plumstead Township, 1 mile west of intersection of County roads 539 and 528, 50 feet north of 528:

Ap—0 to 12 inches, dark brown (10YR 4/3) fine sandy loam; weak fine granular structure; friable; many roots; less than 10 percent glauconite; slightly acid; clear smooth boundary.

A2—12 to 15 inches, brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; common roots; less than 10 percent glauconite; strongly acid; clear smooth boundary.

B2t—15 to 28 inches, dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable, sticky and plastic when wet, hard when dry; common pores; common roots; thin patchy clay films on faces of peds; 20 percent glauconite; strongly acid; clear smooth boundary.

B3—28 to 42 inches, brown (7.5YR 5/4) sandy loam; weak medium subangular blocky structure; friable; few roots; sand grains bridged with clay; 20 percent glauconite; very strongly acid; clear smooth boundary.

C—42 to 60 inches, olive yellow (2.5Y 5/6) stratified sand and sandy loam; single grain or massive; loose or very friable; 30 percent glauconite; very strongly acid.

The solum thickness ranges from 28 to 44 inches but is dominantly 35 to 44 inches. Unless the soil has been limed, reaction is extremely acid in the A horizon and strongly acid to very strongly acid in the B and C horizons.

The A horizon has hue of 10YR or 7.5YR. The Ap horizon has value of 4 and chroma of 2 or 3. The A2 horizon has value of 4 or 5 and chroma of 3 or 4.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4. It is sandy clay loam, loam, or heavy sandy loam.

The C horizon has hue of 2.5Y, value of 5, and chroma of 4 or 6. In many pedons, the C horizon con-

sists of strata of sand and sandy loam 1/2 inch to 2 inches thick.

Downer series

The soils of the Downer series are coarse-loamy, siliceous, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments. Downer soils are on divides and side slopes. Slope ranges from 0 to 5 percent but is dominantly 2 to 5 percent. The natural vegetation includes white oak, black oak, chestnut oak, and a few pitch pines, shortleaf pines, and Virginia pines. The understory is lowbush blueberry, laurel, and bracken fern.

Typical pedon of Downer loamy sand, 0 to 5 percent slopes, in Stafford Township, 200 feet southeast of the Garden State Parkway, 50 feet south of Oxycocus Road:

A1—0 to 2 inches, grayish brown (10YR 5/2) loamy sand; weak fine granular structure; very friable; many fine roots; extremely acid; abrupt smooth boundary.

A2—2 to 16 inches, brown (10YR 5/3) loamy sand; weak fine granular structure; very friable; many medium roots, extremely acid; abrupt smooth boundary.

B2t—16 to 24 inches, yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; common medium roots; clay bridging between sand grains; very strongly acid; clear smooth boundary.

B3—24 to 31 inches, yellowish brown (10YR 5/6) light sandy loam; weak fine subangular blocky structure; very friable; few medium roots; very strongly acid; clear wavy boundary.

C—31 to 60 inches, brownish yellow (10YR 6/6) sand; single grain; loose; few medium roots; very strongly acid.

The solum thickness ranges from 24 to 38 inches but is dominantly 28 to 36 inches. Coarse fragments of rounded quartzose gravel make up 0 to 35 percent of the solum and up to 50 percent of the C horizon. Unless the soil has been limed, reaction is extremely acid in the A horizon and strongly acid to very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 10YR or 2.5Y. The A1 horizon has value of 2 to 5 and chroma of 1 to 3. The A2 horizon has value of 5 to 7 and chroma of 2 to 6. In cultivated areas, the Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is loamy sand, sandy loam, or gravelly sandy loam.

The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. It is dominantly sandy loam and gravelly sandy loam, but is loamy sand or gravelly loamy sand in subhorizons of some pedons.

The C horizon has a hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 6 or 8. It is mainly sand, loamy sand, gravelly sand, or gravelly loamy sand. In some pedons, below a deph of 40 inches it has strata of sandy loam and sandy clay loam.

Evesboro series

The soils of the Evesboro series are mesic, coated Typic Quartzipsamments. These deep, excessively drained soils formed in acid, sandy Coastal Plain sediments. Evesboro soils are on divides and side slopes. Slope ranges from 0 to 15 percent but is dominantly 2 to 5 percent. The natural vegetation includes chestnut oak, post oak, blackjack oak, white oak, black oak, and pitch pine and an understory of lowbush blueberry and bracken fern.

Typical pedon of Evesboro sand, 0 to 5 percent slopes, in Jackson Township, 1.1 miles northwest of the intersection of Brewers Bridge Road and Cooks Bridge Road, 30 feet northeast of Cooks Bridge Road:

A1—0 to 1 inch, grayish brown (10YR 5/2) sand; single grain; loose; many fine roots; extremely acid; abrupt smooth boundary.

A2—1 to 9 inches, brown (10YR 5/3) sand; single grain; loose; many medium roots, extremely acid; clear smooth boundary.

B—9 to 33 inches, yellowish brown (10YR 5/6) sand; single grain; loose; common medium roots; very strongly acid; gradual smooth boundary.

C—33 to 60 inches, yellow (10YR 7/6) sand; single grain; loose; few medium roots; very strongly acid.

The solum thickness ranges from 32 to 44 inches and averages about 40 inches. Coarse fragments of rounded quartzose pebbles make up 0 to 10 percent of the solum. Unless the soils have been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons. In Jackson and Plumstead Townships, Evesboro soils have a profile of loamy fine sand and fine sand.

All parts of the A horizon have hue of 10YR. The A1 horizon has value of 2 to 5 and chroma of 1 or 2. The A2 horizon has value of 5 or 6 and chroma of 2 or 3. Where the soil is cultivated, the Ap horizon has value of 4 or 5 and chroma of 2.

The B horizon has hue of 10YR, value of 5 or 6, and chroma of 6 or 8. It is sand or loamy sand.

The C horizon has hue of 10YR, value of 6 or 7, and chroma of 3, 4, or 6.

Fripp series

The soils of the Fripp series are mixed, thermic Typic Udipsamments. These deep, excessively drained soils formed in sandy coastal dune sediments. Fripp soils are

on divides and side slopes. Slope ranges from 2 to 10 percent. The natural vegetation includes beach plum, wild cherry, eastern redcedar, and American holly and an understory of bayberry, smooth sumac, poison ivy, greenbrier, beach heather, and prickly-pear cactus.

Fripp soils as mapped in Ocean County are taxadjuncts to the series because soil temperature and pH value are lower than defined for the series. In Ocean County, soils in the Fripp series are mixed, mesic Typic Udipsamments.

Typical pedon of Fripp fine sand, 2 to 10 percent slopes, in Island Beach Boro, 4.1 miles south of the entrance to Island Beach State Park, 200 feet east of Central Avenue:

A1—0 to 3 inches, light brownish gray (10YR 6/2) fine sand; single grain; loose; many fine roots; 5 percent black (N 2/0) and dark brown (10YR 3/2) sand grains; strongly acid; abrupt smooth boundary.

C1—3 to 10 inches, very pale brown (10YR 8/3) fine sand; single grain; loose; common medium roots; 5 percent black and dark brown sand grains; strongly acid; clear smooth boundary.

C2—10 to 46 inches, very pale brown (10YR 7/3) fine sand; single grain; loose; few medium roots; 5 percent black and dark brown sand grains; medium acid; gradual smooth boundary.

C3—46 to 60 inches, white (10YR 8/2) fine sand; single grain; loose; 5 percent black and dark brown sand grains; slightly acid.

The depth to the underlying white sand ranges from 36 to 50 inches. The reaction of the profile ranges from strongly acid to slightly acid.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 2.

The C horizon has hue of 10YR or 2.5Y. The upper part of the C horizon has value of 7 or 8 and chroma of 3 or 4. The lower part has value of 7 or 8 and chroma of 1 or 2. The C horizon is fine sand and sand.

Hammonton series

The soils of the Hammonton series are coarse-loamy, siliceous, mesic Aquic Hapludults. These deep, moderately well drained or somewhat poorly drained soils formed in acid, loamy Coastal Plain sediments. Hammonton soils are in depressional areas and on low divides and side slopes. Slope ranges from 0 to 5 percent but is dominantly 0 to 2 percent. The natural vegetation consists of white oak, southern red oak, and black oak and an understory of lowbush blueberry, greenbrier, mountain laurel, sheep laurel, inkberry, and holly.

Typical pedon of Hammonton sandy loam, 0 to 3 percent slopes, in Manchester Township, 500 feet south of the intersection of County road 571 and Alligator Road, 50 feet west of Alligator Road:

Ap—0 to 10 inches, dark grayish brown (10YR 4/2) sandy loam; moderate fine granular structure; very friable; many fine roots; 1 percent quartzose pebbles; slightly acid; gradual wavy boundary.

B2t—10 to 28 inches, yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; common fine roots; 10 percent quartzose pebbles; sand grains bridged with clay; very strongly acid; clear smooth boundary.

B3—28 to 35 inches, yellowish brown (10YR 5/6) loamy sand; common medium distinct light brownish gray (10YR 6/2) mottles; weak fine granular structure; very friable; few fine roots; very strongly acid; clear smooth boundary.

C1—35 to 48 inches, brownish yellow (10YR 6/8) sand; common medium distinct light gray (10YR 7/2) mottles; single grain; loose; very strongly acid; gradual wavy boundary.

C2—48 to 60 inches, light gray (10YR 7/2) sand; common coarse prominent brownish yellow (10YR 6/8) mottles; single grain; loose; very strongly acid.

The solum thickness ranges from 20 to 35 inches. Coarse fragments of quartzose gravel make up less than 10 percent of the solum and less than 30 percent of the C horizon. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 10YR or 2.5Y. The A1 horizon has value of 3 or 4 and chroma of 2. Where present, the Ap horizon has value of 3 or 4 and chroma of 2 and the A2 horizon has value of 4 to 6 and chroma of 4 to 6. The A horizon is loamy sand or sandy loam.

The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 4 or 6. The lower part of the B horizon has mottles with value of 5 or 6 and chroma of 2. The B horizon mainly is sandy loam. Some pedons have a B3 horizon of loamy sand.

The C horizon has hue of 10YR or 2.5Y. The upper part of the C horizon has value of 6 or 7 and chroma of 6 or 8 and has mottles with value of 6 or 7 and chroma of 2. The lower part of the C horizon has value of 6 or 7 and chroma of 2 and has mottles with value of 5 or 6 and chroma of 6 or 8. The stratified horizons are dominantly loamy sand, sand, gravelly loamy sand, and gravelly sand. Below a depth of 40 inches, some pedons are sandy loam or sandy clay loam stratified with coarser textures.

Humaquepts

Humaquepts in Ocean County consist of deep, very poorly drained to somewhat poorly drained soils on flood plains that are flooded several times each year. The soils formed in stratified sandy or loamy sediments of fluvial origin. Slopes range from 0 to 2 percent.

Because of the variability of these soils, a typical pedon is not given. The solum ranges from 20 to 60 inches thick. Pebbles make up 0 to 30 percent of some lower parts of the soil. The soils are extremely acid to strongly acid.

The A horizon dominantly has hue of 7.5YR to 2.5Y, value of 2 or 3, and chroma of 1 or 2. It ranges from loamy sand to loam and their gravelly analogues. It is 4 to 20 inches thick.

The B horizon has hue of 10YR to 2.5Y, value of 5 or 6, and chroma of 1 to 3. The B horizon of some polypedons has yellowish brown mottles below a depth of 20 inches. The B horizon is friable or very friable loamy sand or sandy loam. It ranges from 10 to more than 40 inches thick.

Keyport series

The soils of the Keyport series are clayey, mixed, mesic Aquic Hapludults. These deep, moderately well drained soils formed in acid, clayey Coastal Plain sediments. Keyport soils are on low divides, on side slopes, and in depressional areas. Slope ranges from 0 to 4 percent. The natural vegetation is dominantly white oak, scarlet oak, black oak, and pin oak and an understory of mountain laurel, sheep laurel, and holly.

Typical pedon of Keyport sandy loam, 0 to 4 percent slopes, in Little Egg Harbor Township, 3.5 miles west of Tuckerton on Nugentown Road, 500 feet northeast of Nugentown Road along the boundary of the Bass River State Forest:

Ap—0 to 9 inches, dark brown (10YR 4/3) sandy loam; weak medium granular structure; very friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

B1—9 to 15 inches, light yellowish brown (2.5Y 6/4) loam; weak medium subangular blocky structure; friable; common medium roots; very strongly acid; clear smooth boundary.

B21t—15 to 21 inches, reddish yellow (7.5YR 6/8) silty clay loam; moderate medium subangular blocky structure; firm; few medium roots; thin continuous clay films on ped faces; very strongly acid; clear smooth boundary.

B22t—21 to 30 inches, yellowish brown (10YR 5/8) silty clay; common medium distinct light gray (10YR 6/1) mottles; strong coarse angular blocky structure; very firm; thick clay films on ped faces; very strongly acid; clear smooth boundary.

B23t—30 to 48 inches, light gray (10YR 6/1) silty clay; common medium distinct strong brown (7.5YR 5/8) mottles; strong coarse angular blocky structure; very strongly acid; gradual smooth boundary.

C1—48 to 62 inches, light gray (10YR 7/1) silty clay; many coarse prominent brownish yellow (10YR 6/8) mottles; massive; very firm; very strongly acid; gradual wavy boundary.

C2—62 to 81 inches, brownish yellow (10YR 6/8) silty clay loam; many coarse prominent light gray (10YR 7/1) mottles; massive; firm; very strongly acid.

The solum thickness ranges from 40 to 60 inches. Coarse fragments of rounded quartzose pebbles make up less than 3 percent of the profile. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 10YR. The A1 horizon has value of 4 and chroma of 2 or 3. Where present, the Ap horizon has value of 4 and chroma of 2 or 3 and the A2 horizon has value of 5 and chroma of 2 or 3.

The B horizon has hue of 7.5YR, 10YR, or 2.5Y. The upper part of the B horizon has value of 5 or 6 and chroma of 4, 6, or 8. The lower part has value of 5 or 6 and chroma of 1, 2, 6, or 8. The B1 horizon is loam or sandy loam, and the B2t horizon is silty clay or heavy silty clay loam.

The C horizon has a hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 1, 2, 6, or 8. It is dominantly silty clay, silty clay loam, or clay loam. In some pedons, it is sandier below a depth of 40 inches.

Klej series

The soils of the Klej series are mesic, coated Aquic Quartzipsamments. These deep, moderately well drained or somewhat poorly drained soils formed in acid, sandy Coastal Plain sediments. The Klej soils are in depressional areas and on low divides. Slope ranges from 0 to 3 percent. The natural vegetation consists of black oak, pin oak, scarlet oak, white oak, southern red oak, blackgum, pitch pine, and Virginia pine and an understory of lowbush blueberries, sheep laurel, inkberry, and holly. Where wildfires have been severe, pitch pine is the dominant tree.

Typical pedon of Klej loamy sand, 0 to 3 percent slopes, in Berkeley Township, 500 feet east of the intersection of U.S. Highway 9 and J.F. Kennedy Boulevard, 200 feet south of J.F. Kennedy Boulevard:

A1—0 to 2 inches, very dark grayish brown (10YR 3/2) loamy sand; very weak fine granular structure; very friable; many fine roots; extremely acid; abrupt smooth boundary.

A2—2 to 5 inches, brownish gray (10YR 5/2) loamy sand; single grain; loose; many fine and medium roots; very strongly acid; abrupt smooth boundary.

B21—5 to 30 inches, brownish yellow (10YR 6/6) loamy sand; single grain; loose; common medium roots; very strongly acid; clear smooth boundary.

B22—30 to 38 inches, yellow (10YR 7/6) loamy sand; common medium distinct light gray (10YR 7/2) mot-

tles; single grain; loose; few medium roots; very strongly acid; gradual smooth boundary.

C—38 to 60 inches, light gray (10YR 7/2) sand; common medium prominent yellowish brown (10YR 5/6) mottles; single grain; loose; very strongly acid; gradual smooth boundary.

The solum thickness ranges from 20 to 40 inches. Depth to low-chroma mottles ranges from 18 to 36 inches and averages about 30 inches. Coarse fragments of rounded quartzose gravel make up less than 5 percent of the solum and less than 10 percent of the C horizon. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizon.

All parts of the A horizon have hue of 10YR or 2.5Y. The A1 horizon has value of 3 or 4 and chroma of 2. Where present, the Ap horizon has value of 3 or 4 and chroma of 2. The A2 horizon has value of 5 to 7 and chroma of 2.

The B horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 4 or 6. It is loamy sand and sand.

The C horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 to 6. It has mottles with value of 5 to 7 and chroma of 4 to 6 or chroma of 2. It is dominantly loamy sand or sand to a depth of 40 inches and has stratified sandy loam to sandy clay loam below a depth of 40 inches.

Kresson series

The soils of the Kresson series are clayey, glauconitic, mesic Aquic Hapludults. These deep, somewhat poorly drained soils formed in acid, clayey Coastal Plain sediments containing more than 40 percent glauconite. Kresson soils are in depressional areas and on low divides and side slopes. Slope ranges from 0 to 3 percent. The native vegetation includes pin oak, black oak, white oak, southern red oak, hickories, beech, ash, eastern redcedar, and Virginia pine.

Typical pedon of Kresson fine sandy loam, 0 to 3 percent slopes, in Plumstead Township, 1/2 mile northeast of the intersection of New Egypt-Allentown Road and County road 537, 50 feet south of County road 537:

Ap—0 to 11 inches, olive gray (2.5Y 4/2) fine sandy loam; moderate medium granular structure; friable; many fine roots; 20 percent glauconite; slightly acid; abrupt smooth boundary.

B21t—11 to 18 inches, olive (5Y 4/4) sandy clay; common medium distinct yellowish red (5YR 4/6) mottles; moderate to strong coarse prismatic structure parting to strong medium angular blocky; very firm; slightly sticky and very plastic when wet; common fine roots; thin continuous clay films on faces of peds; more than 40 percent glauconite; very strongly acid; gradual smooth boundary.

B22t—18 to 32 inches, grayish green (5G 4/2) sandy clay; common medium distinct olive (5Y 5/6) mottles; strong medium prismatic structure parting to strong medium angular blocky; very firm, slightly sticky and plastic when wet; few medium roots; thin continuous clay films on faces of peds; more than 40 percent glauconite; very strongly acid; clear smooth boundary.

C1—32 to 43 inches, stratified grayish green (5G 4/2) sandy clay and olive (5Y 4/4) fine sandy loam; common medium prominent dark reddish brown (5YR 3/4) mottles; massive; friable when moist, sticky and plastic when wet; 40 to 60 percent glauconite; very strongly acid; clear smooth boundary.

C2—43 to 48 inches, olive (5Y 4/4) fine sandy loam; few thin strata of grayish green (5G 4/2) sandy clay; massive; friable; 40 to 50 percent glauconite; very strongly acid; abrupt smooth boundary.

C3—48 to 60 inches, yellowish red (5YR 4/6) sandy clay; many coarse prominent grayish green (5G 4/2) mottles; massive; firm when moist, very plastic when wet; 40 to 60 percent glauconite; very strongly acid.

The solum thickness ranges from 24 to 40 inches but is dominantly 28 to 36 inches. Coarse fragments of rounded quartzose gravel make up less than 10 percent of the profile. Unless the soil has been limed, reaction is extremely acid in the A horizon and ranges to strongly acid in the B and C horizons.

The Ap horizon has hue of 5Y or 2.5Y, value of 3 or 4, and chroma of 2.

The Bt horizon has hue of 5Y, 5GY, or 5G, value of 4, and chroma of 2 to 4. It has mottles with hue of 5YR to 5Y, value of 3 to 5, and chroma of 4 to 6. It is clay, sandy clay, and heavy sandy clay loam.

The C horizon is similar to the Bt horizon in color. Some pedons have strata with hue of 5YR, value of 4, and chroma of 6. Mottles have hue of 5YR, 5Y, or 5G, value of 3 or 4, and chroma of 2 to 4. In some pedons, the C horizon consists of strata of fine sandy loam and sandy clay.

Lakehurst series

The soils of the Lakehurst series are mesic, coated Haplaquodic Quartzipsamments. These deep, moderately well drained or somewhat poorly drained soils formed in acid, sandy Coastal Plain sediments. The Lakehurst soils are in depressional areas and on low divides. Slope ranges from 0 to 3 percent. The natural vegetation consists of pitch pine, shortleaf pine, white oak, black oak, and black gum. The understory vegetation consists of scrub oak, lowbush blueberry, sheep laurel, and inkberry. Where wild fires have been severe, blackjack oak and scrub oak are the dominant oaks.

Typical pedon of Lakehurst sand, 0 to 3 percent slopes, in Manchester Township, 1/2 mile west of Pasedena, 40 feet northeast of North Branch Road:

O1—1 inch to 0, partly decomposed leaf litter, many fine roots; extremely acid; abrupt smooth boundary.
A1—0 to 2 inches, very dark gray (10YR 3/2) sand; single grain; loose; many fine roots; extremely acid; clear wavy boundary.
A2—2 to 12 inches, gray (10YR 6/1) sand; single grain; loose; common medium roots; extremely acid; abrupt irregular boundary.
B21h—12 to 14 inches, dark brown (7.5YR 4/2) sand; massive; firm; common medium roots; very strongly acid; clear irregular boundary.
B22—14 to 24 inches, yellowish brown (10YR 5/6) sand; single grain; loose; few medium roots; very strongly acid; clear wavy boundary.
B3—24 to 46 inches, light yellowish brown (2.5Y 6/4) sand; common medium distinct light gray (2.5Y 7/2) mottles; single grain; loose; few medium roots; very strongly acid; gradual smooth boundary.
Cg—46 to 60 inches, light gray (2.5Y 7/2) sand; common medium distinct yellowish brown (10YR 5/6) mottles; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 50 inches. Depth to the low-chroma mottles ranges from 18 to 40 inches and averages about 25 inches. Coarse fragments of rounded quartzose gravel make up less than 10 percent of the profile. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 10YR or 2.5Y. The A1 horizon has value of 2 to 4 and chroma of 1 or 2. Where present, the Ap horizon has value of 5 and chroma of 2. The A2 horizon has value of 6 or 7 and chroma of 1 or 2.

The B horizon has hue of 5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 6. Mottles have value of 4 through 7 and chroma of 1 to 3. The B horizon is loamy sand or sand.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 7, and chroma of 2 to 8. Mottles have a value of 6 or 7 and chroma of 2. The C horizon is dominantly sand or fine sand, but in some pedons strata of sandy loam to clay are below a depth of 40 inches.

Lakewood series

The soils of the Lakewood series are mesic, coated Spodic Quartzipsamments. These deep, excessively drained soils formed in acid, sandy Coastal Plain sediments. Lakewood soils are on divides and side slopes. Slope ranges from 0 to 10 percent but is dominantly 0 to 5 percent. The natural vegetation includes pitch pine, blackjack oak, post oak, chestnut oak, white oak, and black oak and an understory of lowbush blueberry and scrub oak.

Typical pedon of Lakewood sand, 0 to 5 percent slopes, in Lakewood Township, 0.9 mile west of the Garden State Parkway on N.J. Highway 70, 150 feet west of Beth Am Cemetery, 30 feet north of N.J. Highway 70:

A1—0 to 1 inch, black (10YR 2/1) sand; single grain; loose; common fine roots; extremely acid; clear broken boundary.
A2—1 to 10 inches, light brownish gray (10YR 6/2) sand; single grain; loose; few medium roots; extremely acid; gradual irregular boundary.
B2h—10 to 14 inches, yellowish brown (10YR 5/4) sand; single grain; loose; common medium roots; tongues of A2 horizon 1 to 3 feet apart; extremely acid; gradual wavy boundary.
B3—14 to 36 inches, yellowish brown (10YR 5/6) sand; single grain; loose; few medium roots; very thin coatings on most grains; extremely acid; diffuse wavy boundary.
C—36 to 60 inches, brownish yellow (10YR 6/6) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 50 inches. The profile is sand. Coarse fragments of rounded quartzose pebbles make up 0 to 15 percent of the profile. Unless the soil has been limed, the A and B horizons are very strongly acid to extremely acid and the C horizon is very strongly acid.

The A horizon has hue of 10YR. The A1 horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 6 or 7 and chroma of 1 or 2.

The B horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8.

The C horizon has hue of 2.5Y or 10YR, value of 6 or 7, and chroma of 4 or 6. In some pedons the part of the C horizon below a depth of 40 inches has strata of sandy loam or sandy clay loam.

Manahawkin series

The soils of the Manahawkin series are sandy or sandy-skeletal, siliceous, euic, mesic Terric Medisaprists. These very poorly drained soils formed in acid organic material derived from woody plants. Manahawkin soils are in stream valleys, in wide depressional areas, and on broad flats at the lowest position on the landscape. Slope is less than 2 percent. The natural vegetation consists of Atlantic white-cedar, red maple, blackgum, sweetgum, sweetbay, and pitch pine and a dense understory of sweet pepperbush, highbush blueberries, inkberry, and greenbrier.

Typical pedon of Manahawkin muck, in Berkeley Township, 0.6 mile southwest of the intersection of

Double Trouble and Keswick Roads, on an unnamed dirt road, 50 feet southeast of the dirt road:

Oa1—0 to 8 inches, black (5YR 2/1) muck (sapric material); about 10 percent fibers, less than 2 percent rubbed; moderate medium granular structure; many fine roots; primarily herbaceous material, trace of woody fragments; about 85 percent organic material; extremely acid; clear wavy boundary.

Oa2—8 to 20 inches, black (5YR 2/1) muck (sapric material); about 5 percent fibers, less than 2 percent rubbed; weak medium granular structure; many fine roots; mixture of woody and herbaceous materials; about 95 percent organic matter; 2 percent soft woody coarse fragments which break down when rubbed; very strongly acid; gradual wavy boundary.

Oa3—20 to 30 inches, black (5YR 2/1) muck (sapric material); about 15 percent fibers, less than 2 percent rubbed; weak medium granular structure; common fine and medium roots; dominantly derived from woody materials; about 95 percent organic matter; 10 percent soft woody coarse fragments up to 1 inch in diameter which break down when rubbed; very strongly acid; gradual wavy boundary.

Oa4—30 to 39 inches; black (5YR 2/1) muck (sapric material); about 10 percent fibers, less than 2 percent rubbed; massive; few medium roots; dominantly derived from woody materials; about 90 percent organic matter; 30 percent woody coarse fragments up to 2 inches in diameter which break down when rubbed; very strongly acid; abrupt smooth boundary.

IIC1—39 to 46 inches; gray (10YR 5/1) sand; single grain; loose; very strongly acid; abrupt smooth boundary.

IIC2—46 to 60 inches; gray (10YR 6/1) gravelly sand; single grain; loose; 20 percent quartzose pebbles; very strongly acid.

The depth to the IIC horizon ranges from 16 to 51 inches. The organic material is primarily derived from woody plants. Some horizons are dominantly derived from herbaceous plants. Some pedons contain horizons that are as much as 50 percent woody fragments consisting of twigs, branches, or logs ranging from 1/8 inch to 20 inches in diameter. Most woody fragments, with the exception of large fragments, are in an advanced stage of decay and break down completely when rubbed. The percent of mineral matter ranges from 5 to 65 percent. Unless the soil has been limed, reaction is extremely acid to very strongly acid in the Oa1 horizon and very strongly acid to strongly acid in the Oa2, Oa3, Oa4, and IIC horizons.

The Oa horizon is neutral or has hue of 5YR or 10YR. The Oa1 horizon has value of 2 or 3 and chroma of 0 or 1. The Oa2, Oa3, and Oa4 horizons have value of 2 or 3 and chroma of 0 to 2.

The IIC horizon has hue of 10YR or is neutral. The IIC1 horizon has value of 2 to 5 and chroma of 0 or 1. IIC2 horizon has value of 5 or 6 and chroma of 0 or 1.

Mullica series

The soils of the Mullica series are coarse-loamy, siliceous, thermic Typic Umbraquults. These very poorly drained soils formed in acid, loamy Coastal Plain sediments. Mullica soils are in wide depressional areas and on broad flats that are at very low positions on the landscape. Slope is less than 2 percent. The natural vegetation includes blackgum, sweetgum, red maple, sweetbay, swamp white oak, pitch pine, pin oak, willow oak, Atlantic white-cedar, southern red oak, gray birch, and holly. The understory consists mostly of dense highbush blueberry, sweet pepperbush, inkberry, and greenbrier.

Typical pedon of Mullica sandy loam, in Jackson Township, 1 mile northwest of the intersection of County roads 527 and 547, 50 feet north of 527:

O2—3 inches to 0, leaf mull and root material.

A1—0 to 12 inches, black (10YR 2/1) sandy loam; weak medium granular structure; very friable; many fine roots; very strongly acid; abrupt smooth boundary.

B21tg—12 to 16 inches, grayish brown (2.5Y 5/2) sandy loam; weak medium subangular blocky structure; common medium roots; common medium pores; clay bridging between sand grains; very strongly acid; clear smooth boundary.

B22tg—16 to 25 inches, light brownish gray (2.5Y 6/2) sandy loam; few medium distinct light olive brown (2.5Y 5/6) mottles; weak medium subangular blocky structure; friable; few medium roots; common medium pores; clay bridging between sand grains; very strongly acid; clear smooth boundary.

C1g—25 to 36 inches, light brownish gray (2.5Y 6/2) loamy sand; single grain; loose; 5 percent rounded quartzose pebbles; very strongly acid; clear smooth boundary.

C2g—36 to 60 inches, light brownish gray (2.5Y 6/2) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 22 to 36 inches but is dominantly 24 to 30 inches. Coarse fragments of rounded quartzose gravel make up less than 15 percent of the profile. Unless the soil is limed, the surface layer is extremely acid or very strongly acid and the subsoil and substratum are very strongly acid.

The A1 horizon has hue of 10YR to 5Y, value of 2 or 3, and chroma of 1 or 2. It is sandy loam and fine sandy loam.

The Btg horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. Mottles have value of 5 or 6 and chroma of 6 or 8. The horizon is sandy loam and fine sandy loam.

The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 or 2. The C horizon is stratified and normally composed of some combination of sand, loamy sand, loamy fine sand, sandy loam, or loam.

Pemberton series

The soils of the Pemberton series are loamy, mixed, mesic Arenic Hapludults. These deep, moderately well drained or somewhat poorly drained soils formed in acid, loamy Coastal Plain sediments containing 5 to 20 percent glauconite. Pemberton soils are on nearly level divides and gentle side slopes. Slope ranges from 0 to 5 percent but is dominantly 0 to 2 percent. Natural vegetation includes black oak, white oak, pitch pine, and blackgum. The understory consists mostly of highbush blueberry, mountain laurel, sheep laurel, and greenbrier.

Typical pedon of Pemberton sand 0 to 5 percent slopes, in Plumstead Township, 0.3 mile northwest of New Egypt on County road 528, 200 feet east of farm buildings:

Ap—0 to 10 inches, dark grayish brown (2.5Y 4/2) sand; very weak fine granular structure; very friable; many fine roots; less than 10 percent glauconite; slightly acid; abrupt smooth boundary.

A2—10 to 22 inches, light olive brown (2.5Y 5/6) sand; single grain; loose; nearly clean sand grains; common medium roots; less than 10 percent glauconite; strongly acid; clear smooth boundary.

B2t—22 to 36 inches, yellowish brown (10YR 5/6) fine sandy loam; common medium distinct olive gray (5Y 5/2) mottles; weak medium subangular blocky structure; friable; sand grains bridged with clay; few medium roots; less than 10 percent glauconite; very strongly acid; gradual smooth boundary.

C—36 to 60 inches, pale olive (5Y 6/4) stratified sand and sandy loam; common medium distinct dark brown (7.5YR 4/4) mottles; single grain; massive; very friable; 5 percent glauconite; very strongly acid.

The solum thickness ranges from 30 to 36 inches. The thickness of the A horizon ranges from 20 to 28 inches. Unless the soil has been limed, reaction is extremely acid in the A horizon and strongly acid to very strongly acid in the B and C horizons.

The A horizon has hue of 10YR or 2.5Y. The Ap horizon has value of 4 or 5 and chroma of 2. The A2 horizon has value of 5 or 6 and chroma of 4 or 6. Some pedons have an A2 horizon that has mottles with chroma of 2.

The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 4 or 6. Mottles have a hue of 2.5Y or 5Y, value of 5 or 6, and chroma of 2. The horizon is sandy loam and sandy clay loam.

The C horizon has hue of 5Y, value of 6, and chroma of 4 or 6. It consists of strata of sand and sandy loam of variable thickness.

Phalanx series

The soils of the Phalanx series are coarse-loamy, siliceous, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments. The Phalanx soils are mainly on knobs and side slopes, and a few areas are on divides. Slope ranges from 2 to 10 percent. The natural vegetation consists of chestnut oak, black oak, scarlet oak, white oak, and pitch pine and an understory of scrub oak, mountain laurel, and lowbush blueberry.

Typical pedon of Phalanx loamy sand, 2 to 5 percent slopes, in Jackson Township, 0.5 mile west of the intersection of County roads 528 and 571, 85 feet north of 528:

A1—0 to 2 inches, dark brown (7.5YR 3/2) loamy sand; weak medium granular structure; very friable; many fine roots; many medium continuous irregular pores; extremely acid; clear smooth boundary.

A2—2 to 6 inches, reddish brown (5YR 5/3) loamy sand; weak medium granular structure; very friable; many fine and medium roots; many fine continuous irregular pores; extremely acid; gradual wavy boundary.

B1—6 to 12 inches, red (2.5YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; common medium and fine roots; many fine continuous irregular pores; very strongly acid; diffuse wavy boundary.

B21t—12 to 22 inches, red (2.5YR 4/6) sandy loam; weak medium subangular blocky structure; very friable; common medium roots; many fine continuous irregular pores; bridging between sand grains; very strongly acid; gradual wavy boundary.

B22t—22 to 32 inches, red (10R 4/6) channery sandy loam; weak medium subangular blocky structure; friable; common medium roots; common fine continuous irregular pores; bridging between sand grains; 35 percent 1/2-inch to 2-inch indurated continuous but fractured layers of iron-cemented sandstone fragments about 5 inches long and less than 1 inch thick; very strongly acid; gradual wavy boundary.

B23t—32 to 40 inches; red (10R 4/6) flaggy loamy sand; friable; massive; few medium roots; few fine continuous irregular pores; few patchy clay films on grains; 75 percent 1- to 3-inch indurated continuous but fractured layers of iron-cemented sandstone fragments as much as 10 inches long and 2 inches thick; very strongly acid; gradual wavy boundary.

B3—40 to 46 inches; red (2.5YR 4/6) flaggy loamy sand; massive; firm; few fine and medium continuous irregular pores; few patchy clay films on grains; 50 percent 1/2-inch to 2-inch indurated continuous but

fractured layers of iron-cemented sandstone fragments up to 6 inches long and less than 1 inch thick; weakly cemented; very strongly acid; gradual wavy boundary.

C—46 to 72 inches; yellowish red (5YR 5/6) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 60 inches. Depth to the first petroferric contact consisting of an indurated iron-cemented sandstone layer ranges from 12 to 30 inches. Alternating layers of friable or firm soil and thin to thick (1/8 inch to several feet) continuous sheets of fractured iron-cemented sandstone are in the B horizon. Thick massive beds with fragments larger than small stones are in the C horizon of some pedons at depths greater than 4 feet in places. Coarse fragments consisting primarily of ironstone fragments but including some quartzose pebbles make up 0 to 15 percent of the A horizon and upper part of the B horizon and 20 to 75 percent of layers within the C horizon. Unless the soils have been limed, reaction is extremely acid in the A1 horizon and strongly acid to very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 2.5YR to 7.5YR. The A1 horizon has value of 2 to 4 and chroma of 2 or 3. The Ap horizon, where present, has value of 3 or 4 and chroma of 2 or 3. The A2 horizon has value of 4 to 6 and chroma of 2 to 4.

The B horizon has hue of 10R, 2.5YR, or 5YR, value of 4 to 6, and chroma of 4, 6, or 8. The upper part of the B horizon is loamy sand, sandy loam, channery loamy sand, or channery sandy loam. The lower part is flaggy or channery loamy sand and channery or flaggy sandy loam.

The C horizon has hue of 2.5YR, 5YR, or 7.5YR, value of 5 or 6, and chroma of 6 or 8. It is dominantly sand or loamy sand but in places has thin strata of sandy loam or sandy clay loam below a depth of 40 inches.

Psamments

Psamments in Ocean County consist of moderately deep to deep, excessively drained to very poorly drained soils with no horizonation. They formed in stratified or smoothed sandy fill. Slope is 0 to 5 percent.

Because of the variability of these soils, a typical pedon is not given. The soils are 20 to 60 inches deep or more to the original soil or waste fill. They are extremely acid or very strongly acid.

Since all Psamments in Ocean County are composed of fill material, they do not have designated A, B, and C horizons.

Sassafras series

The soils of the Sassafras series are fine-loamy, siliceous, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments. Sassafras soils are on divides and side slopes. Slope ranges from 2 to 5 percent. The natural vegetation includes white oak, black oak, scarlet oak, hickories, and a few pitch pines, shortleaf pines, and Virginia pines. The understory is laurel, scrub oak, and lowbush blueberry.

Typical pedon of Sassafras sandy loam, 2 to 5 percent slopes, in Union Township, 1.6 miles north of the intersection of N.J. highway 72 and County road 539, 100 feet west of 539:

A1—0 to 3 inches, very dark grayish brown (10YR 3/1) sandy loam; weak fine granular structure; very friable; many fine and medium roots; extremely acid; abrupt smooth boundary.

A2—3 to 6 inches, yellowish brown (10YR 5/4) sandy loam; weak fine granular structure; very friable; 5 percent quartzose pebbles; many fine and medium roots; extremely acid; clear smooth boundary.

B1—6 to 12 inches, brown (10YR 5/3) sandy loam; weak fine subangular blocky structure; 5 percent quartzose pebbles; common medium roots; very strongly acid; clear smooth boundary.

B21t—12 to 17 inches, brown (10YR 5/6) heavy loam; moderate medium subangular blocky structure; friable; 5 percent quartzose pebbles; common medium roots; clay bridging between sand grains; very strongly acid; clear smooth boundary.

B22t—17 to 41 inches, yellowish brown (10YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; 5 percent rounded quartzose pebbles; few medium roots; clay bridging between sand grains; very strongly acid; abrupt wavy boundary.

IIC1—41 to 54 inches, reddish yellow (7.5YR 5/8) loamy coarse sand; massive; very friable; 10 percent fine quartzose pebbles; very strongly acid; abrupt wavy boundary.

IIIC2—54 to 72 inches, brownish yellow (10YR 6/8) sand; single grain; loose; very strongly acid.

The solum thickness ranges from 30 to 45 inches but is dominantly 30 to 40 inches. Coarse fragments of rounded quartzose gravel make up 5 to 20 percent of the solum and up to 30 percent of the C horizon. Unless this soil has been limed, reaction is extremely acid in the A horizon and strongly acid to very strongly acid in the B and C horizons.

All parts of the A horizon have hue of 10YR or 7.5YR. The A1 horizon has value of 3 or 4 and chroma of 1 to 3. The A2 horizon has value of 5 and chroma of 3 or 4. In cultivated areas, the Ap horizon has value of 4 or 5 and chroma of 2 or 3.

The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 8. It is dominantly sandy clay loam, loam, and heavy sandy loam but is gravelly sandy

clay loam or gravelly sandy loam in subhorizons of some pedons.

The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 6 or 8. The C horizon normally is stratified and includes strata of loamy sand, sand, and sandy loam or their gravelly analogues.

Shrewsbury series

The soils of the Shrewsbury series are fine-loamy, mixed, mesic Typic Ochraquults. These poorly drained soils formed in acid, loamy Coastal Plain sediments containing 5 to 40 percent glauconite. Shrewsbury soils are in wide depressional areas and on broad flats that are at the lowest position on the landscape. Slope is less than 2 percent. The native vegetation includes willow oak, pin oak, swamp white oak, ash, beech, hickory, sweetgum, blackgum, and red maple and an undergrowth of viburnum, spicebush, elderberry, greenbriar, highbush blueberry, and sweet pepperbush.

Typical pedon of Shrewsbury fine sandy loam, in Plumstead Township, 0.9 mile north of New Egypt on New Egypt-Allentown Road, 100 feet west of the road:

Ap—0 to 10 inches, very dark gray (10YR 3/1) fine sandy loam; weak medium granular structure; very friable, slightly plastic when wet; many fine roots; less than 10 percent glauconite; slightly acid; abrupt smooth boundary.

A2g—10 to 13 inches, olive gray (5Y 4/2) fine sandy loam; few medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium granular structure and very weak medium subangular blocky; very friable, slightly plastic when wet; common fine roots; less than 10 percent glauconite; strongly acid; clear smooth boundary.

B2tg—13 to 25 inches, olive gray (5Y 5/2) sandy clay loam; many medium prominent dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable, slightly plastic when wet; many fine pores; thin patchy clay films on faces of peds; less than 10 percent glauconite; very strongly acid; clear smooth boundary.

B3tg—25 to 35 inches, light olive gray (5Y 6/2) heavy fine sandy loam; many coarse prominent dark yellowish brown (10YR 4/6) mottles; weak medium subangular blocky structure; friable, slightly plastic when wet; some clay bridging between sand grains; few fine roots; less than 10 percent glauconite; very strongly acid; clear smooth boundary.

Cg—35 to 60 inches, stratified olive (5Y 5/4) fine sandy loam and light olive gray (5Y 6/2) sand; many coarse prominent dark yellowish brown (10YR 4/6) mottles; massive or single grain strata; very friable or loose; 5 to 10 percent glauconite; very strongly acid.

The solum thickness ranges from 25 to 36 inches. Coarse fragments of rounded quartzose gravel make up less than 5 percent of the profile. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons.

The A horizon has hue of 10YR or 5Y. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The A2 horizon has value of 4 or 5 and chroma of 1 or 2.

The Bt horizon has hue of 5Y, value of 5 or 6, and chroma of 1 or 2. Mottles have hue of 7.5YR or 10YR, value of 4 or 6, and chroma of 4 or 6. The horizon is sandy clay loam and fine sandy loam. Consistence is friable when moist and slightly plastic when wet.

The C horizon has hue of 5Y, value of 5 or 6, and chroma of 2 or 4. Mottles have hue of 10YR, value of 4 or 5, and chroma of 4 or 6. In most places the C horizon consists of thin strata of sand, loamy sand, and fine sandy loam. A few thin strata of sandy clay loam are in some pedons.

Sulfaquents

Sulfaquents in Ocean County consist of deep, poorly drained or very poorly drained, nearly level mineral soils subject to tidal flooding. The soils formed over stratified sandy sediments of fluviomarine origin. The soils are on tidal flats adjacent to bays and tidal streams.

Because of the variability of these soils, a typical pedon is not given. The solum ranges in thickness from 20 to 50 inches or more. The soils are nearly neutral in reaction when wet and become more acid when dry.

The surface horizon dominantly is neutral or has hue of 10YR to 2.5Y, value of 2 or 3, and chroma of 0 to 2. It is silt loam or mucky loam. The substratum dominantly is neutral or has hue of 2.5YR to 5Y, value of 2 or 3, and chroma of 0 to 2. It dominantly is silt loam but includes mucky lenses.

Sulfihemists

Sulfihemists in Ocean County consist of deep, poorly drained or very poorly drained, nearly level organic soils subject to tidal flooding. The soils formed over stratified sandy sediments of fluviomarine origin. The soils are on tidal flats adjacent to bays or tidal streams.

Because of the variability of these soils, a typical pedon is not given. The solum ranges in thickness from 25 to 50 inches or more. The soils are nearly neutral in reaction when wet and become more acid when dry.

The surface and subsurface horizons dominantly have hue of 5YR to 10YR, value of 2, and chroma of 1. The material is dominantly muck containing few undecayed organic fragments.

Tinton series

The soils of the Tinton series are loamy, mixed, mesic Arenic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments containing 10 to 40 percent glauconite. Tinton soils are on divides and side slopes. Slope ranges from 0 to 5 percent but is dominantly 2 to 5 percent. The natural vegetation includes white oak, black oak, red oak, and chestnut oak and scattered Virginia pine.

Typical pedon of Tinton sand, 0 to 5 percent slopes, in Plumstead Township, 0.9 mile northeast of the intersection of Moorehouse Road and County road 528, 50 feet north of a small group of trees:

Ap—0 to 12 inches, grayish brown (10YR 4/2) sand; very weak fine granular structure; very friable or loose; many fine roots; less than 10 percent glauconite; slightly acid; abrupt smooth boundary.

A2—12 to 25 inches, yellowish brown (10YR 5/6) sand; single grain; loose; many fine roots; less than 10 percent glauconite; strongly acid; clear smooth boundary.

Bt—25 to 42 inches, dark yellowish brown (10YR 4/6) heavy fine sandy loam; moderate coarse subangular blocky structure; friable when moist, slightly sticky when wet; clay bridging between sand grains; few medium roots; 10 percent glauconite; very strongly acid; clear smooth boundary.

C—42 to 60 inches, light olive brown (2.5Y 5/6) sand with thin strata of sandy loam; single grain; loose; 10 percent glauconite; very strongly acid.

The solum thickness ranges from 38 to 54 inches but is dominantly 40 to 46 inches. The thickness of the A horizon ranges from 22 to 36 inches but is dominantly 24 to 30 inches. Unless the soil has been limed, reaction is extremely acid in the A horizon and very strongly acid in the B and C horizons.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 4 or 6.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 or 6. It is fine sandy loam or sandy clay loam.

The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 6 or 8. It consists of strata of sand and sandy loam of variable thickness.

Woodmansie series

The soils of the Woodmansie series are coarse-loamy, siliceous, mesic Typic Hapludults. These deep, well drained soils formed in acid, loamy Coastal Plain sediments. Woodmansie soils are on divides and side slopes. Slope ranges from 0 to 10 percent but is dominantly 0 to 5 percent. The natural vegetation includes pitch pine, white oak, black oak, blackjack oak, scarlet oak, and chestnut oak and an understory of scrub oak and lowbush blueberry.

Typical pedon of Woodmansie sand, 0 to 5 percent slopes, in Manchester Township, 4.3 miles south of the intersection of N.J. highway 70 and County road 539, on County road 539, 450 feet southwest of 539 on Manchester-Lacey Township line dirt road, 60 feet north of Manchester-Lacey Township line:

A1—0 to 4 inches, black (N 2/0) sand; weak medium granular structure; very friable; many fine and medium roots; extremely acid; clear wavy boundary.

A2—4 to 10 inches, gray (10YR 6/1) sand; single grain; loose; many medium roots; extremely acid; clear wavy boundary.

Bh1—10 to 14 inches, yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; friable; many medium roots; extremely acid; clear broken boundary.

A'2—14 to 20 inches, pale yellow (2.5Y 7/4) loamy sand; massive; very friable; few medium roots; extremely acid; abrupt wavy boundary.

B'2t—20 to 29 inches, light yellowish brown (10YR 6/4) sandy clay loam; moderate medium subangular blocky structure; friable; many medium roots; clay bridging between sand grains; very strongly acid; abrupt wavy boundary.

B'3t—29 to 42 inches, light yellowish brown (2.5Y 6/4) sandy loam; massive; friable; few medium roots; very strongly acid; clear wavy boundary.

C—42 to 70 inches, stratified light gray (2.5Y 7/2) coarse sand and strong brown (7.5YR 5/6) to very pale brown (10YR 8/3) sandy loam; single grain or massive; loose or very friable; very strongly acid.

The solum thickness ranges from 30 to 46 inches but is dominantly 30 to 42 inches. Coarse fragments of rounded quartzose gravel make up 0 to 5 percent of the A horizon, 0 to 30 percent of the B horizon, and up to 50 percent of the C horizon. Unless the soil has been limed, reaction ranges from extremely acid through strongly acid throughout.

The A1 horizon is neutral or has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 0 to 2. The A2 horizon has hue of 10YR, value of 6 or 7, and chroma of 1 or 2. The A'2 horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 4 or 6. The A horizon is sand, loamy sand, or their gravelly analogues.

The Bh horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 4 or 6. It is sand or loamy sand. The Bt horizon has a hue of 7.5YR to 2.5Y, value of 5 or 6, and chroma of 4 to 8. It is dominantly sandy loam, sandy clay loam, gravelly sandy loam, or gravelly sandy clay loam, but in places some subhorizons are loamy sand or gravelly loamy sand.

The C horizon has hue of 7.5YR to 2.5Y, value of 5 to 8, and chroma of 2 to 8. It is sand, loamy sand, sandy loam, sandy clay loam, and their gravelly analogues. Thickness of the strata is variable.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*8*). Readers interested in further details about the system should refer to "Soil taxonomy" (*13*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 19, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Entisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Haplaquents (*Hapl*, meaning simple horizons, plus *aquent*, the suborder of Entisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceeding the name of the great group. The adjective *Typic* identifies the subgroup that is thought to typify the great group. An example is Typic Haplaquents.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, nonacid, mesic, Typic Haplaquents.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

References

(1) Allan, P. F., L. E. Garland, and R. Dugan. 1963. Rating northeastern soils for their suitability for wildlife habitat. 28th North Am. Wildl. Nat. Resour. Cont. Wildl. Manage. Inst., pp. 247-261, illus.

(2) American Association of State Highway [and Transportation] Officials. 1970. Standard specifications for highway materials and methods of sampling and testing. Ed. 10, 2 vol., illus.

(3) American Society for Testing and Materials. 1974. Method for classification of soils for engineering purposes. ASTM Stand. D 2487-69. *In* 1974 Annual Book of ASTM Standards, Part 19, 464 pp., illus.

(4) Beck, Donald E. 1962. Yellow-poplar site index curves. U.S. Dep. Agric., Forest Serv., Southeast. Forest Exp. Stn. Res. Note 180, 2 pp., illus.

(5) Broadfoot, W. M. and Krinard, R. M. 1959. Guide for evaluating sweetgum sites. U.S. Dep. Agr., Forest Serv., South. Forest Exp. Stn. Occas. Pap. 176, 8 pp., illus.

(6) Kummel, Henry B. 1940. The geology of New Jersey. N. J. Dep. Conserv. Dev. Bull. 50, 203 pp., illus.

(7) Schnur, G. Luther. 1937. Yield, stand, and volume tables for even-aged upland oak forest. U.S. Dep. Agric. Tech. Bull. 560, 88 pp., illus. [Reprinted 1961.]

(8) Simonson, Roy W. 1962. Soil classification in the United States. Sci. 137: 1027-1034.

(9) Soil Science Society of America and American Society of Agronomy. 1966. Soil surveys and land use planning. 196 pp., illus.

(10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus. [Supplements replacing pp. 173–188 issued May 1962]
(11) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210, 21 pp.
(12) United States Department of Agriculture. 1974. Soil survey laboratory data and descriptions for some soils of New Jersey.
(13) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv. U.S. Dep. Agric. Handbk. 436. 754pp., illus.

Glossary

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim. An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 40-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 2.4
Low	2.4 to 3.2
Moderate	3.2 to 5.2
High	More than 5.2

Backdunes. Coastal dunes parallel to the shoreline and separated from the ocean beach by one or more dunes.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light textured) soil. Sand or loamy sand.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is 40 or 80 inches (1 or 2 meters).

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of

regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave. Unstable walls of cuts made by earthmoving equipment. The soil sloughs easily.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by running water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes a bare surface.

Fast intake. The rapid movement of water into the soil.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured (heavy textured) soil. Sandy clay, silty clay, and clay.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or

commonly covering swamps and marshes is not considered flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foredunes. Coastal dunes parallel to the shoreline and fronting the ocean beach.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action. Freezing and thawing of soil moisture. Frost action can damage structures and plant roots.

Glauconite. A dark green mineral, essentially a potassium iron silicate.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table, which is the upper limit of saturation.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming at or near the surface, in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon most of which was originally part of a B horizon.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that from which the solum is presumed to have formed. If the material is known to differ from that in the solum the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Ironstone. An iron-cemented sandstone.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Large stones. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. Inadequate strength for supporting loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy textured) soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material mixed with mineral soil material. The content of organic matter is more than 20 percent.

Neutral soil. A soil having a pH value between 6.6 and 7.3.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the bases of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from a semisolid to a plastic state.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Quartzose. Material that is composed mainly of quartz but which also includes other minerals.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristics of the soil are largely confined to the solum.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use or management.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt, silt loam, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer. Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

ILLUSTRATIONS

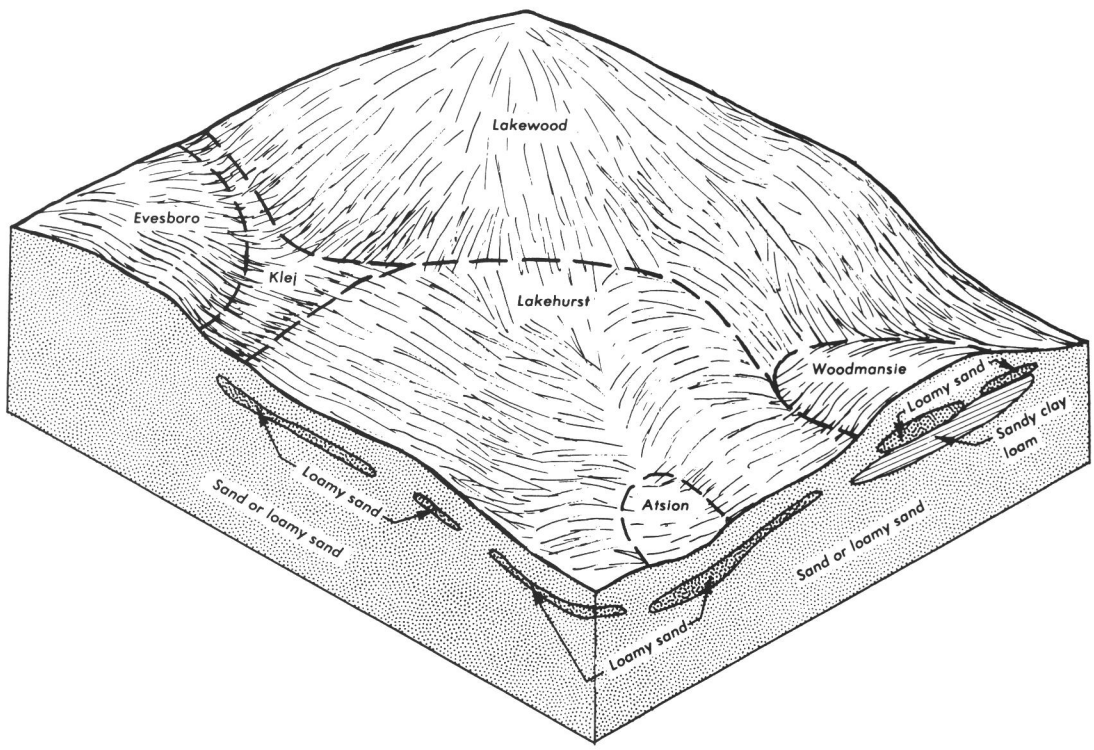

Figure 1.—Typical pattern of soils and parent material in the Lakehurst-Lakewood-Evesboro association.

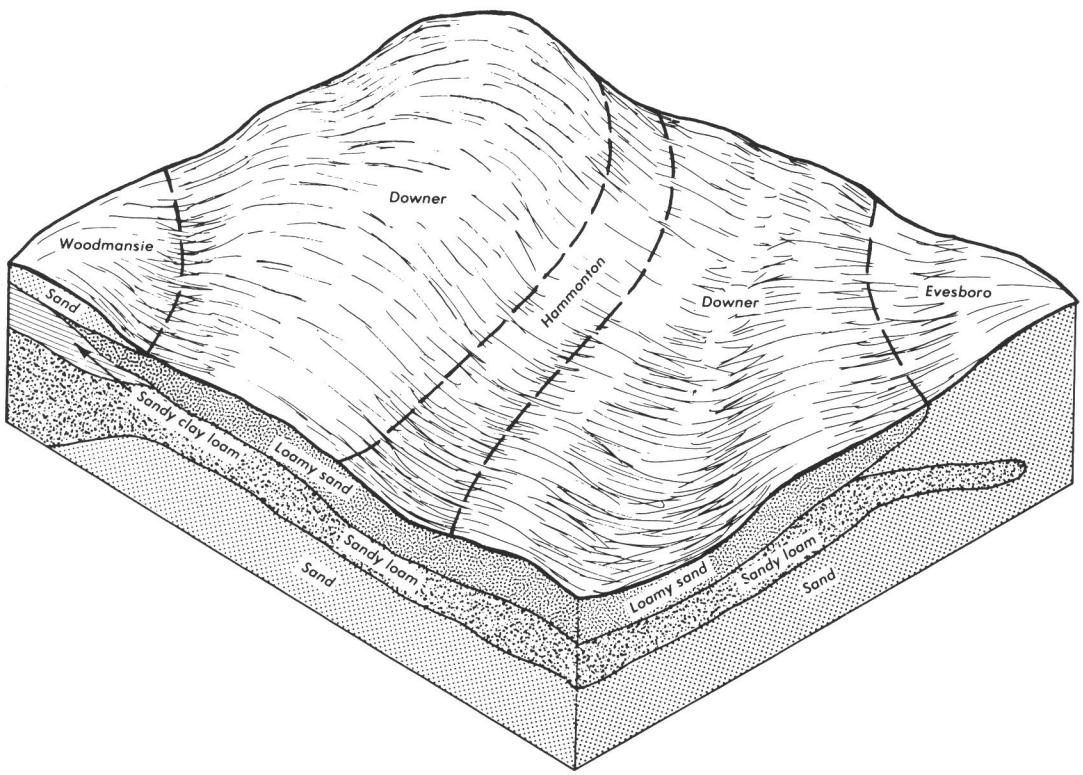

Figure 2.—Typical pattern of soils and parent material in the Downer-Evesboro association

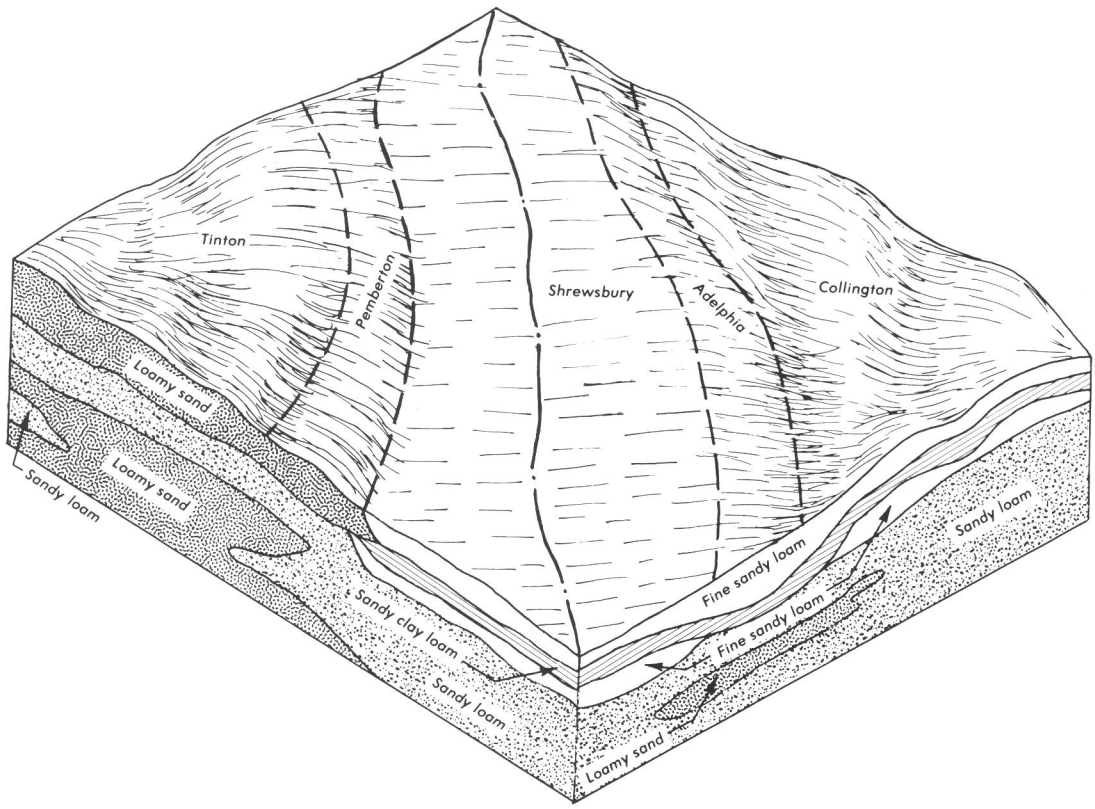

Figure 3.—Typical pattern of soils and parent material in the Shrewsbury-Collington-Tinton association.

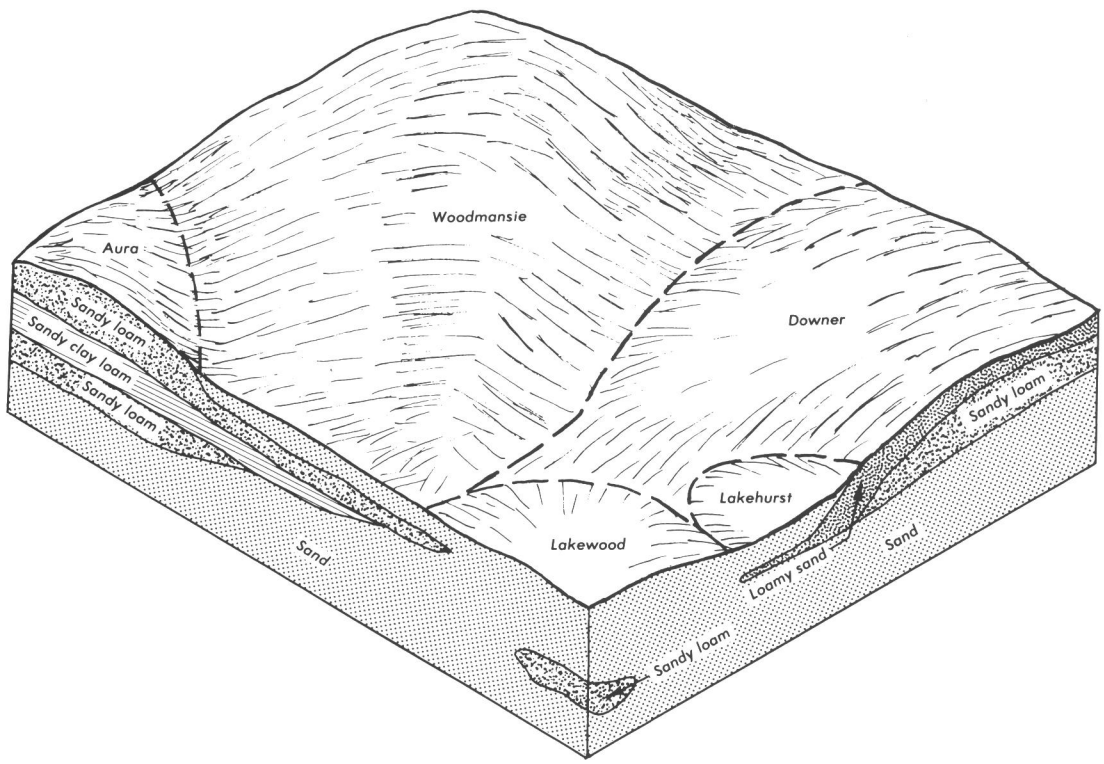

Figure 4.—Typical pattern of soils and parent material in the Woodmansie-Downer association.

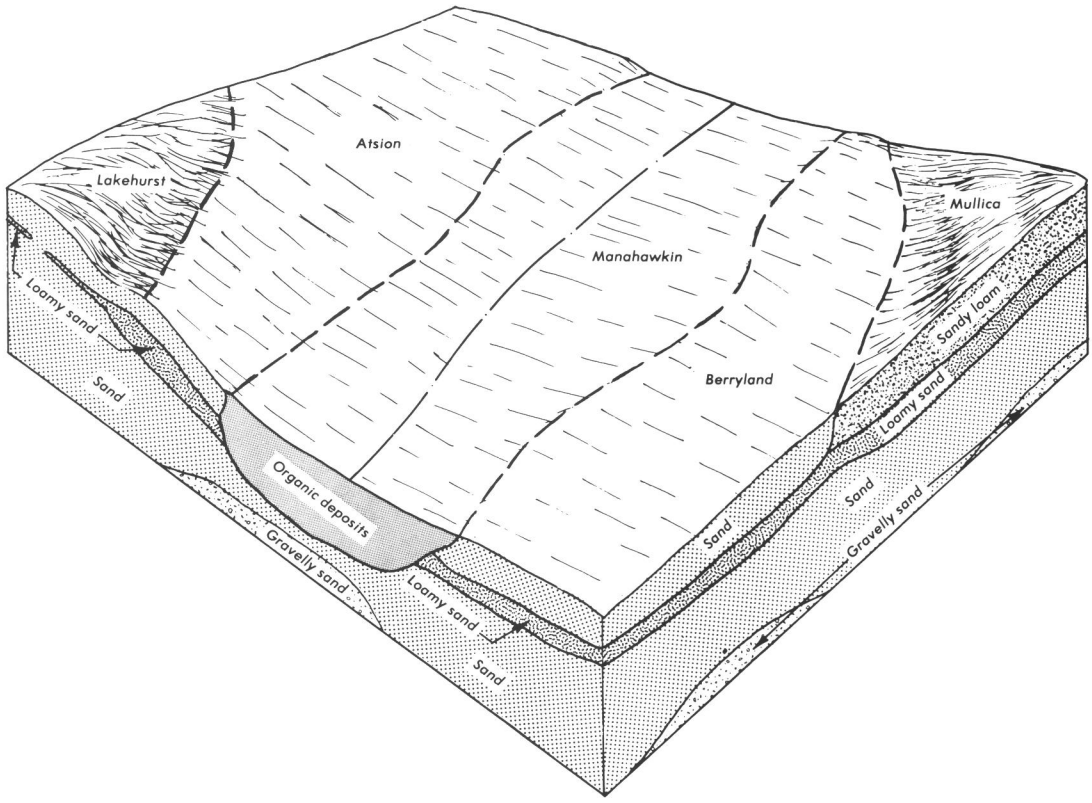

Figure 5.—Typical pattern of soils and parent material in the Manahawkin-Atsion-Berryland association.

Figure 6.—Cabbage on an area of Collington fine sandy loam, 0 to 2 percent slopes.

Figure 7.—An area of hardwood forest on Downer loamy sand, 0 to 5 percent slopes.

Figure 8.—Water on this area of Shrewsbury fine sandy loam reduces the yield of soybeans.

Figure 9.—Salt-tolerant grasses in a tidal marsh of Sulfaquents-Sulfihemists, frequently flooded.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION DATA

[Data were recorded in the period 1960-75 at Toms River, N.J.]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	40.9	21.3	31.1	65	-2	28	3.32	2.01	4.48	6	5.3
February---	42.2	22.5	32.4	66	-4	7	3.69	2.45	4.80	6	5.5
March------	50.2	30.0	40.1	78	11	109	3.97	2.54	5.25	6	3.7
April------	61.3	37.9	49.6	89	21	292	3.90	2.13	5.33	7	.1
May--------	71.0	47.9	59.5	93	31	605	3.34	1.58	4.77	6	.0
June-------	80.5	58.0	69.2	97	41	876	3.55	2.27	4.70	6	.0
July-------	84.7	62.6	73.6	97	47	1,042	4.74	2.49	6.57	7	.0
August-----	83.8	61.5	72.7	96	44	1,014	4.38	2.12	6.21	6	.0
September--	77.2	54.9	66.1	94	34	783	4.10	2.27	5.59	5	.0
October----	67.5	42.7	55.1	85	21	468	3.66	1.84	5.14	5	.0
November---	56.6	34.9	45.7	78	16	192	3.56	1.40	5.29	6	.0
December---	44.7	26.2	35.5	68	7	51	4.37	2.35	6.02	6	2.6
Yearly:											
Average--	63.4	41.7	52.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-4	---	---	---	---	---	---
Total----	---	---	---	---	---	5,467	46.58	40.18	52.70	72	17.2

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Data were recorded in the period 1960-75 at Toms River, N.J.]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 15	May 3	May 14
2 years in 10 later than--	April 10	April 28	May 9
5 years in 10 later than--	April 1	April 19	April 29
First freezing temperature in fall:			
1 year in 10 earlier than--	October 19	October 18	September 29
2 years in 10 earlier than--	October 26	October 21	October 4
5 years in 10 earlier than--	November 9	October 28	October 15

TABLE 3.--GROWING SEASON LENGTH

[Data were recorded in the period 1960-75 at Toms River, N.J.]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	197	175	141
8 years in 10	205	181	150
5 years in 10	221	191	168
2 years in 10	238	201	186
1 year in 10	246	207	195

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AdA	Adelphia fine sandy loam, 0 to 3 percent slopes	410	0.1
At	Atsion sand	26,200	6.4
Aw	Atsion sand, tide flooded	740	0.2
AxB	Aura sandy loam, 2 to 5 percent slopes	2,100	0.5
Be	Berryland sand	14,100	3.4
BF	Berryland sand, frequently flooded	2,550	0.6
CoA	Collington fine sandy loam, 0 to 2 percent slopes	560	0.1
CoB	Collington fine sandy loam, 2 to 5 percent slopes	380	0.1
CoC	Collington fine sandy loam, 5 to 10 percent slopes	190	*
DoA	Downer loamy sand, 0 to 5 percent slopes	53,900	13.2
DpA	Downer sandy loam, 0 to 2 percent slopes	6,450	1.6
DpB	Downer sandy loam, 2 to 5 percent slopes	20,900	5.1
DrB	Downer gravelly sandy loam, gravelly substratum, 2 to 5 percent slopes	4,000	1.0
EvB	Evesboro sand, 0 to 5 percent slopes	21,400	5.2
EvC	Evesboro sand, 5 to 10 percent slopes	4,500	1.1
EvD	Evesboro sand, 10 to 15 percent slopes	1,050	0.3
FtB	Fripp fine sand, 2 to 10 percent slopes	2,500	0.6
HaA	Hammonton loamy sand, 0 to 5 percent slopes	5,950	1.4
HcA	Hammonton sandy loam, 0 to 3 percent slopes	2,750	0.7
HU	Humaquepts, frequently flooded	490	0.1
KeA	Keyport sandy loam, 0 to 4 percent slopes	700	0.2
KlA	Klej loamy sand, 0 to 3 percent slopes	6,250	1.5
KrA	Kresson fine sandy loam, 0 to 3 percent slopes	100	*
LhA	Lakehurst sand, 0 to 3 percent slopes	54,240	13.3
LmA	Lakehurst sand, clayey substratum, 0 to 3 percent slopes	990	0.2
LwB	Lakewood sand, 0 to 5 percent slopes	41,800	10.2
LwC	Lakewood sand, 5 to 10 percent slopes	5,300	1.3
Ma	Manahawkin muck	26,800	6.5
Mr	Mullica fine sandy loam, loamy substratum	2,050	0.5
Mu	Mullica sandy loam	4,300	1.0
PeA	Pemberton sand, 0 to 5 percent slopes	1,150	0.3
PhB	Phalanx loamy sand, 2 to 5 percent slopes	910	0.2
PhC	Phalanx loamy sand, 5 to 10 percent slopes	540	0.1
Pm	Pits, sand and gravel	9,150	2.2
PN	Psamments, nearly level	4,900	1.2
PO	Psamments, sulfidic substratum	9,650	2.3
PW	Psamments, waste substratum	600	0.1
SaB	Sassafras sandy loam, 2 to 5 percent slopes	3,100	0.8
Sh	Shrewsbury fine sandy loam	1,200	0.3
SS	Sulfaquents and Sulfihemists, frequently flooded	26,200	6.4
TnB	Tinton sand, 0 to 5 percent slopes	1,100	0.3
UL	Urban land	3,500	0.9
UP	Urban land-Fripp complex	4,500	1.1
WoB	Woodmansie sand, 0 to 5 percent slopes	19,000	4.6
WoC	Woodmansie sand, 5 to 10 percent slopes	8,800	2.1
	Water	3,050	0.7
	Total	411,000	100.0

* Less than 0.1 percent.

TABLE 5.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated. NP means nonplastic]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AdA----------	0-22	Fine sandy loam	SM, SC	A-2, A-4	0	95-100	95-100	60-95	30-40	---	---
Adelphia	22-34	Sandy clay loam, loam.	SC, CL	A-4, A-6	0	95-100	95-100	70-95	35-65	20-40	8-18
	34-60	Stratified loamy sand to sandy loam.	SM, SC	A-2, A-4	0	95-100	95-100	50-75	10-40	<30	NP-10
At----------	0-18	Sand----------	SP, SP-SM	A-3	0	95-100	90-100	55-90	0-10	---	---
Atsion	18-24	Loamy sand, sand.	SP, SP-SM	A-2, A-3	0	95-100	90-100	55-90	0-20	---	NP
	24-60	Stratified sand to sandy loam.	SP, SM, SM-SC, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-90	2-35	<25	NP-7
Aw----------	0-13	Sand----------	SM, SP-SM	A-3	0	95-100	90-100	55-90	0-10	---	---
Atsion	13-28	Sand, loamy sand	SP, SM, SP-SM	A-2, A-3	0	95-100	90-100	55-90	0-20	---	NP
	28-60	Stratified sand to loamy sand.	SP, SM, SM-SC, SP-SM	A-1, A-2, A-3	0	95-100	85-100	40-90	2-35	<25	NP-7
AxB----------	0-16	Sandy loam------	SM, SC	A-2, A-4	0	95-100	80-100	30-90	30-40	---	---
Aura	16-50	Gravelly sandy loam, sandy clay loam, gravelly sandy clay loam.	SM, SC, GM, GC	A-2, A-4, A-6	0	55-100	45-100	35-85	25-50	20-45	5-15
	50-72	Sand, gravelly sand, sandy clay loam.	SM, SC, GM, GC	A-1, A-2, A-4	0	70-100	60-100	35-85	10-50	<40	NP-15
Be, BF----------	0-15	Sand----------	SP, SP-SM	A-3	0	95-100	90-100	55-90	2-10	---	---
Berryland	15-24	Sand, loamy sand	SP, SP-SM	A-2, A-3	0	95-100	90-100	55-90	2-10	---	NP
	24-35	Sand----------	SP, SP-SM	A-3	0	95-100	90-100	55-90	2-10	---	NP
	35-60	Stratified sand to sandy loam.	SP, SM, SM-SC, SP-SM	A-1, A-2, A-3	0	95-100	80-100	40-90	2-35	<25	NP-8
CoA, CoB, CoC------	0-15	Fine sandy loam	SM-SC	A-2, A-4	0	95-100	95-100	60-90	30-50	---	---
Collington	15-42	Sandy loam, sandy clay loam, clay loam.	SM, SC, ML, CL	A-4, A-6	0	95-100	95-100	60-90	30-70	25-45	5-25
	42-60	Loamy sand to sandy loam.	SM, SC	A-2, A-4	0	95-100	95-100	50-75	10-40	<30	<10
DoA----------	0-10	Loamy sand------	SM, SC	A-2, A-1	0	80-100	75-100	40-90	15-30	---	---
Downer	10-31	Sandy loam, gravelly sandy loam.	SM, SC	A-2, A-4	0	80-100	55-100	40-90	20-40	<35	NP-10
	31-60	Stratified sand to gravelly loamy sand.	SP, SM, GM	A-2, A-3	0	45-100	35-100	20-90	0-35	<30	NP-12

TABLE 5.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DpA, DpB---------- Downer	0-10	Sandy loam------	SM, SC	A-2	0	80-100	75-100	40-90	25-35	---	---
	10-31	Sandy loam, gravelly sandy loam.	SM, SC	A-2, A-4	0	80-100	55-100	40-90	20-40	<35	NP-10
	31-60	Stratified sand to gravelly loamy sand.	SP, SM, GM	A-2, A-3	0	45-100	35-100	20-90	0-35	<30	NP-10
DrB---------- Downer	0-10	Gravelly sandy loam.	GM, SM	A-2, A-1	---	60-80	55-75	30-50	20-35	---	---
	10-26	Gravelly sandy loam.	GM, GC, SM, SC	A-2, A-1, A-4	---	60-80	55-75	40-65	25-40	10-25	NP-10
	26-40	Gravelly loamy sand.	GM, GC, SM, SC	A-2, A-1	---	45-80	35-75	20-55	10-20	10-20	NP-12
	40-60	Stratified gravelly sand.	GP-GM, SP-SM	A-1	---	40-80	30-75	20-50	2-10	<20	NP
EvB, EvC, EvD------ Evesboro	0-10	Sand----------	SP, SP-SM	A-1, A-2, A-3	0	90-100	85-100	40-90	0-12	---	---
	10-33	Sand, loamy sand	SP, SP-SM	A-1, A-2, A-3	0	90-100	85-100	40-90	0-12	---	NP
	33-60	Sand to sandy loam.	SP, SM, SC	A-1, A-2	0	80-100	80-100	45-90	0-35	---	NP-10
FtB---------- Fripp	0-3	Fine sand-------	SP	A-3	0	100	98-100	85-99	0-5	---	---
	3-60	Fine sand, sand	SP	A-3	0	100	98-100	85-99	0-5	---	NP
HaA---------- Hammonton	0-14	Loamy sand------	SM	A-2, A-1	0	80-100	75-100	50-90	15-30	---	---
	14-23	Sandy loam, gravelly sandy loam.	SM, SC	A-2, A-1, A-4	0	80-100	70-100	40-70	20-40	10-35	NP-10
	23-60	Stratified gravelly sand to sandy loam.	SP, SM, GM	A-2, A-3, A-1, A-4	0	60-100	45-100	20-70	0-45	<30	NP-10
HcA---------- Hammonton	0-10	Sandy loam------	SM	A-2	0	80-100	75-100	50-90	25-35	---	---
	10-28	Sandy loam, gravelly sandy loam.	SM, SC	A-2, A-1, A-4	0	80-100	70-100	40-70	20-40	10-35	NP-10
	28-60	Stratified gravelly sand to sandy loam.	SP, SM, GM	A-2, A-3, A-1, A-4	0	60-100	45-100	20-70	0-45	<30	NP-10
HU*. Humaquepts											
KeA---------- Keyport	0-9	Sandy loam------	SM, SC	A-2, A-4	0	85-100	85-100	60-95	30-40	---	---
	9-60	Silty clay loam, clay loam, clay.	ML, CL, MH, CH	A-4, A-6, A-7	0	90-100	90-100	75-100	60-90	25-85	10-40
KlA---------- Klej	0-30	Loamy sand------	SM	A-2, A-4	0	100	95-100	50-95	15-30	<20	NP
	30-60	Sand, fine sand	SP, SP-SM, SM	A-1, A-2	0	90-100	75-100	40-80	4-35	<20	NP

See footnote at end of table.

TABLE 5.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KrA---------- Kresson	0-11	Fine sandy loam	SM, SC	A-2, A-4	0	95-100	85-100	50-95	30-40	---	---
	11-32	Clay, clay loam, sandy clay.	ML, CL, MH, CH	A-6, A-7	0	95-100	90-100	70-95	55-90	35-60	10-25
	32-60	Stratified sandy loam to clay.	SM, SC, CL	A-4, A-6, A-7	0	95-100	90-100	70-90	35-80	30-50	10-20
LhA---------- Lakehurst	0-12	Sand----------	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-80	0-20	---	---
	12-46	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-80	0-30	---	NP
	46-60	Sand, gravelly sand, sandy loam.	SP, SM, SC, SM-SC	A-1, A-2, A-3	0	80-100	70-100	40-80	0-35	<15	NP-8
LmA---------- Lakehurst	0-16	Sand----------	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-80	0-20	---	---
	16-41	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-80	0-30	---	NP
	41-60	Sandy clay loam, sandy clay.	SC, CL	A-4, A-6, A-7	0	90-100	85-100	80-100	45-70	20-50	10-25
LwB---------- Lakewood	0-10	Sand----------	SP, SP-SM	A-1, A-2, A-3	0	95-100	90-100	40-90	0-12	---	---
	10-36	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-85	0-30	---	NP
	36-60	Sand, gravelly sand, sandy loam.	SP, SM	A-1, A-2, A-3	0	85-100	75-100	40-90	0-35	<20	NP-5
LwC---------- Lakewood	0-11	Sand----------	SP, SP-SM	A-1, A-2, A-3	0	95-100	90-100	40-90	0-12	---	---
	11-28	Sand, fine sand, loamy sand.	SP, SM, SP-SM	A-1, A-2, A-3	0	85-100	80-100	40-85	0-30	---	NP
	28-60	Sand, gravelly sand, sandy loam.	SP, SM	A-1, A-2, A-3	0	85-100	75-100	40-90	0-35	<20	NP-5
Ma---------- Manahawkin	0-39	Sapric material	Pt	A-8	---	---	---	---	---	---	---
	39-60	Sand, gravelly sand.	SP-SM, SP	A-1	0	80-100	70-100	35-45	4-10	---	NP
Mr---------- Mullica	0-11	Fine sandy loam	SM, SC, CL-ML	A-2, A-1, A-4	0	85-100	75-100	40-85	15-55	---	---
	11-25	Loamy sand, sand	SM, SP-SM	A-1, A-2, A-3	0	80-100	65-100	30-75	4-30	<22	NP-8
	25-60	Sandy clay loam, sandy loam, sand.	SM, SC, CL	A-1, A-2, A-4, A-6	0	80-100	65-100	30-90	4-55	<38	NP-15

See footnote at end of table.

TABLE 5.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Mu---------- Mullica	0-12	Sandy loam------	SM, SC, CL-ML	A-2, A-1, A-4	0	85-100	75-100	40-85	15-55	---	---
	12-25	Loamy sand, sand	SM, SP-SM	A-2, A-1, A-3	0	80-100	65-100	30-75	4-30	<22	NP-8
	25-60	Sandy clay loam, sandy loam, sand.	SM, SC, CL	A-1, A-2, A-4, A-6	0	80-100	65-100	30-90	4-55	<38	NP-15
PeA---------- Pemberton	0-22	Sand----------	SM, SP-SM	A-2, A-3	0	100	100	80-100	5-20	---	---
	22-36	Sandy loam, fine sandy loam, sandy clay loam.	SM, SC	A-2, A-4, A-6	0	100	100	90-100	25-50	25-40	3-15
	36-60	Stratified sand to sandy loam.	SM, SC	A-2, A-4, A-6	0	100	95-100	70-95	10-40	<50	NP-10
PhB---------- Phalanx	0-6	Loamy sand------	SM	A-1, A-2	0	90-100	85-95	40-70	15-30	---	---
	6-22	Sandy loam, loamy sand, channery sandy loam.	SM, GM	A-1, A-2, A-4	0-15	40-95	35-85	20-75	15-40	<25	NP-10
	22-46	Channery sandy loam, flaggy loamy sand, sandy clay loam.	SM, SC, GC, GM	A-1, A-2, A-4	5-30	40-95	35-85	20-75	15-45	<30	NP-10
	46-60	Sand, loamy sand, flaggy sand.	SP, SM, GP, GM	A-1, A-2, A-3	0-30	35-100	30-100	15-75	2-25	<20	NP
PhC---------- Phalanx	0-12	Loamy sand------	SM	A-1, A-2	0	90-100	85-95	40-70	15-30	---	---
	12-26	Sandy loam, loamy sand, channery sandy loam.	SM, GM	A-1, A-2, A-4	0-15	40-95	35-85	20-75	15-40	<25	NP-10
	26-42	Channery sandy loam, flaggy loamy sand, sandy clay loam.	SM, SC, GC, GM	A-1, A-2, A-4	5-30	40-95	35-85	20-75	15-45	<30	NP-10
	42-60	Sand, loamy sand, flaggy sand.	SP, SM	A-1, A-2	0-30	35-100	30-100	15-75	2-25	<20	NP
Pm*. Pits, sand and gravel											
PN*, PO*, PW*. Psamments											
SaB---------- Sassafras	0-6	Sandy loam------	SM	A-2, A-4	0	85-100	80-100	50-95	25-40	---	---
	6-41	Loam, sandy clay loam, sandy loam.	SM-SC, CL, ML-CL	A-2, A-4, A-6	0	85-100	75-100	50-95	30-75	20-33	5-15
	41-60	Gravelly sandy loam, fine sandy loam, sand.	SP-SM, SC, SM	A-1, A-2, A-4	0	70-100	55-100	30-75	5-50	<26	NP-8

See footnote at end of table.

TABLE 5.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Sh---------- Shrewsbury	0-13	Fine sandy loam	SM, SC	A-2, A-4, A-6, A-7	0	98-100	95-100	75-90	25-50	---	---
	13-35	Sandy loam, sandy clay loam, loam.	SM, SC, ML, CL	A-2, A-4, A-6	0	98-100	95-100	85-100	30-70	25-40	5-15
	35-60	Stratified loamy sand to sandy loam.	SM, SC	A-2, A-4, A-6, A-7	0	98-100	95-100	75-95	20-45	<45	NP-15
SS*: Sulfaquents.											
Sulfihemists.											
TnB---------- Tinton	0-25	Sand----------	SM, SP-SM	A-2, A-3	0	100	100	70-100	5-20	---	---
	25-42	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC	A-2, A-4, A-6	0	100	100	80-100	25-50	20-40	3-15
	42-60	Stratified sand to sandy loam.	SM, SP-SM	A-2, A-4	0	100	98-100	70-100	10-40	---	NP-6
UL*. Urban land											
UP*: Urban land.											
Fripp----------	0-3	Sand----------	SP	A-3	0	100	98-100	85-99	0-5	---	---
	3-60	Fine sand, sand	SP	A-3	0	100	98-100	85-99	0-5	---	NP
WoB---------- Woodmansie	0-20	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	85-100	85-100	40-90	2-15	---	---
	20-42	Sandy loam, gravelly sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4	0	70-100	60-100	50-90	30-50	20-30	5-10
	42-60	Stratified gravelly sand to sandy clay loam.	SM, SP-SM, SC, GM	A-1, A-2, A-3, A-4	0	50-100	40-100	30-70	5-50	<30	NP-8
WoC---------- Woodmansie	0-15	Sand----------	SP, SP-SM, SM	A-1, A-2, A-3	0	85-100	85-100	40-90	2-15	---	---
	15-26	Sandy loam, gravelly sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4	0	70-100	60-100	50-90	30-50	20-30	5-10
	26-60	Stratified gravelly sand to sandy clay loam.	SM, SP-SM, SC, GM	A-1, A-2, A-3, A-4	0	50-100	40-100	30-70	5-50	<30	NP-8

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
AdA----------	0-22	0.2-6.0	0.16-0.24	3.6-5.0	Low----------	0.32	3	---
Adelphia	22-34	0.2-2.0	0.16-0.22	3.6-5.0	Moderate------	0.43		
	34-60	0.6-6.0	0.10-0.18	3.6-5.0	Low----------	0.20		
At----------	0-18	6.0-20	0.06-0.08	3.6-4.4	Low----------	0.17	3	---
Atsion	18-24	2.0-6.0	0.08-0.12	4.5-5.0	Low----------	0.20		
	24-60	2.0-20	0.04-0.14	4.5-5.5	Low----------	0.20		
Aw----------	0-13	6.0-20	0.06-0.08	4.5-5.0	Low----------	0.17	3	---
Atsion	13-28	2.0-6.0	0.08-0.12	4.5-5.0	Low----------	0.20		
	28-60	>6.0	0.04-0.14	4.5-5.0	Low----------	0.20		
AxB----------	0-16	0.2-6.0	0.10-0.18	3.6-4.4	Low----------	0.43	3	---
Aura	16-50	0.2-2.0	0.12-0.14	4.1-5.0	Low----------	0.43		
	50-72	0.2-6.0	0.04-0.12	4.1-5.0	Low----------	0.43		
Be, BF----------	0-15	6.0-20	0.06-0.08	3.6-4.4	Low----------	0.17	2	---
Berryland	15-24	2.0-6.0	0.08-0.12	4.5-5.0	Low----------	0.20		
	24-35	2.0-6.0	0.04-0.08	4.5-5.0	Low----------	0.20		
	35-60	0.6-2.0	0.04-0.14	4.5-5.0	Low----------	0.20		
CoA, CoB, CoC----	0-15	0.6-2.0	0.14-0.20	3.6-4.4	Low----------	0.28	4	
Collington	15-42	0.2-2.0	0.16-0.22	4.5-5.0	Moderate------	0.32		
	42-60	0.2-6.0	0.03-0.16	4.5-5.0	Low----------	0.24		
DoA, DpA, DpB----	0-10	0.6-6.0	0.10-0.16	3.6-4.4	Low----------	0.28	4	2
Downer	10-31	0.6-6.0	0.10-0.14	4.5-5.0	Low----------	0.28		
	31-60	>2.0	0.05-0.10	4.5-5.0	Low----------	0.24		
DrB----------	0-10	0.6-6.0	0.10-0.13	3.6-4.4	Low----------	0.24	4	---
Downer	10-26	0.6-2.0	0.10-0.13	4.5-5.0	Low----------	0.24		
	26-40	0.6-2.0	0.04-0.08	4.5-5.0	Low----------	0.20		
	40-60	2.0-6.0	0.02-0.06	4.5-5.0	Low----------	0.20		
EvB, EvC, EvD----	0-10	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	1
Evesboro	10-33	1.0-20	0.04-0.09	3.6-5.0	Low----------	0.17		
	33-60	>2.0	0.04-0.10	4.5-5.0	Low----------	0.17		
FtB----------	0-3	6.0-20	0.02-0.08	5.1-7.8	Low----------	0.10	5	---
Fripp	3-60	6.0-20	0.02-0.06	5.6-7.8	Low----------	0.10		
HaA----------	0-14	2.0-6.0	0.10-0.16	3.6-4.4	Low----------	0.28	4	2
Hammonton	14-23	0.6-6.0	0.10-0.14	4.5-5.0	Low----------	0.32		
	23-60	>2.0	0.05-0.10	4.5-5.0	Low----------	0.24		
HcA----------	0-10	2.0-6.0	0.10-0.16	3.6-4.4	Low----------	0.28	4	2
Hammonton	10-28	0.6-6.0	0.10-0.14	4.5-5.0	Low----------	0.32		
	28-60	>2.0	0.05-0.10	4.5-5.0	Low----------	0.24		
HU*.								
Humaquepts								
KeA----------	0-9	0.6-2.0	0.12-0.18	3.6-4.4	Moderate------	0.43	3-2	---
Keyport	9-60	<0.2	0.16-0.20	4.5-5.0	Moderate------	0.43		
KlA----------	0-38	6.0->20	0.06-0.11	3.6-5.0	Low----------	0.17	5	---
Klej	38-60	6.0->20	0.06-0.08	3.6-5.0	Low----------	0.17		
KrA----------	0-11	0.2-6.0	0.18-0.22	<3.-5.5	Moderate------	0.43	2	---
Kresson	11-32	0.06-0.2	0.16-0.20	3.6-5.5	Moderate------	0.43		
	32-60	0.02-0.6	0.16-0.20	3.6-5.5	Low----------	0.27		

See footnote at end of table.

TABLE 6.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
LhA---------- Lakehurst	0-12	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	1
	12-46	6.0-20	0.04-0.10	3.6-5.0	Low----------	0.17		
	46-60	6.0-20	0.04-0.10	4.5-5.0	Low----------	0.17		
LmA---------- Lakehurst	0-16	6.0-20	0.04-0.07	3.6-5.0	Low----------	0.17	5	1
	16-41	6.0-20	0.04-0.10	3.6-5.0	Low----------	0.17		
	41-60	<0.2	0.10-0.16	4.5-5.0	Moderate------	0.17		
LwB---------- Lakewood	0-10	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	1
	10-36	6.0-20	0.04-0.10	3.6-4.5	Low----------	0.17		
	36-60	2.0->6.0	0.04-0.14	3.6-4.5	----------	0.17		
LwC---------- Lakewood	0-11	6.0-20	0.04-0.09	3.6-5.0	Low----------	0.17	5	1
	11-28	6.0-20	0.04-0.10	3.6-4.5	Low----------	0.17		
	28-60	2.0->6.0	0.04-0.14	3.6-4.5	----------	0.17		
Ma---------- Manahawkin	0-39	0.2-6.0	0.30-0.35	3.6-5.5	High----------	---	---	---
	39-60	2.0-6.0	0.04-0.08	4.5-5.0	Low----------	---		
Mr---------- Mullica	0-11	0.6-2.0	0.12-0.20	3.6-4.5	Low----------	0.24	3	---
	11-25	2.0-6.0	0.06-0.10	3.6-5.0	Low----------	0.20		
	25-60	0.6-6.0	0.06-0.18	3.6-5.0	Low----------	0.28		
Mu---------- Mullica	0-12	0.6-2.0	0.12-0.20	3.6-4.5	Low----------	0.24	3	---
	12-25	2.0-6.0	0.06-0.10	3.6-5.0	Low----------	0.20		
	25-60	0.6-6.0	0.06-0.18	3.6-5.0	Low----------	0.28		
PeA---------- Pemberton	0-22	2.0-6.0	0.04-0.10	3.6-5.5	Low----------	0.20	4	1
	22-36	2.0-6.0	0.14-0.18	4.5-5.5	Low----------	0.20		
	36-60	2.0-6.0	0.06-0.16	4.5-5.5	Low----------	0.20		
PhB---------- Phalanx	0-6	2.0-6.0	0.07-0.14	3.6-5.0	Low----------	0.28	4	---
	6-22	0.6-6.0	0.10-0.14	4.5-5.5	Low----------	0.20		
	22-46	0.6-2.0	0.02-0.14	4.5-5.5	Low----------	0.20		
	46-60	2.0-6.0	0.02-0.14	4.5-5.5	Low----------	0.20		
PhC---------- Phalanx	0-12	2.0-6.0	0.07-0.14	3.6-5.0	Low----------	0.28	4	---
	12-26	0.6-6.0	0.10-0.14	4.5-5.5	Low----------	0.20		
	26-42	0.6-2.0	0.02-0.14	4.5-5.5	Low----------	0.20		
	42-60	2.0-6.0	0.02-0.14	4.5-5.5	Low----------	0.20		
Pm*. Pits, sand and gravel								
PN*, PO*, PW*. Psamments								
SaB---------- Sassafras	0-6	0.6-6.0	0.12-0.20	3.6-5.5	Low----------	0.28	4	---
	6-41	0.6-2.0	0.11-0.22	3.6-5.5	Low----------	0.43		
	41-60	0.6-20	0.04-0.12	3.6-5.5	Low----------	0.17		
Sh---------- Shrewsbury	0-10	0.6-2.0	0.18-0.24	3.6-4.4	Low----------	0.28	2	---
	10-35	0.6-2.0	0.16-0.22	4.5-5.0	Moderate------	0.32		
	35-60	2.0-6.0	0.12-0.18	4.5-5.0	Low----------	0.28		
SS*: Sulfaquents.								
Sulfihemists.								
TnB---------- Tinton	0-25	6.0-20	0.10-0.14	3.6-4.4	Low----------	0.20	4	1
	25-42	2.0-6.0	0.14-0.18	4.5-5.0	Low----------	0.20		
	42-60	2.0-6.0	0.12-0.16	4.5-5.0	Low----------	0.20		
UL*. Urban land								

See footnote at end of table.

TABLE 6.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
UP*: Urban land.								
Fripp	0-3	6.0-20	0.02-0.08	5.1-7.8	Low	0.10	5	---
	3-60	6.0-20	0.02-0.06	5.6-7.8	Low	0.10		
WoB	0-20	6.0-20	0.06-0.08	3.6-4.4	Low	0.20	4	1
Woodmansie	20-42	0.6-6.0	0.10-0.13	3.6-5.5	Low	0.24		
	42-60	0.6-20	0.08-0.12	3.6-5.5	Low	0.20		
WoC	0-15	6.0-20	0.06-0.08	3.6-4.4	Low	0.20	4	1
Woodmansie	15-26	0.6-6.0	0.10-0.13	3.6-5.5	Low	0.24		
	26-60	0.6-20	0.08-0.12	3.6-5.5	Low	0.20		

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the Glossary explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
AdA---- Adelphia	C	None----	---	---	1.5-4.0	Apparent	Jan-Apr	High----	Moderate	High.
At---- Atsion	D	None----	---	---	0-1.0	Apparent	Nov-Jun	Low----	High----	High.
Aw---- Atsion	D	Frequent----	Very brief	Jan-Dec	0-1.0	Apparent	Jan-Dec	Low----	High----	High.
AxB---- Aura	B	None----	---	---	>6.0	---	---	Low----	Low----	High.
Be---- Berryland	D	Rare----	Brief to long.	Mar-Jun	0-0.5	Apparent	Oct-Jun	Low----	High----	High.
BF---- Berryland	D	Frequent----	Brief to long.	Mar-Jun	0-0.5	Apparent	Oct-Jun	Low----	High----	High.
CoA, CoB, CoC---- Collington	B	None----	---	---	>6.0	---	---	Moderate	Low----	High.
DoA, DpA, DpB---- Downer	B	None----	---	---	>6.0	---	---	Low----	Low----	High.
DrB---- Downer	B	None----	---	---	>6.0	---	---	Moderate	Low----	High.
EvB, EvC, EvD---- Evesboro	A	None----	---	---	>6.0	---	---	Low----	Low----	High.
FtB---- Fripp	A	Rare----	---	---	>6.0	---	---	---	Low----	Low.
HaA, HcA---- Hammonton	B	None----	---	---	1.5-4.0	Apparent	Jan-Apr	High----	Moderate	High.
HU*. Humaquepts										
KeA---- Keyport	C	None----	---	---	1.5-4.0	Perched	Nov-May	High----	High----	High.
KlA---- Klej	B	None----	---	---	1.5-2.0	Apparent	Dec-Apr	Moderate	Low----	High.
KrA---- Kresson	C	None----	---	---	1.0-1.5	Perched	Dec-May	High----	High----	High.
LhA---- Lakehurst	A	None----	---	---	1.5-3.5	Apparent	Jan-Apr	Low----	Low----	High.
LmA---- Lakehurst	A	None----	---	---	1.5-2.5	Perched	Jan-Apr	Low----	Low----	High.
LwB, LwC---- Lakewood	A	None----	---	---	>6.0	---	---	Low----	Low----	High.
Ma---- Manahawkin	D	Frequent----	Long----	Jan-Mar	+1-0	Apparent	Oct-Jul	High----	High----	High.
Mr, Mu---- Mullica	D	None----	---	---	0-0.5	Apparent	Dec-May	---	High----	High.

See footnote at end of table.

TABLE 7.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months		Uncoated steel	Concrete
					Ft					
PeA---------- Pemberton	A	None--------	---	---	1.0-4.0	Apparent	Dec-May	Moderate	Low-------	Low.
PhB, PhC---------- Phalanx	B	None--------	---	---	>6.0	---	---	Low-------	Low-------	Moderate.
Pm*. Pits, sand and gravel										
PN*, PO*, PW*. Psamments										
SaB---------- Sassafras	B	None--------	---	---	>6.0	---	---	Moderate	Low-------	High.
Sh---------- Shrewsbury	D	None--------	---	---	0-1.0	Apparent	Oct-Jun	High------	High------	High.
SS*: Sulfaquents.										
Sulfihemists.										
TnB---------- Tinton	A	None--------	---	---	>6.0	---	---	Moderate	Low-------	High.
UL*. Urban land										
UP*: Urban land.										
Fripp----------	A	Rare--------	---	---	>6.0	---	---	---	Low-------	Low.
WoB, WoC---------- Woodmansie	B	None--------	---	---	>6.0	---	---	Low-------	Low-------	High.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	6,450	---	---	---
II	94,190	28,380	9,810	55,000
III	9,990	190	8,700	1,100
IV	84,480	540	55,230	28,710
V	42,850	---	42,850	---
VI	---	---	---	---
VII	104,900	---	27,540	77,360
VIII	---	---	---	---

TABLE 9.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. The estimates were made in 1977. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Ton	Ton
AdA---------- Adelphia	130	50	50	5.0	24
At, Aw---------- Atsion	---	---	---	---	---
AxB---------- Aura	100	35	45	---	20
Be, BF---------- Berryland	---	---	---	---	---
CoA---------- Collington	130	50	50	5.5	26
CoB---------- Collington	130	50	50	5.5	26
CoC---------- Collington	120	45	45	5.5	24
DoA, DrB---------- Downer	80	25	35	---	16
DpA, DpB---------- Downer	100	30	35	---	20
EvB, EvC, EvD---------- Evesboro	---	---	---	---	---
FtB---------- Fripp	---	---	---	---	---
HaA---------- Hammonton	90	30	35	---	20
HcA---------- Hammonton	100	35	35	---	25
HU*. Humaquepts					
KeA---------- Keyport	100	---	40	---	---
KlA---------- Klej	110	30	---	---	---
KrA---------- Kresson	120	40	40	4.5	16
LhA, LmA---------- Lakehurst	---	---	---	---	---
LwB, LwC---------- Lakewood	---	---	---	---	---
Ma---------- Manahawkin	---	---	---	---	---
Mr, Mu---------- Mullica	110	40	---	---	12

See footnote at end of table.

TABLE 9.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Wheat	Alfalfa hay	Tomatoes
	Bu	Bu	Bu	Ton	Ton
PeA---------- Pemberton	70	30	35	3.5	16
PhB---------- Phalanx	---	---	---	---	---
PhC---------- Phalanx	---	---	---	---	---
Pm*. Pits, sand and gravel					
PN*, PO*, PW*. Psamments					
SaB---------- Sassafras	130	45	50	5.0	24
Sh---------- Shrewsbury	120	35	---	---	---
SS---------- Sulfaquents	---	---	---	---	---
TnB---------- Tinton	---	30	30	---	16
UL*. Urban land					
UP---------- Urban land	---	---	---	---	---
WoB, WoC---------- Woodmansie	---	---	---	---	---

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--ORNAMENTAL TREES AND SHRUBS

[Soils not listed are generally unsuitable for ornamental plantings. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs	Evergreen shrubs
AdA---------- Adelphia	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellowwood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.
At---------- Atsion	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
AxB---------- Aura	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellowwood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.
Be, BF---------- Berryland	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
CoA, CoB, CoC---------- Collington	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellowwood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.

TABLE 10.--ORNAMENTAL TREES AND SHRUBS--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs	Evergreen shrubs
DoA, DpA, DpB, DrB---- Downer	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellow-wood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.
EvB, EvC, EvD--------- Evesboro	American hornbeam, ironwood, zelkova.	Austrian pine, white pine.	Bayberry, amur honeysuckle, autumn olive.	
FtB---------- Fripp	Live oak, white oak.	Arborvitae, American holly, Austrian pine, balsam fir, blue spruce, Douglas fir, Eastern red cedar, Japanese black pine, white spruce.	Beach plum, bayberry, rugosa rose, wax myrtel.	Pfitzer juniper, shore juniper, spreading juniper.
HaA, HcA---------- Hammonton	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, shadbush, sweetgum.	Eastern hemlock, American holly, Austrian pine, white pine, Norway spruce, northern white-cedar.	Arrowwood, bayberry, blackhaw, red-osier dogwood, maple species, winterberry, white fringe tree, chokeberry.	Juniper species, mountain laurel, rhododendron.
HU---------- Humaquepts	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
KeA---------- Keyport	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, American hornbeam, ironwood, littleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, shadbush, sweetgum.	Eastern hemlock, American holly, Austrian pine, white pine, Norway spruce, northern white-cedar.	Arrowwood, bayberry, blackhaw, red-osier dogwood, maple species, winterberry, white fringe tree, chokeberry.	Juniper species, mountain laurel, rhododendron.

TABLE 10.--ORNAMENTAL TREES AND SHRUBS--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs	Evergreen shrubs
KlA---------- Klej	American hornbeam, ironwood, zelkova.	Austrian pine, white pine.	Bayberry, amur honeysuckle, autumn-olive.	
KrA---------- Kresson	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, shadbush, sweetgum.	Eastern hemlock, American holly, Austrian pine, white pine, Norway spruce, northern white-cedar.	Arrowwood, bayberry, blackhaw, red-osier dogwood, maple species, winterberry, white fringe tree, chokeberry.	Juniper species, mountain laurel, rhododendron.
LhA, LmA---------- Lakehurst	American hornbeam, ironwood, zelkova.	Austrian pine, white pine.	Bayberry, amur honeysuckle, autumn-olive.	
LwB, LwC---------- Lakewood	American hornbeam, ironwood, zelkova.	Austrian pine, white pine.	Bayberry, amur honeysuckle, autumn-olive.	
Ma---------- Manahawkin	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
Mr, Mu---------- Mullica	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
PeA---------- Pemberton	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, shadbush, sweetgum.	Eastern hemlock, American holly, Austrian pine, white pine, Norway spruce, northern white-cedar.	Arrowwood, bayberry, blackhaw, red-osier dogwood, maple species, winterberry, white fringe tree, chokeberry.	Juniper species, mountain laurel, rhododendron.
PhB, PhC---------- Phalanx	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellow-wood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.

TABLE 10.--ORNAMENTAL TREES AND SHRUBS--Continued

Soil name and map symbol	Deciduous trees	Evergreen trees	Deciduous shrubs	Evergreen shrubs
SaB---------- Sassafras	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellowwood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian pine, white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.
Sh---------- Shrewsbury	Pin oak, willow oak, white oak, sweetgum.	Atlantic white-cedar	Arrowwood, red-osier dogwood, winterberry, white fringe tree, chokeberry.	
TnB---------- Tinton	White ash, European beech, gray birch, flowering crabapple, flowering dogwood, ginkgo, American hornbeam, ironwood, littleleaf linden, sugar maple, northern red oak, pin oak, scarlet oak, willow oak, white oak, Japanese pagoda tree, Bradford pear, plums and cherries, golden-rain-tree, shadbush, sweetgum, yellowwood, zelkova.	Atlas cedar, cryptomeria, white fir, eastern hemlock, American holly, Austrian white pine, Colorado blue spruce, Norway spruce, northern white-cedar.	Arrowwood, flame azalea, bayberry, blackhaw, red-osier dogwood, Laland firethorn, forsythia, Franklinia tree, hawthorns, amur honeysuckle, maple species, autumn-olive, winterberry, white fringe tree, chokeberry.	Azalea, Japanese holly, Juniper species, mountain laurel, Mugo pine, rhododendron, Japanese yew.
UP Urban land part.				
Fripp part----------	Live oak, white oak.	Arborvitae, American holly, Austrian pine, balsam fir, blue spruce, Douglas fir, Eastern red cedar, Japanese black pine, white spruce.	Beach plum, Bayberry, rugosa rose, wax myrtel.	Pfitzer juniper, shore juniper, spreading juniper.
WoB, WoC---------- Woodmansie	American hornbeam, ironwood, zelkova.	Austrian pine, white pine.	Bayberry, amur honeysuckle, autumn olive.	

TABLE 11.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
AdA---------- Adelphia	2o	Slight	Slight	Slight	Slight	Northern red oak----	---	Northern red oak, sweetgum, yellow-poplar, black walnut.
						White oak----------	---	
						Black oak----------	---	
						Sweetgum----------	82	
						Yellow-poplar-------	95	
At---------- Atsion	3w	Slight	Severe	Severe	Severe	Pitch pine----------	65	Pitch pine.
AxB---------- Aura	3o	Slight	Slight	Slight	Slight	Black oak----------	70	Virginia pine.
						White oak----------	70	
						Scarlet oak---------	70	
						Virginia pine-------	70	
Be, BF---------- Berryland	4w	Slight	Severe	Severe	Severe	Pitch pine----------	60	
CoA, CoB, CoC------ Collington	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar.
						Black oak----------	80	
						Yellow-poplar-------	90	
						Scarlet oak---------	80	
						White oak----------	80	
DoA, DpA, DpB, DrB Downer	3o	Slight	Slight	Slight	Slight	Black oak----------	70	Virginia pine.
						White oak----------	70	
						Scarlet oak---------	70	
						Virginia pine-------	70	
EvB, EvC, EvD------ Evesboro	4s	Slight	Moderate	Slight	Slight	Shortleaf pine------	60	Virginia pine.
						Pitch pine----------	60	
						Virginia pine-------	70	
						Black oak----------	70	
						White oak----------	70	
						Chestnut oak--------	70	
FtB---------- Fripp	4s	Slight	Moderate	Moderate	Slight	Pitch pine----------	60	Slash pine.
HaA, HcA---------- Hammonton	2o	Slight	Slight	Slight	Slight	Black oak----------	80	Virginia pine.
						White oak----------	80	
						Virginia pine-------	---	
						Shortleaf pine------	---	
						Pitch pine----------	---	
KeA---------- Keyport	2w	Slight	Moderate	Slight	Slight	Yellow-poplar-------	90	Yellow-poplar, northern red oak.
						Northern red oak----	80	
KlA---------- Klej	3s	Slight	Moderate	Slight	Slight	Sweetgum----------	80	Virginia pine.
						White oak----------	70	
						Virginia pine-------	70	
KrA---------- Kresson	2w	Slight	Moderate	Moderate	Moderate	Sweetgum----------	90	Sweetgum, yellow-poplar.
						White oak----------	80	
						Pin oak------------	80	
						Yellow-poplar-------	90	
						Willow oak----------	80	

TABLE 11.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
LhA---------- Lakehurst	5s	Slight	Moderate	Moderate	Slight	Pitch pine----------	30	Virginia pine.
LmA---------- Lakehurst	5s	Slight	Moderate	Moderate	Slight	Pitch pine----------	30	Virginia pine.
						Black oak----------	45	
						White oak----------	45	
						Blackgum----------	45	
LwB, LwC---------- Lakewood	5s	Slight	Slight	Moderate	Slight	Pitch pine----------	50	Pitch pine, shortleaf pine.
						Shortleaf pine------	50	
						Virginia pine-------	60	
Ma---------- Manahawkin	4w	Slight	Severe	Severe	Severe	Atlantic white-cedar	50	
						Red maple----------	---	
						Sweetbay----------	---	
						Blackgum----------	---	
Mr, Mu---------- Mullica	2w	Slight	Severe	Severe	Slight	Pitch pine----------	80	Sweetgum.
						Pin oak----------	85	
						Sweetgum----------	90	
PeA---------- Pemberton	2s	Slight	Slight	Moderate	Slight	Sweetgum----------	80	Sweetgum, shortleaf pine.
						Northern red oak----	80	
						Pin oak----------	80	
PhB, PhC---------- Phalanx	3o	Slight	Slight	Slight	Slight	Chestnut oak--------	70	Pitch pine.
						Black oak----------	70	
						White oak----------	70	
						Virginia pine-------	70	
						Pitch pine----------	---	
SaB---------- Sassafras	2o	Slight	Slight	Slight	Slight	White oak----------	80	Eastern white pine, yellow-poplar.
						Yellow-poplar-------	90	
						Virginia pine-------	80	
Sh---------- Shrewsbury	2w	Slight	Severe	Severe	Moderate	Pin oak----------	80	Eastern white pine, sweetgum.
						Sweetgum----------	90	
TnB---------- Tinton	3o	Slight	Moderate	Moderate	Slight	Northern red oak----	70	Eastern white pine.
						Virginia pine-------	70	
						Shortleaf pine------	70	
UP*: Urban land.								
Fripp----------	4s	Slight	Moderate	Moderate	Slight	Pitch pine----------	55	
WoB, WoC---------- Woodmansie	4s	Slight	Slight	Moderate	Slight	Pitch pine----------	60	Pitch pine, shortleaf pine.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AdA---- Adelphia	Fair	Good	Good	Good	Good	Poor	Poor	Good	Fair	Poor.
At, Aw---- Atsion	Poor	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair.
AxB---- Aura	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Be, BF---- Berryland	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CoA---- Collington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoB---- Collington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CoC---- Collington	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
DoA---- Downer	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
DpA, DpB, DrB---- Downer	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
EvB, EvC---- Evesboro	Poor	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
EvD---- Evesboro	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
FtB---- Fripp	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
HaA---- Hammonton	Poor	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
HcA---- Hammonton	Fair	Good	Good	Fair	Fair	Poor	Poor	Good	Fair	Poor.
HU*. Humaquepts										
KeA---- Keyport	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
KlA---- Klej	Fair	Fair	Good	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
KrA---- Kresson	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
LhA, LmA---- Lakehurst	Poor	Poor	Fair	Poor	Poor	Poor	Fair	Poor	Poor	Poor.
LwB, LwC---- Lakewood	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ma---- Manahawkin	Very poor.	Poor	Poor	Poor	Poor	Good	Poor	Poor	Poor	Fair.

See footnote at end of table.

TABLE 12.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Mr, Mu---------- Mullica	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
PeA---------- Pemberton	Poor	Poor	Good	Good	Good	Poor	Poor	Fair	Fair	Poor.
PhB, PhC---------- Phalanx	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Pm*. Pits, sand and gravel										
PN*, PO*, PW*. Psamments										
SaB---------- Sassafras	Good	Good	Good	Good	Poor	Poor	Very poor.	Good	Good	Very poor.
Sh---------- Shrewsbury	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
SS*: Sulfaquents.										
Sulfihemists.										
TnB---------- Tinton	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
UL*. Urban land										
UP*: Urban land.										
Fripp----------	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
WoB, WoC---------- Woodmansie	Very poor.	Poor	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AdA---------- Adelphia	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Slight.
At---------- Atsion	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness, too sandy.
Aw---------- Atsion	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, too sandy.	Severe: wetness, floods.	Severe: wetness, floods, too sandy.
AxB---------- Aura	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.
Be---------- Berryland	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.	Severe: wetness.	Severe: wetness.
BF---------- Berryland	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness, too sandy.	Severe: floods, wetness.	Severe: floods, wetness, too sandy.
CoA---------- Collington	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
CoB---------- Collington	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
CoC---------- Collington	Slight----------	Slight----------	Severe: slope.	Slight----------	Slight.
DoA---------- Downer	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: too sandy, droughty.
DpA---------- Downer	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
DpB---------- Downer	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
DrB---------- Downer	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: small stones.	Moderate: small stones.
EvB---------- Evesboro	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, droughty.
EvC, EvD---------- Evesboro	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: slope, too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, droughty.
FtB---------- Fripp	Severe: too sandy, floods.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy.
HaA---------- Hammonton	Moderate: dusty, too sandy, soil blowing.	Moderate: dusty, too sandy.	Moderate: wetness.	Moderate: dusty.	Moderate: too sandy, droughty.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HcA---------- Hammonton	Slight----------	Slight----------	Moderate: wetness.	Slight----------	Slight.
HU*. Humaquepts					
KeA---------- Keyport	Moderate: percs slowly.	Moderate: wetness.	Moderate: percs slowly.	Slight----------	Severe: percs slowly.
KlA---------- Klej	Moderate: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy, wetness.	Moderate: too sandy.	Severe: too sandy.
KrA---------- Kresson	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
LhA---------- Lakehurst	Severe: too sandy.	Severe: too sandy, dusty.	Severe: too sandy.	Severe: too sandy.	Severe: droughty, too sandy.
LmA---------- Lakehurst	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty, too sandy.
LwB---------- Lakewood	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
LwC---------- Lakewood	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: too sandy.
Ma---------- Manahawkin	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, excess humus.	Severe: wetness, floods, low strength.
Mr, Mu---------- Mullica	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
PeA---------- Pemberton	Severe: wetness, too sandy.	Severe: wetness, too sandy.	Severe: soil blowing, too sandy.	Severe: wetness, too sandy.	Severe: too sandy.
PhB---------- Phalanx	Moderate: too sandy.	Moderate: too sandy.	Moderate: too sandy, slope.	Moderate: too sandy.	Moderate: too sandy.
PhC---------- Phalanx	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: too sandy.
Pm*. Pits, sand and gravel					
PN*, PO*, PW*. Psamments					
SaB---------- Sassafras	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
Sh---------- Shrewsbury	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
SS*: Sulfaquents.					
Sulfihemists.					

See footnote at end of table.

TABLE 13.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
TnB--Tinton	Severe: too sandy.	Severe: too sandy.	Severe: soil blowing, too sandy.	Severe: too sandy.	Severe: too sandy.
UL*. Urban land					
UP*: Urban land.					
Fripp	Severe: too sandy, floods.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.
WoB--Woodmansie	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, droughty.
WoC--Woodmansie	Severe: too sandy, dusty.	Severe: too sandy, dusty.	Severe: slope, too sandy, dusty.	Severe: too sandy, dusty.	Severe: too sandy, droughty.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AdA---------- Adelphia	Severe: wetness.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, frost action.	Slight.
At---------- Atsion	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, too sandy.
Aw---------- Atsion	Severe: wetness, floods, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods, too sandy.
AxB---------- Aura	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
Be---------- Berryland	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
BF---------- Berryland	Severe: wetness, cutbanks cave.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness, too sandy.
CoA, CoB, CoC----- Collington	Slight---------	Moderate: frost action.	Slight---------	Severe: slope.	Moderate: frost action.	Slight.
DoA---------- Downer	Moderate: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too sandy, droughty.
DpA, DpB---------- Downer	Moderate: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
DrB---------- Downer	Moderate: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: small stones.
EvB---------- Evesboro	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too sandy, droughty.
EvC---------- Evesboro	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: too sandy, droughty.
EvD---------- Evesboro	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: too sandy, droughty.
FtB---------- Fripp	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: too sandy, droughty.
HaA---------- Hammonton	Severe: cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness, frost action.	Moderate: too sandy, droughty.
HcA---------- Hammonton	Severe: cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness, frost action.	Slight.
HU*. Humaquepts						
KeA---------- Keyport	Moderate: wetness.	Severe: frost action.	Moderate: wetness.	Moderate: wetness.	Severe: frost action.	Severe: percs slowly.

See footnote at end of table.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
KlA---------- Klej	Severe: wetness, cutbanks cave.	Moderate: frost action, wetness.	Severe: wetness.	Moderate: frost action, wetness.	Moderate: frost action, wetness.	Severe: too sandy.
KrA---------- Kresson	Severe: wetness.	Severe: wetness, low strength, frost action.	Severe: wetness.	Severe: wetness, low strength, frost action.	Severe: wetness, low strength, frost action.	Severe: wetness.
LhA, LmA---------- Lakehurst	Severe: wetness, cutbanks cave.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: droughty, too sandy.
LwB---------- Lakewood	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too sandy.
LwC---------- Lakewood	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: too sandy.
Ma---------- Manahawkin	Severe: floods, cutbanks cave, wetness.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, floods, low strength.	Severe: wetness, low strength, floods.	Severe: wetness, floods, low strength.
Mr, Mu---------- Mullica	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
PeA---------- Pemberton	Severe: cutbanks cave, wetness.	Moderate: wetness, frost action.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, frost action.	Severe: too sandy.
PhB---------- Phalanx	Severe: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: too sandy.
PhC---------- Phalanx	Severe: large stones.	Moderate: large stones.	Moderate: large stones.	Moderate: slope, large stones.	Moderate: large stones.	Moderate: too sandy.
Pm*. Pits, sand and gravel						
PN*, PO*, PW*. Psamments						
SaB---------- Sassafras	Slight---------	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
Sh---------- Shrewsbury	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness, frost action.	Severe: wetness.
SS*: Sulfaquents.						
Sulfihemists.						
TnB---------- Tinton	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too sandy.
UL*. Urban land						
UP*: Urban land.						
Fripp----------	Severe: cutbanks cave.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.	Severe: too sandy.
WoB---------- Woodmansie	Slight---------	Slight---------	Slight---------	Slight---------	Slight---------	Severe: too sandy, droughty.

See footnote at end of table.

TABLE 14.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WoC---------- Woodmansie	Slight---------	Slight---------	Slight---------	Moderate: slope.	Slight---------	Severe: too sandy, droughty.

*. See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AdA---- Adelphia	Moderate: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Good.
At---- Atsion	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, too sandy.
Aw---- Atsion	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Severe: wetness, floods.	Poor: wetness, too sandy.
AxB---- Aura	Moderate: percs slowly.	Moderate: slope, seepage.	Slight----	Slight----	Good.
Be---- Berryland	Severe: wetness.	Severe: wetness, seepage, floods.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness, too sandy.
BF---- Berryland	Severe: wetness, floods.	Severe: wetness, seepage, floods.	Severe: floods, seepage, wetness.	Severe: floods, wetness, seepage.	Poor: wetness, too sandy.
CoA---- Collington	Slight----	Moderate: seepage.	Severe: seepage.	Severe: seepage.	Good.
CoB---- Collington	Slight----	Moderate: slope, seepage.	Severe: seepage.	Severe: seepage.	Good.
CoC---- Collington	Slight----	Severe: slope.	Severe: seepage.	Severe: seepage.	Good.
DoA---- Downer	Slight----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy.
DpA, DpB---- Downer	Slight----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
DrB---- Downer	Slight----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: small stones.
EvB---- Evesboro	Slight*----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
EvC---- Evesboro	Slight*----	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
EvD---- Evesboro	Moderate: slope.	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
FtB---- Fripp	Moderate: floods.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
HaA, HcA---- Hammonton	Moderate: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Good.

See footnotes at end of table.

TABLE 15.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HU**. Humaquepts					
KeA---------- Keyport	Severe: percs slowly.	Slight----------	Moderate: too clayey.	Slight----------	Poor: area reclaim.
KlA---------- Klej	Moderate*: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Fair: too sandy.
KrA---------- Kresson	Severe: percs slowly, wetness.	Slight----------	Severe: wetness.	Severe: wetness.	Fair: wetness, too clayey.
LhA---------- Lakehurst	Moderate*: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: too sandy.
LmA---------- Lakehurst	Severe: percs slowly.	Slight----------	Severe: wetness.	Severe: wetness.	Poor: too sandy.
LwB---------- Lakewood	Slight*----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
LwC---------- Lakewood	Slight*----------	Severe: slope, seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
Ma---------- Manahawkin	Severe: wetness, floods.	Severe: excess humus, seepage, wetness.	Severe: wetness, floods, seepage.	Severe: wetness, floods, seepage.	Poor: excess humus, wetness, hard to pack.
Mr, Mu---------- Mullica	Severe: wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
PeA---------- Pemberton	Moderate: wetness.	Severe: wetness, seepage, too sandy.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: too sandy, seepage.
PhB---------- Phalanx	Moderate: large stones.	Severe: seepage.	Severe: seepage, large stones.	Severe: seepage.	Fair: large stones.
PhC---------- Phalanx	Moderate: large stones.	Severe: slope, seepage.	Severe: seepage, large stones.	Severe: seepage.	Fair: large stones.
Pm**. Pits, sand and gravel					
PN**, PO**, PW**. Psamments					
SaB---------- Sassafras	Slight----------	Moderate: slope, seepage.	Severe: seepage.	Slight----------	Good.
Sh---------- Shrewsbury	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	Poor: wetness.
SS**: Sulfaquents. Sulfihemists.					

See footnotes at end of table.

TABLE 15.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
TnB---------- Tinton	Slight----------	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Fair: too sandy.
UL**. Urban land					
UP**: Urban land.					
Fripp----------	Moderate: floods.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
WoB---------- Woodmansie	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: too sandy.
WoC---------- Woodmansie	Slight----------	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: too sandy.

* Rapid permeability in the substratum may cause pollution of ground water.
** See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AdA---- Adelphia	Fair: wetness.	Poor: excess fines.	Unsuited: excess fines.	Good.
At---- Atsion	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness, too sandy.
Aw---- Atsion	Poor: wetness.	Poor: excess fines.	Unsuited: excess fines.	Poor: wetness, too sandy.
AxB---- Aura	Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Fair: small stones.
Be, BF---- Berryland	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness, too sandy.
CoA, CoB, CoC---- Collington	Fair: low strength, frost action.	Poor: excess fines.	Unsuited: excess fines.	Good.
DoA---- Downer	Good	Fair: excess fines.	Poor: excess fines.	Poor: too sandy, droughty.
DpA, DpB---- Downer	Good	Fair: excess fines.	Poor: excess fines.	Fair: small stones.
DrB---- Downer	Good	Good	Fair: excess fines.	Poor: small stones.
EvB, EvC, EvD---- Evesboro	Good	Good	Unsuited: excess fines.	Poor: too sandy.
FtB---- Fripp	Good	Good	Unsuited: excess fines.	Poor: too sandy.
HaA---- Hammonton	Poor: frost action.	Fair: excess fines.	Poor: excess fines.	Poor: too sandy, droughty.
HcA---- Hammonton	Poor: frost action.	Fair: excess fines.	Poor: excess fines.	Fair: small stones.
HU*. Humaquepts				
KeA---- Keyport	Poor: area reclaim, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
KlA---- Klej	Fair: frost action.	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
KrA---- Kresson	Poor: low strength, frost action, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, too clayey.
LhA---- Lakehurst	Good	Good	Unsuited: excess fines.	Poor: too sandy.

See footnote at end of table.

TABLE 16.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
LmA---------- Lakehurst	Good----------	Poor: excess fines.	Unsuited: excess fines.	Poor: too sandy.
LwB, LwC---------- Lakewood	Good----------	Good----------	Unsuited: excess fines.	Poor: too sandy.
Ma---------- Manahawkin	Poor: excess humus, wetness.	Poor: excess humus.	Poor: excess humus.	Poor: excess humus.
Mr, Mu---------- Mullica	Poor: wetness.	Fair: excess fines.	Unsuited: excess fines.	Poor: wetness.
PeA---------- Pemberton	Good----------	Fair: excess fines.	Unsuited: excess fines.	Poor: too sandy.
PhB, PhC---------- Phalanx	Good----------	Fair: excess fines.	Poor: excess fines.	Poor: too sandy.
Pm*. Pits, sand and gravel				
PN*, PO*, PW*. Psamments				
SaB---------- Sassafras	Good----------	Fair: excess fines.	Unsuited: excess fines.	Good.
Sh---------- Shrewsbury	Poor: wetness, frost action.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
SS*: Sulfaquents.				
Sulfihemists.				
TnB---------- Tinton	Good----------	Fair: excess fines.	Poor: excess fines.	Poor: too sandy.
UL*. Urban land				
UP*: Urban land.				
Fripp----------	Good----------	Good----------	Unsuited: excess fines.	Poor: too sandy.
WoB, WoC---------- Woodmansie	Good----------	Fair: excess fines.	Poor: thin layer, excess fines.	Poor: too sandy.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AdA---------- Adelphia	Seepage, piping.	Deep to water	Favorable------	Favorable------	Piping---------	Favorable.
At---------- Atsion	Piping, seepage.	Favorable------	Wetness, cutbanks cave.	Wetness, droughty, fast intake.	Not needed-----	Not needed.
Aw---------- Atsion	Piping, seepage, floods.	Floods---------	Wetness, floods.	Wetness, floods.	Not needed-----	Not needed.
AxB---------- Aura	Favorable------	No water-------	Not needed-----	Percs slowly, rooting depth.	Favorable------	Favorable.
Be, BF---------- Berryland	Piping, seepage.	Favorable------	Wetness, cutbanks cave.	Wetness, droughty.	Not needed-----	Not needed.
CoA, CoB, CoC----- Collington	Low strength---	No water-------	Not needed-----	Favorable------	Favorable------	Favorable.
DoA, DpA, DpB, DrB---------- Downer	Seepage--------	No water-------	Not needed-----	Favorable------	Favorable------	Favorable.
EvB, EvC, EvD----- Evesboro	Seepage, piping.	No water-------	Not needed-----	Soil blowing---	Too sandy, soil blowing.	Droughty.
FtB---------- Fripp	Seepage, piping.	No water-------	Not needed-----	Droughty, fast intake, slope.	Too sandy, slope.	Droughty, slope.
HaA, HcA---------- Hammonton	Seepage--------	Deep to water	Cutbanks cave	Favorable------	Not needed-----	Favorable.
HU*. Humaquepts						
KeA---------- Keyport	Low strength---	Slow refill----	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.	Percs slowly, slope.
KlA---------- Klej	Piping, low strength, unstable fill.	Cutbanks cave	Cutbanks cave, frost action.	Wetness, fast intake, seepage.	Not needed-----	Not needed.
KrA---------- Kresson	Low strength---	Slow refill----	Percs slowly, wetness.	Wetness--------	Percs slowly, wetness, erodes easily.	Percs slowly, wetness.
LhA, LmA---------- Lakehurst	Seepage, piping, hard to pack.	Deep to water	Cutbanks cave	Droughty, fast intake, seepage.	Not needed-----	Not needed.
LwB, LwC---------- Lakewood	Seepage, piping, hard to pack.	No water-------	Not needed-----	Fast intake, seepage, droughty.	Too sandy------	Droughty.
Ma---------- Manahawkin	Seepage--------	Favorable------	Floods, cutbanks cave, excess humus.	Floods, wetness.	Not needed-----	Not needed.
Mr, Mu---------- Mullica	Seepage, piping.	Favorable------	Wetness, cutbanks cave.	Wetness, fast intake.	Not needed-----	Wetness.
PeA---------- Pemberton	Seepage, piping.	Deep to water	Cutbanks cave	Droughty, fast intake.	Piping---------	Not needed.

See footnote at end of table.

TABLE 17.--WATER MANAGEMENT--Continued

Soil name and map symbol	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PhB, PhC---------- Phalanx	Seepage, large stones.	No water-------	Not needed-----	Favorable------	Favorable, large stones.	Favorable.
Pm*. Pits, sand and gravel.						
PN*, PO*, PW*. Psamments						
SaB---------- Sassafras	Piping---------	Deep to water	Not needed-----	Slope----------	Slope----------	Slope.
Sh---------- Shrewsbury	Piping, unstable fill.	Favorable------	Wetness--------	Wetness, seepage.	Wetness--------	Wetness.
SS*: Sulfaquents.						
Sulfihemists.						
TnB---------- Tinton	Seepage, piping.	No water-------	Not needed-----	Slope, droughty, fast intake.	Piping---------	Droughty.
UL*. Urban land						
UP*: Urban land.						
Fripp----------	Seepage, piping.	No water-------	Not needed-----	Droughty, fast intake, slope.	Too sandy, slope.	Droughty, slope.
WoB, WoC---------- Woodmansie	Seepage--------	Deep to water	Not needed-----	Droughty, soil blowing.	Soil blowing---	Droughty.

* See the description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL SERIES ARRANGED ACCORDING TO TEXTURE OF THE SUBSOIL AND NATURAL DRAINAGE

Texture of the subsoil[1] and other soil characteristics	Excessively drained	Well drained	Moderately well drained	Somewhat poorly drained	Poorly drained	Very poorly drained
Mineral soils:						
Sand or loamy sand subsoil[2]--						
Base of albic horizon more than 4 inches below the surface.	Lakewood	----------	Lakehurst	Lakehurst	Atsion	Berryland
Albic horizon lacking or base of albic horizon less than 4 inches below the surface--						
Extremely acid to very strongly acid.	Evesboro	----------	Klej	Klej	----------	----------
Strongly acid to slightly acid	Fripp	----------	----------	----------	----------	----------
Sandy loam subsoil[2]--						
Subsoil with ironstone	----------	Phalanx	----------	----------	----------	----------
Subsoil without ironstone	----------	Downer	Hammonton	Hammonton	----------	Mullica
Sandy clay loam subsoil[2]--						
Nonglauconitic material--						
Base of albic horizon more than 4 inches below the surface.	----------	Woodmansie	----------	----------	----------	----------
Albic horizon lacking or base of albic horizon less than 4 inches below the surface--						
Very firm subsoil	----------	Aura	----------	----------	----------	----------
Friable or firm subsoil	----------	Sassafras	----------	----------	----------	----------
Glauconitic material--						
Sandy surface layer more than 20 inches thick.	----------	Tinton	Pemberton	Pemberton	----------	----------
Sandy surface layer lacking or less than 20 inches thick.	----------	Collington	Adelphia	Adelphia	Shrewsbury	----------
Clayey subsoil[2]--						
Nonglauconitic material	----------	----------	Keyport	----------	----------	----------
Glauconitic material	----------	----------	----------	Kresson	----------	----------
Organic soils:	----------	----------	----------	----------	----------	Manahawkin

[1]Subsoil texture listed in order of increasing clay content. [2]Dominant texture of finest horizon.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Adelphia	Fine-loamy, mixed, mesic Aquic Hapludults
Atsion	Sandy, siliceous, mesic Aeric Haplaquods
Aura	Fine-loamy, mixed, mesic Typic Hapludults
Berryland	Sandy, siliceous, mesic Typic Haplaquods
Collington	Fine-loamy, mixed, mesic Typic Hapludults
Downer	Coarse-loamy, siliceous, mesic Typic Hapludults
Evesboro	Mesic, coated Typic Quartzipsamments
*Fripp	Mixed, thermic Typic Udipsamments
Hammonton	Coarse-loamy, siliceous, mesic Aquic Hapludults
Keyport	Clayey, mixed, mesic Aquic Hapludults
Klej	Mesic, coated Aquic Quartzipsamments
Kresson	Clayey, glauconitic, mesic Aquic Hapludults
Lakehurst	Mesic, coated Haplaquodic Quartzipsamments
Lakewood	Mesic, coated Spodic Quartzipsamments
Manahawkin	Sandy or sandy-skeletal, siliceous, euic, mesic Terric Medisaprists
Mullica	Coarse-loamy, siliceous, thermic Typic Umbraquults
Pemberton	Loamy, mixed, mesic Arenic Hapludults
Phalanx	Coarse-loamy, siliceous, mesic Typic Hapludults
Sassafras	Fine-loamy, siliceous, mesic Typic Hapludults
Shrewsbury	Fine-loamy, mixed, mesic Typic Ochraquults
Tinton	Loamy, mixed, mesic Arenic Hapludults
Woodmansie	Coarse-loamy, siliceous, mesic Typic Hapludults

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