SOIL SURVEY OF

Somerset County, New Jersey

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

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.

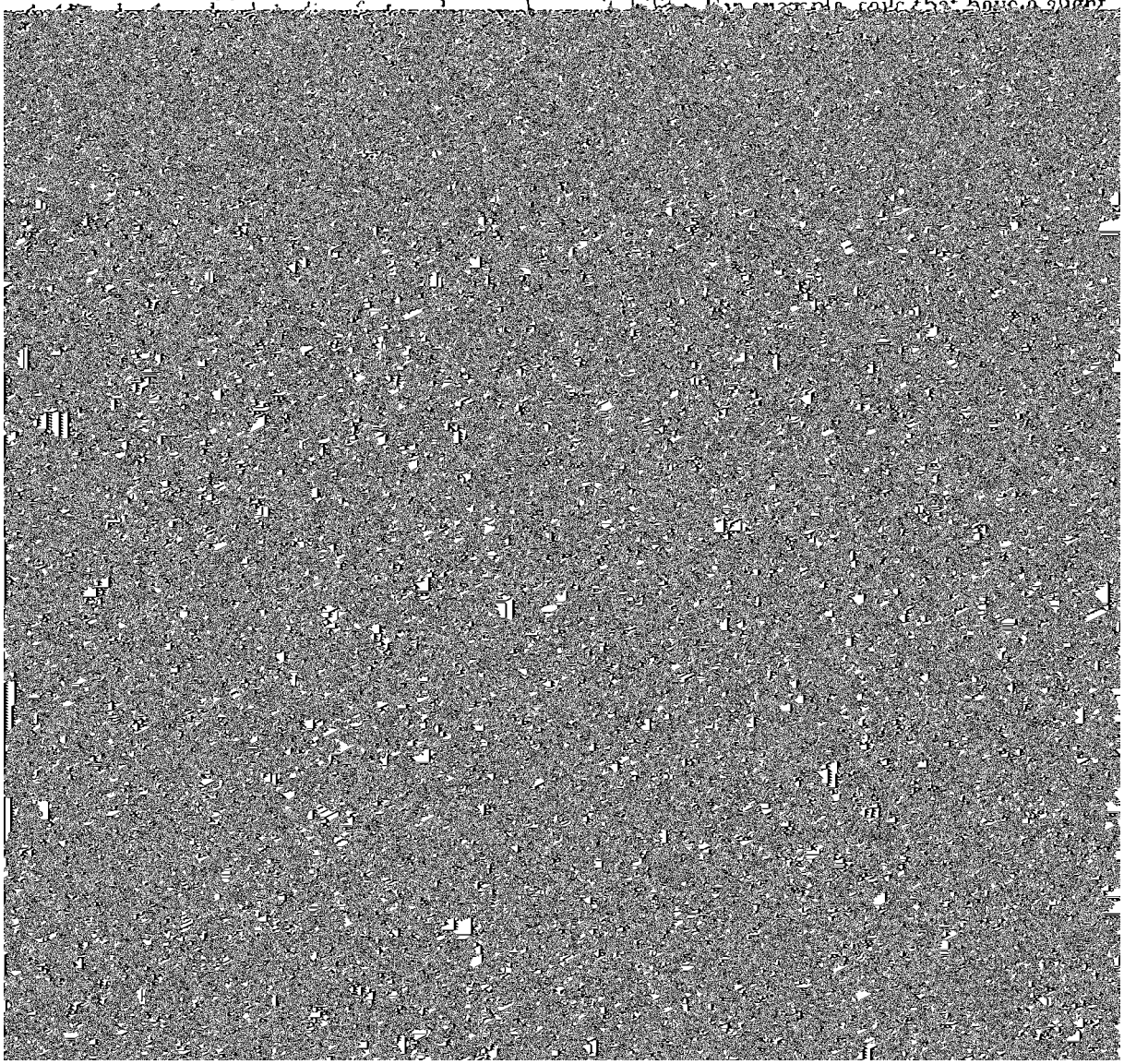
Major fieldwork for this soil survey was completed in the period 1957-68. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the New Jersey Agricultural Experiment Station, Cook College, Rutgers, the State University. It is part of the technical assistance furnished to the Somerset-Union Soil Conservation District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could 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.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and

overlay over the soil map and colored to show soils that have the same limitation or



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SOIL SURVEY OF SOMERSET COUNTY, NEW JERSEY

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

SOMERSET COUNTY is in the north-central part of New Jersey (fig. 1). It borders Morris, Union, Middlesex, Mercer, and Hunterdon Counties. Somerset County has a total of 196,288 acres. The northeastern fourth of the county is mostly steep and wooded. The other three-fourths consists of gently undulating and moderately sloping plains.

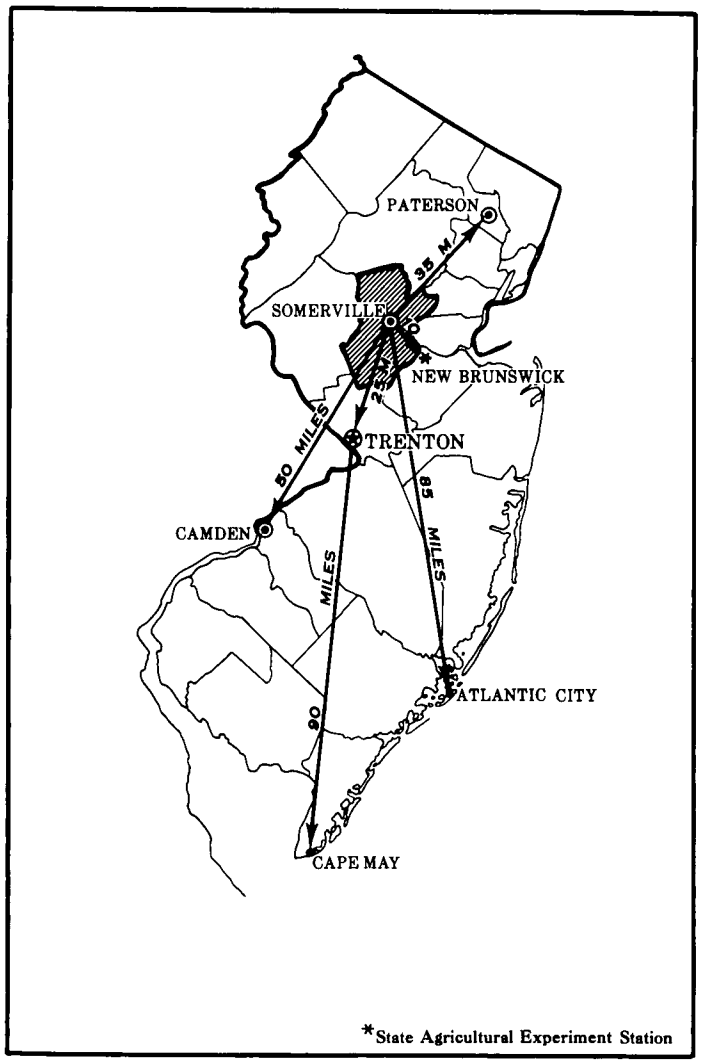


Figure 1.—Location of Somerset County in New Jersey.

About 25 percent of the county is in farms, and about 65 percent of the farmland is cultivated. In 1970 the population was 198,372 for the county and 14,165 for Somerville, the county seat. Nearly all the streams drain into the Raritan River, which flows east to the ocean. The Dead and Passaic Rivers in the northeastern part of the county flow eastward and empty into the Hudson River.

Dairying is the dominant type of farming in Somerset County. In 1969 about 371 farms were in the county. About 40 percent of this total was dairy farms, 25 percent horse farms, 25 percent poultry farms, 5 percent general farms, and 5 percent miscellaneous and unclassified farms.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Somerset County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Royce and Raritan,

for example, are the names of two soil series named after [illegible] agronomists, engineers, and others, then adjust the groups [illegible]

This association makes up about 6 percent of the county. It is 40 percent Edneyville soils, 20 percent Parker soils, 15 percent Meckesville soils, and 25 percent minor soils. The minor soils are Califon, Fluvaquents, and Udifluvents and Ochrepts.

Edneyville soils are deep, well-drained gravelly loams that have a moderately high content of gravel. They are gently sloping to steep and are subject to erosion if cultivated.

Parker soils are gently sloping to very steep, deep, somewhat excessively drained sandy loams. They are very gravelly, rocky, or very stony.

Meckesville soils are gently sloping to strongly sloping, moderately well drained gravelly loams. They have a slowly permeable fragipan.

The moderately well drained to somewhat poorly drained Califon soils are on uplands. The poorly drained Fluvaquents and the somewhat poorly drained to moderately well drained Udifluvents and Ochrepts are along streams.

The soils in this association are used mainly as woodland. Some areas of Edneyville and Parker soils have been cleared of stones and are cultivated. The major crops are corn, small grains, and hay and pasture plants. The abundant stones and gravel on the surface are a severe limitation for farming. Erosion is a potential hazard where a protective cover of vegetation is not maintained. Steep slopes, stoniness, and slow permeability are limitations for community development.

nonstony nearly level to strongly sloping soils are used for corn, soybeans, small grains, and hay and pasture plants. Artificial drainage is needed to remove excess water from the Mount Lucas and Amwell soils. Erosion is a potential hazard where the soils are strongly sloping or steep. Steep slopes, stoniness, and a seasonal high water table are limitations for community development.

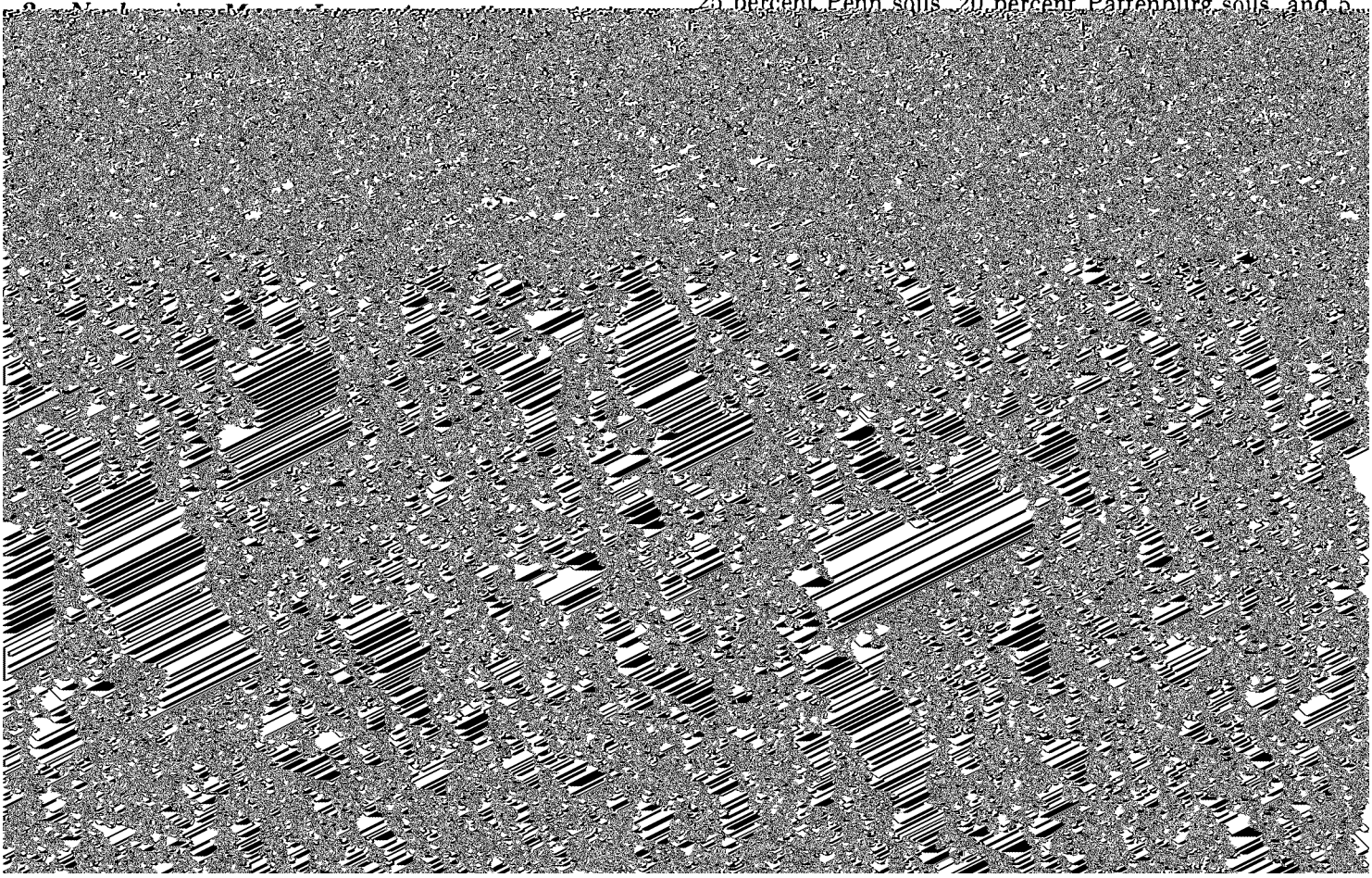
Soils Formed in Material Weathered Mainly From Shale, Siltstone, or Sandstone but Partly From Conglomerate and Argillite

The nearly level to very steep soils that make up these associations formed mainly in material weathered from red shale. In places they formed in material weathered from sandstone, siltstone, argillite, or conglomerate. The soils are mainly nearly level to strongly sloping. They have a surface layer of silt loam. The main farming areas of the county are in these associations.

3. *Arendtsville-Penn-Pattenburg association*

Nearly level to moderately steep, deep to moderately deep, well-drained loamy, gravelly, and shaly soils underlain mainly by quartzite conglomerate and red shale; on uplands

This association is on uplands mainly where the landscape is undulating and rolling. It makes up about 2 percent of the county. It is 50 percent Arendtsville soils, 25 percent Penn soils, 20 percent Pattenburg soils, and 5



county. It is 45 percent Norton soils, 20 percent Penn soils, 15 percent Lansdowne soils, and 20 percent minor soils. The minor soils are Reaville, Croton, Meckesville, Birdsboro, and Raritan.

Norton soils are deep, well-drained loams that formed in glacial till. They are nearly level to strongly sloping.

Penn soils are moderately deep, well-drained silt loams or shaly silt loams that formed in material weathered mainly from shale. They are nearly level to strongly sloping.

Lansdowne soils are deep, moderately well drained to somewhat poorly drained silt loams that formed in glacial till. These soils are in slight depressions. They are nearly level to gently sloping, are slowly permeable, and have a subsoil that is high in content of clay.

The main crops are corn, small grains, hay, and pasture. Artificial drainage is commonly needed for removing excess water from the Lansdowne, Raritan, Croton, and Reaville soils. The more sloping soils that are farmed intensively are subject to erosion unless conservation measures are used. Slow permeability, depth to bedrock, and a seasonal high water table are the main limitations for community development.

5. *Penn-Klinesville-Reaville association*

Nearly level to very steep, moderately deep and shallow, well drained to somewhat poorly drained loamy and shaly soils underlain mainly by red shale; on uplands

This association is on uplands where the landscape is

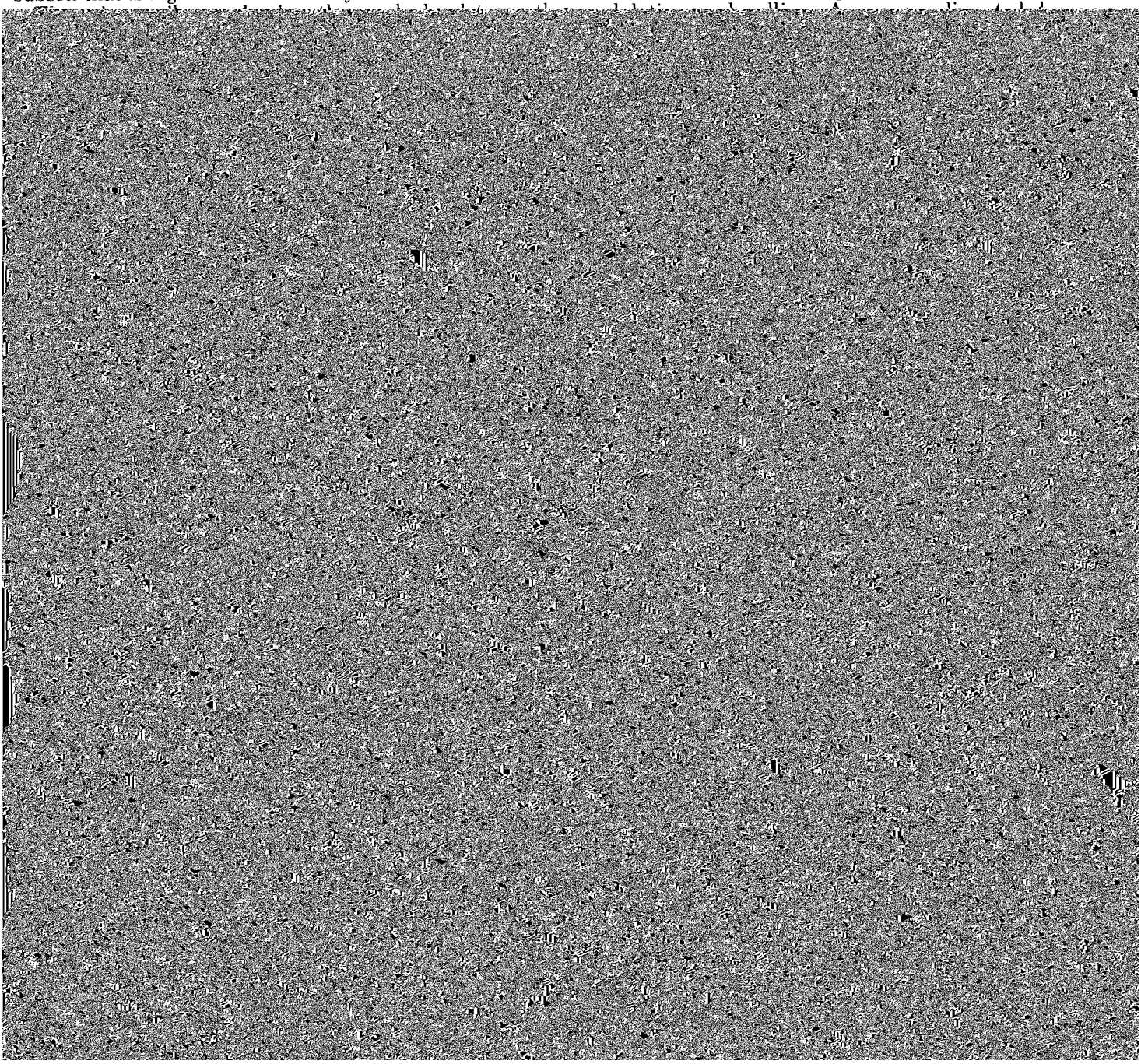


Figure 3.—**Dairy farm on association 6.**

Klinesville soils are shallow, well-drained shaly loams. They are gently sloping to very steep.

Reaville soils are moderately deep, moderately well drained to somewhat poorly drained silt loams. They are nearly level or gently sloping.

The Abbottstown soils are somewhat poorly drained, the Croton soils are poorly drained, the Norton soils are well drained, and the Lansdowne soils are moderately well drained and somewhat poorly drained. The Abbottstown, Croton, and Lansdowne soils have a seasonal perched water table. The Norton soils are well drained and have a slowly permeable subsoil.

The soils in this association are used mostly for general farming and dairying. The less sloping soils are used for corn, soybeans, small grains, hay, and pasture. Klinesville soils are droughty, shallow, and shaly and are not well suited to crops. Artificial drainage is generally needed to remove excess water from the Reaville, Abbottstown, Croton, and Lansdowne soils. Erosion is a potential hazard where the soils are farmed intensively unless conservation measures are used. Depth to bedrock, steepness of slope, and a seasonal water table are limitations for community development.

minor soils. The minor soils are Penn, Reaville, and Croton soils.

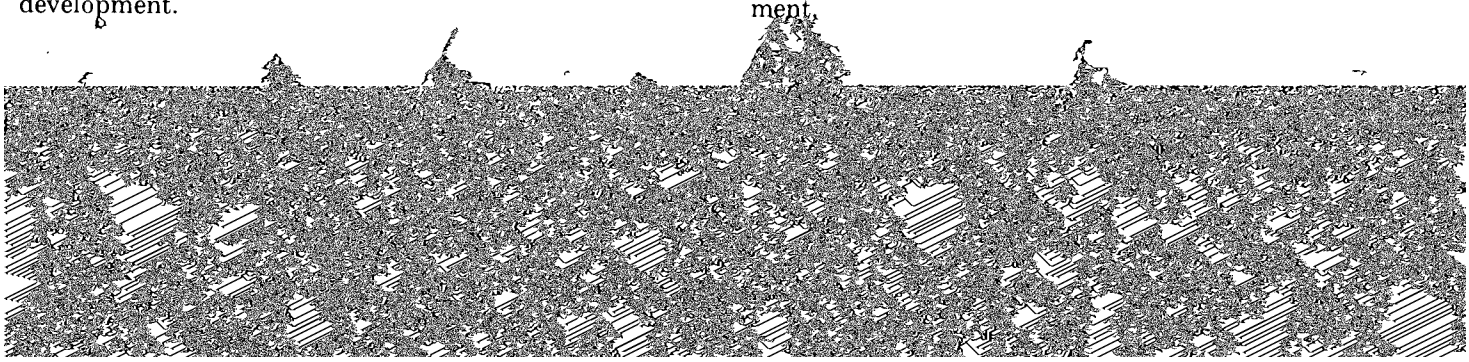
Bucks soils are deep, well-drained silt loams. They are nearly level to strongly sloping.

Abbottstown soils are deep, somewhat poorly drained silt loams that have a fragipan. They are nearly level to gently sloping.

Readington soils are deep, moderately well drained silt loams that have a fragipan. They are gently sloping.

Penn soils are moderately deep over shale bedrock. Reaville soils are moderately deep over shale, and they have a seasonal high water table. Croton soils are poorly drained, and they are deep over shale bedrock.

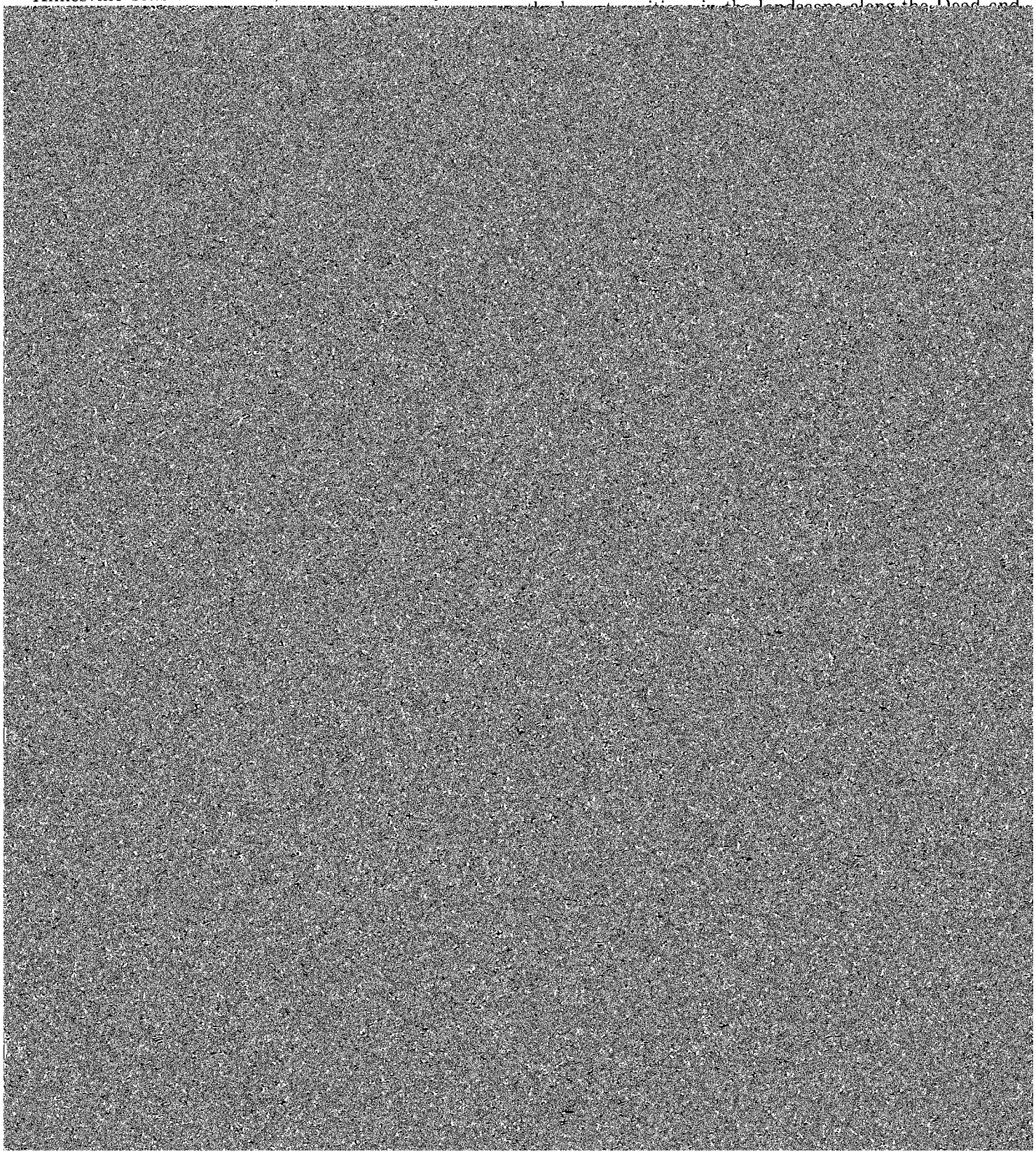
Most of the soils in this association are used mainly for general farming and dairying. Bucks and Readington soils are well suited to cultivated crops. The hazard of erosion is the main limitation to the use of the Bucks soil for farming, but wetness commonly delays tillage in spring on the Abbottstown and Readington soils. Artificial drainage is needed for good growth of crops, particularly on Abbottstown soils. Slow permeability and a perched seasonal high water table are limitations for community development.



Penn soils are moderately deep, well-drained silt loams or shaly silt loams. They are nearly level to strongly sloping.

Klinesville soils are shallow, well-drained shaly loams.

The soils of this association are mainly poorly drained, but somewhat poorly drained and moderately well drained soils are also present. This association is in the northern part of the county in the old Lake Passaic basin. It occupies



Soils Formed in Recent Alluvium and Old Alluvium

The nearly level to strongly sloping soils that make up these associations are on the flood plains and terraces along the major streams. They formed dominantly in stream sediment and glacial outwash material. The soils of these associations are mainly farmed or are in pasture.

11. Dunellen-Rowland-Birdsboro association

Nearly level to strongly sloping, deep, well drained to somewhat poorly drained loamy soils formed in glacial outwash or alluvial deposits; on flood plains and terraces

The soils of this association are in one large area in the east-central part of the county in the foothills of the Watchung Mountains (fig. 4). They are mainly nearly level to gently sloping.

This association makes up about 4 percent of the county. It is 45 percent Dunellen soils, 30 percent Rowland soils, 15 percent Birdsboro soils, and 10 percent minor soils. The minor soils are the Raritan, Bowmansville, Lamington, and Dunellen, moderately well drained variant.

Dunellen soils are deep, well-drained sandy loams. These soils formed in glacial outwash material and are on high terraces. They are nearly level to gently sloping.

Rowland soils are deep, moderately well drained and somewhat poorly drained silt loams that formed in recent alluvium along the major streams. They are subject to flooding several times a year.

Birdsboro soils are deep, well-drained silt loams that formed in old alluvium deposits on stream terraces. They are nearly level to strongly sloping and are subject to flooding in only the lowest areas.

The Dunellen moderately well drained variant and the Raritan soils are on terraces above the normal flood plains. Bowmansville soils are on flood plains and are subject to frequent flooding. The Lamington soils are on terraces.

Most of the soils in this association are used for farming and for urban uses. The main crops are corn, small grains, hay, and pasture. Vegetable crops are also well suited to most of the soils in this association. Where water is available for irrigation, vegetables, nursery crops, and other high-value crops can be grown on these soils. The Rowland soils, which are subject to annual flooding, are used mainly for pasture and sod farming. Frequent flooding is a limitation for community development.

12. Rowland-Birdsboro-Raritan association

Nearly level to strongly sloping, deep, well drained to somewhat poorly drained loamy soils formed in alluvial sediment; on flood plains and terraces

The soils of this association are along the major streams. Soils that are subject to flooding are dominant in the association. These soils occupy the flood plains and terraces that are adjacent to the north and south branches of the Raritan River and adjacent to the Lamington, Millstone, Neshanic, and Green Brook Rivers.

This association makes up about 10 percent of the

Figure 4.—**Birdsboro and Raritan soils, association 11.**

county. It is 60 percent Rowland soils, 15 percent Birdsboro soils, 15 percent Raritan soils, and 10 percent minor soils. The minor soils are Bowmansville and Lamington soils, Fluvaquents, and Udifluvents and Ochrepts.

Rowland soils are moderately well drained to somewhat poorly drained soils on flood plains. They have a seasonal high water table and are subject to frequent flooding. These soils are deep silt loams that formed in recent alluvium washed from uplands.

Birdsboro and Raritan soils formed in old alluvium. Birdsboro soils are deep, well-drained silt loams. They are on the higher positions on the terraces, and only the lowest areas are subject to infrequent stream flooding. Raritan soils are deep, moderately well drained to somewhat poorly drained silt loams. They have a seasonal high water table and are slowly permeable. They are on stream terraces, and only the lowest areas are subject to flooding. Flooding as a result of stream overflow, however, is an infrequent occurrence.

The poorly drained Bowmansville soils are on the lower flood plains. Although both the Rowland and Bowmansville soils are subject to flooding, the Bowmansville soils tend to

contains suggestions on how the soil can be managed. Color terms are for moist soil unless otherwise stated.

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

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit are the capability unit and woodland suitability group in which the mapping unit has been placed. The page for the description of each woodland suitability group can be learned by referring to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*11*).[1]

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

Soil	Area	Extent
	Acres	*Percent*
Abbottstown silt loam, 0 to 2 percent slopes	240	0.1
Abbottstown silt loam, 2 to 6 percent slopes	1,380	.7
Amwell gravelly loam, 2 to 6 percent slopes	1,670	.9
Amwell gravelly loam, 6 to 12 percent slopes	410	.2
Amwell gravelly silt loam, rock substratum, 2 to 6 percent slopes	1,960	1.0
Amwell gravelly silt loam, rock substratum, 6 to 12 percent slopes	570	.3
Arendtsville gravelly loam, 2 to 6 percent slopes	1,000	.5
Arendtsville gravelly loam, 6 to 12 percent slopes	1,020	.5
Bartley loam, 3 to 15 percent slopes	420	.2
Birdsboro silt loam, 0 to 2 percent slopes	430	.2
Birdsboro silt loam, 2 to 6 percent slopes	5,500	2.8
Birdsboro silt loam, 6 to 12 percent slopes	560	.3
Bowmansville silt loam	2,350	1.2
Bucks silt loam, 2 to 6 percent slopes	3,000	1.5
Bucks silt loam, 6 to 12 percent slopes, eroded	700	.4
Califon gravelly loam, 3 to 8 percent slopes	260	.1
Califon very stony loam, 3 to 8 percent slopes	320	.2
Chalfont silt loam, 2 to 6 percent slopes	1,430	.7
Chalfont silt loam, 6 to 12 percent slopes	520	.3
Chalfont stony silt loam, 2 to 6 percent slopes	680	.3
Chalfont stony silt loam, 6 to 12 percent slopes	880	[illegible]
Mount Lucas gravelly silt loam, 6 to 12 percent slopes	420	.2
Mount Lucas-Watchung very stony silt loams, 2 to 12 percent slopes	7,130	3.6
Neshaminy silt loam, 2 to 6 percent slopes	3,500	1.8
Neshaminy silt loam, 6 to 12 percent slopes	1,210	.6
Neshaminy very stony silt loam, 18 to 35 percent slopes	2,360	1.2
Neshaminy-Mount Lucas very stony silt loams, 2 to 12 percent slopes	10,050	5.1
Neshaminy-Mount Lucas very stony silt loams, 12 to 18 percent slopes	4,620	2.4
Neshaminy silt loam, fragipan variant, 2 to 6 percent slopes	420	.2
Neshaminy silt loam, fragipan variant, 6 to 12 percent slopes	820	.4
Norton loam, 0 to 2 percent slopes	560	.3
Norton loam, 2 to 6 percent slopes	5,400	2.8
Norton loam, 6 to 12 percent slopes	580	.3
Norton loam, 6 to 12 percent slopes, eroded	630	.3
Parker very gravelly sandy loam, 3 to 15 percent slopes	1,150	.6
Parker rocky sandy loam, 25 to 35 percent slopes	530	.3
[illegible]	[illegible]	[illegible]

R—48 inches, reddish-brown (2.5YR 4/4) partly weathered shale.

The solum ranges from 30 to 43 inches in thickness. Depth to the fragipan is 15 to 25 inches, and depth to bedrock is 3½ to 4½ feet. Coarse fragments make up as much as 10 percent of the solum and 10 to 30 percent of the C horizon. Low-chroma mottles are at a depth of 9 to 18 inches.

The A horizon has a hue of 10YR to 5YR, a value of 3 to 5, and a chroma of 2 to 4.

The B2t horizon ranges from silt loam to clay loam. It has a hue of 7.5YR or 5YR, a value of 4 to 6, and a chroma of 1 to 6.

The Bx horizon has a hue of 5YR or 2.5YR, a value of 4 to 6, and a chroma of 1 to 4. It has weak, very coarse, prismatic structure parting to moderate, medium, angular blocky and weak, medium, platy.

The C horizon ranges from shaly loam to shaly clay loam. It has a hue of 5YR or 2.5YR, a value of 4 or 5, and a chroma of 1 to 6.

Abbottstown soils are associated with the moderately well drained Readington soils at the higher elevations. They are associated with the moderately deep, moderately well drained and somewhat poorly drained Reaville soils and the poorly drained Croton soils on the lower parts of slopes, in depressions, and along drainageways. Well-drained Bucks and Penn soils are near the Abbottstown soils but are higher and steeper.

Abbottstown soils are less gray in the B horizon than Croton soils and more gray than Reaville soils. Mottling in the B horizon distinguishes Abbottstown soils from Penn and Bucks soils.

Abbottstown silt loam, 0 to 2 percent slopes (AbA).—This soil occupies intermediate positions of the landscape. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Readington and Bucks soils. Also included are areas where the subsoil is brown and very silty.

The content of organic matter is moderate. The surface layer is generally easy to till, but wetness early in spring and after heavy rain delays plowing and cultivation. Runoff is slow, and ponding is common in low-lying areas after heavy rain. The hazard of erosion is slight.

This soil is used for the crops commonly grown in the county and for hay and pasture. In undrained areas it is only fairly suited to corn, soybeans, and spring-sown small grains. Alfalfa and winter grains are likely to be seriously affected by ponded water and frost heaving. The natural wetness caused by seeps, springs, and ponding can be reduced by diversion terraces and surface drains. Drainage ditches remove excess water effectively. Drainage via drain tiles, however, is generally too slow to be practical. Capability unit IIIw-71; woodland suitability group 3w1.

Abbottstown silt loam, 2 to 6 percent slopes (AbB).—This soil is on broad undulating uplands. It has a profile similar to the one described as representative of the series, but the surface layer contains more shale fragments.

Included with this soil in mapping are areas of Readington soils, Croton soils, soils that have slopes of more than 6 percent, and eroded soils. The eroded soils have poorer germination and poorer crop production than the soils that are not eroded.

grains. Alfalfa and winter grains are likely to be seriously damaged by frost heaving. The natural wetness caused by seeps and springs can be reduced by diversion terraces and surface drains. Many areas need diversion terraces to intercept runoff from higher soils, improve drainage, and control erosion. Drain tiles generally do not remove excess water effectively. On long slopes contour cultivation and contour stripcropping help reduce runoff and the amount of soil lost through erosion. Capability unit IIIw-71; woodland suitability group 3w1.

Amwell Series

The Amwell series consists of deep, moderately well drained and somewhat poorly drained soils that have a firm fragipan in the lower part of the subsoil. These soils are gently sloping and strongly sloping. They are on hillsides and lower slopes and at the base of the Watchung Mountains. They occupy intermediate positions of the landscape. The surface layer and upper part of the subsoil formed in gravelly trap colluvium, and the lower part of the subsoil formed in residuum of basalt or diabase.

In a representative profile the surface layer is dark grayish-brown gravelly loam 3 inches thick. The upper part of the subsoil is dark-brown gravelly loam 11 inches thick. The next 7 inches of the subsoil is mottled, yellowish-brown clay loam. The lower 15 inches of it is a firm fragipan of brown loam and dark yellowish-brown fine sandy loam. The substratum, between depths of 36 and 60 inches, is yellowish-brown and dark yellowish-brown fine sandy loam.

In unlimed areas these soils are strongly acid to medium acid in the upper part of the profile and strongly acid to slightly acid in the lower part. Natural fertility is high. The effective rooting depth is limited by the fragipan. Permeability is slow in the lower part of the subsoil, and the available water capacity is moderate. These soils have a perched seasonal high water table at a depth of 1 foot to 4 feet. Water moves laterally over the fragipan late in winter and early in spring.

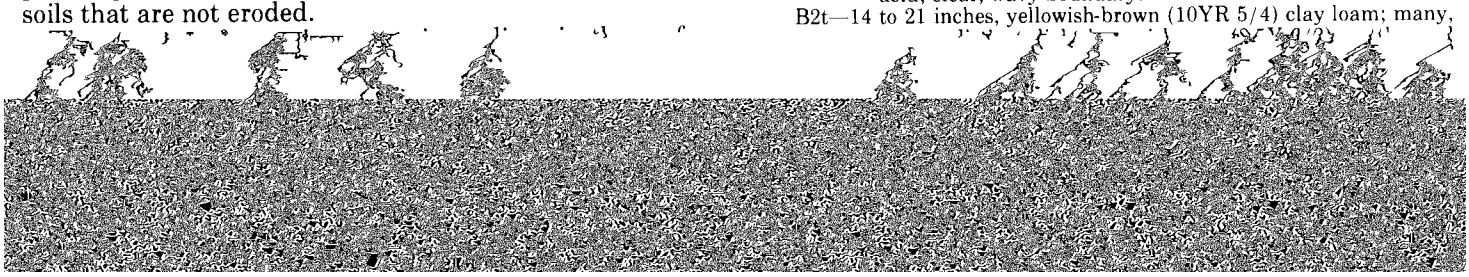
Much of the acreage of Amwell soils is wooded. The native vegetation consists of hardwood forest of mixed oaks, beech, ash, and maple. The soils are fairly well suited to crops and are well suited to hay and pasture.

Representative profile of Amwell gravelly loam, 2 to 6 percent slopes, in Bernards Township; on the east side of the Mine Brook Road, 200 yards north of Interstate 287:

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) gravelly loam; strong, fine, granular structure; friable; many fine and large roots; 15 percent pebbles and cobbles, mostly basalt; medium acid; gradual, wavy boundary.

B1—3 to 14 inches, dark-brown (10YR 4/3) gravelly loam; weak, coarse, subangular blocky structure; friable; many fine and large roots; 15 percent pebbles, mostly basalt; medium acid; clear, wavy boundary.

B2t—14 to 21 inches, yellowish-brown (10YR 5/4) clay loam; many,



pebbles; thin patchy clay films on horizontal surfaces of peds; medium acid; gradual, wavy boundary.

Bx2—26 to 36 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; common, coarse, distinct, light brownish-gray (10YR 6/2) mottles; weak, thick, platy structure; brittle, very firm; 5 percent pebbles; thin patchy clay films on horizontal surfaces of peds; medium acid; gradual, wavy boundary.

C1—36 to 46 inches, yellowish-brown (10YR 5/6) fine sandy loam; few, coarse, distinct, light brownish-gray (2.5Y 6/2) mottles and few, fine, olive-yellow (2.5Y 6/6) mottles; massive; friable; 10 percent pebbles; medium acid; gradual, wavy boundary.

C2—46 to 60 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; massive; friable; 10 percent pebbles; medium acid.

The solum ranges from 30 to 50 inches in thickness. Depth to red shale or basalt bedrock ranges from 3½ to 8 feet or more. Coarse fragments make up 15 to 25 percent of the upper part of the solum and 20 to 35 percent of the lower part.

The A horizon has a hue of 10YR or 7.5YR, a value of 3 to 6, and a chroma of 2 to 6. In wooded areas hue, value, and chroma are commonly 10YR 4/2, and in cultivated areas they are 10YR 5/6. This horizon is typically gravelly loam or gravelly silt loam.

The matrix of the B2t horizon has a hue of 7.5YR or 10YR, a value of 4 to 6, and a chroma of 4 to 6. Few to many low-chroma mottles start at a depth of 10 to 20 inches. The Bt horizon is loam, silt loam, clay loam, silty clay loam, and gravelly silt loam. The Bx horizon has a hue of 7.5YR to 10YR, a value of 4 to 6, and a chroma of 1 to 6. The fragipan is commonly loam but ranges to fine sandy loam, gravelly silty clay loam, and cobbly light silty clay loam.

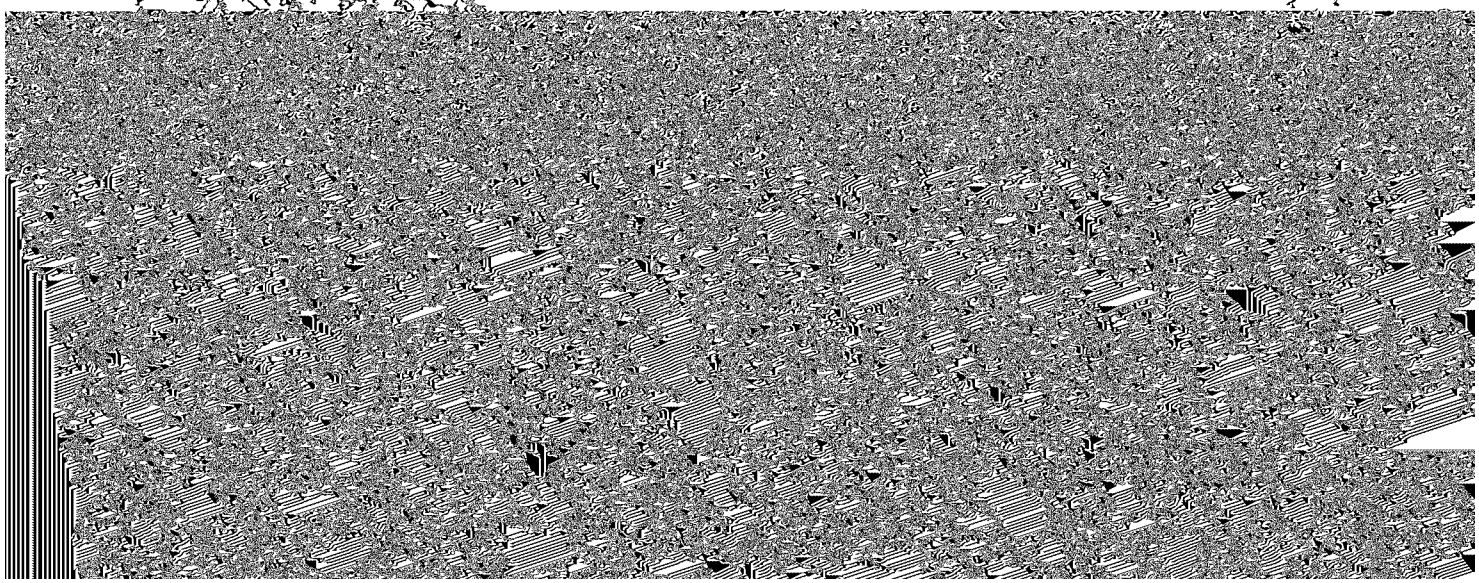
The C horizon has a hue of 7.5YR or 10YR, a value of 4 to 6, and a chroma of 2 to 6. This horizon is commonly fine sandy loam but ranges to gravelly silt loam and very gravelly sandy loam.

Amwell soils are next to the moderately well drained Neshaminy fragipan variant soils on hillsides and ridges, the moderately well drained and somewhat poorly drained Mount Lucas soils on lower slopes, and the gray poorly drained Watchung soils in slight depressions and pockets along drainageways.

Amwell soils differ from the Neshaminy fragipan variant in containing more gravel in the surface layer and in having a mottled subsoil. Unlike Mount Lucas soils, Amwell soils have a fragipan. They are better drained and not so gray as Watchung soils.

Amwell gravelly loam, 2 to 6 percent slopes (AmB).—This gently sloping soil is on lower slopes and along drainageways at the base of the Watchung Mountains. It has the profile described as representative of the series. Bedrock is rippable red shale.

Included with this soil in mapping are small areas of nongravelly or cobbly soils and poorly drained Watchung soils in depressions and drainageways.



layer in plowing. Also included are some small areas of the Neshaminy fragipan variant and Mount Lucas and Neshaminy soils.

The organic-matter content is moderate, and the surface layer is generally easy to till. This soil should be cultivated only during optimum moisture conditions because of wetness caused by slow permeability and seeps. Drainage is necessary for the best growth of most crops. Runoff is medium, and the erosion hazard is moderate where this soil is plowed and left bare or where it is used for row crops.

This soil is fairly well suited to corn, soybeans, spring-sown small grains, hay, and pasture. Alfalfa is subject to winterkill. Diversion terraces can be used for drainage, and tile can be used to remove water from seep spots. In cultivated fields a suitable cropping system, contour farming, and stripcropping are needed to control runoff and erosion. Capability unit IIIe-70; woodland suitability group 2w1.

Amwell gravelly silt loam, rock substratum, 2 to 6 percent slopes (AnB).—This soil has a profile similar to the one described as representative of the series, but it has more coarse fragments in the surface layer. Bedrock is hard basalt.

Included with this soil in mapping are small areas of poorly drained soils and some areas of soils that have less coarse fragments in the surface layer than this Amwell soil. Also included are areas of Neshaminy and Mount Lucas soils.

Runoff and the hazard of erosion are slight. Wetness is the major concern of management in cultivated areas, and the seasonal high water table limits the use of this soil for crops. Drainage is needed for the best growth of most crops and for many other uses. Wetness also affects alfalfa. Grasses and legumes that tolerate wetness should be planted for hay and pasture.

Most of the acreage is wooded, but a small acreage is used for pasture or orchards. Drainage by diversion terraces or by other methods can be used to remove excess water. Underdrains can be used to carry water away from seep spots. The depth to bedrock may interfere with installation of underdrains. Where gravel and cobbles make up more than 25 percent of the surface layer, they in-

needed to control runoff and erosion and reduce wetness. Capability unit IIIe-70; woodland suitability group 2w1.

Arendtsville Series

The Arendtsville series consists of deep, well-drained soils. These soils are gently sloping to strongly sloping. They are in undulating and rolling uplands and occupy high positions in the landscape. They formed in material weathered from quartzite conglomerate or fanglomerate.

In a representative profile in a cultivated area, the surface layer is reddish-brown gravelly loam 10 inches thick. The upper part of the subsoil, between depths of 10 and 30 inches, is reddish-brown gravelly loam and dark reddish-brown heavy gravelly loam. The next 13 inches of the subsoil is dark reddish-brown gravelly sandy clay loam. Between depths of 43 and 55 inches is dark reddish-brown gravelly sandy loam. The substratum, between depths of 55 and 62 inches, is very friable, dark reddish-brown gravelly sandy loam.

In unlimed areas these soils are extremely acid or very strongly acid in the upper part and very strongly acid or strongly acid in the lower part. Natural fertility is medium. The rooting zone is deep. Permeability is moderately rapid, and the available water capacity is moderate.

Arendtsville soils are suited to the crops commonly grown in the county, including corn, soybeans, small grains, fruit, hay, and pasture. The native vegetation consists of forests of such mixed deciduous trees as yellow-poplar, upland oaks, hickory, and maple.

Representative profile of Arendtsville gravelly loam, 2 to 6 percent slopes; in Bedminster Township, one-half mile west of intersection of Highway 202 and County Route 7 and 400 feet south of County Route 7:

Ap—0 to 10 inches, reddish-brown (5YR 4/3) gravelly loam; weak, fine, granular structure; friable; common fine roots; 20 percent rounded and broken quartzite pebbles and cobbles; medium acid; abrupt, smooth boundary.

B1—10 to 15 inches, reddish-brown (5YR 4/4) gravelly loam; weak, fine, subangular blocky structure; friable; common fine roots; 20 percent rounded and broken quartzite pebbles and cobbles; few thin clay films on some ped faces; medium acid; clear, wavy boundary.

B21t—15 to 30 inches, dark reddish-brown (5YR 3/4) heavy gravelly loam; moderate, medium, subangular blocky structure; friable; few fine roots; slightly sticky and slightly plastic; common moderately thick clay films on ped faces and in root channels; 20 percent rounded and broken quartzite pebbles and cobbles; strongly acid; gradual, wavy boundary.

B22t—30 to 43 inches, dark reddish-brown (2.5YR 3/4) gravelly sandy clay loam; moderate, medium, angular and subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; moderately thick clay films on most ped faces; 20 percent rounded and broken quartzite pebbles and cobbles; strongly acid; gradual, wavy boundary.

B3—43 to 55 inches, dark reddish-brown (2.5YR 3/4) gravelly sandy loam; weak, fine, subangular blocky structure; very friable; 20 percent rounded and broken quartzite pebbles and cobbles; strongly acid; diffuse, irregular boundary.

C—55 to 62 inches, dark reddish-brown (2.5YR 3/4) gravelly sandy loam; massive; very friable; 35 percent rounded quartzite pebbles and cobbles; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock ranges from 6 to 10 feet. Coarse fragments of rounded quartzite make up 15 to 35 percent of the solum and 20 to 60 percent of the C horizon.

The A horizon has a hue of 7.5YR or 5YR, a value of 4 or 5, and a chroma of 2 to 4.

The B horizon has a hue of 5YR or 2.5YR, a value of 3 or 4, and a chroma of 3 or 4. This horizon is loam, sandy clay loam, clay loam, and their gravelly equivalents.

The C horizon has a hue of 5YR, 2.5YR, or 10R; a value of 3 or 4; and a chroma of 3 or 4. It is gravelly and very gravelly sandy loam.

Arendtsville soils are next to the shallow, well-drained Klinesville soils on steep hillsides; the moderately deep, well-drained Penn soils on rolling uplands; the deep, well-drained gravelly Pattenburg soils on side slopes; the deep, moderately well drained Meckesville soils on hilltops and ridges; and the deep, moderately well drained to somewhat poorly drained Rowland soils along drainageways and stream flood plains.

Arendtsville soils contain less gravel and more clay in the B horizon than Pattenburg soils. They are deeper over bedrock and less shaly than Klinesville and Penn soils. They are redder than Meckesville soils, and they do not have the firm, brittle fragipan that is common in those soils. They have a more developed B horizon than Rowland soils.

Arendtsville gravelly loam, 2 to 6 percent slopes (ArB).—This gently sloping soil is on broad undulating uplands. It has the profile described as representative of the series. Rounded gravel and cobbles 1 inch to 6 inches in diameter are scattered over the surface and throughout the profile.

Included with this soil in mapping are areas where the surface layer is loam and small areas of soils that are capped with a thin layer of gneissic glacial till. Also included are small areas of moderately deep Penn soils and shallow Klinesville soils.

The organic-matter content is medium. The surface layer is generally easy to till, but gravel and cobbles interfere somewhat with tillage operations. Runoff is slow, and the hazard of erosion is slight.

This soil is used mainly for corn, small grains, and hay. Long slopes may need stripcropping or contour cultivation to control erosion. Capability unit IIe-55; woodland suitability group 2o1.

Arendtsville gravelly loam, 6 to 12 percent slopes (ArC).—This sloping soil is on hillsides along drainageways.

Included with this soil in mapping are small areas where slopes are more than 12 percent and small areas of soils that are capped with a thin layer of gneissic glacial till. Also included are areas of moderately deep Penn soils and shallow Klinesville soils.

In cultivated and unprotected areas, runoff is medium and the hazard of erosion is moderate. Gravel and cobbles interfere with tillage operations, especially where they make up more than 25 percent of the surface layer.

This soil is used mainly for hay and corn. Other crops are alfalfa, Ladino clover, timothy, and bromegrass. Long slopes may need diversion terraces to intercept surface water. Stripcropping and contour cultivation are needed on long slopes to control erosion and reduce runoff. Capability unit IIIe-53; woodland suitability group 2o1.

Bartley Series

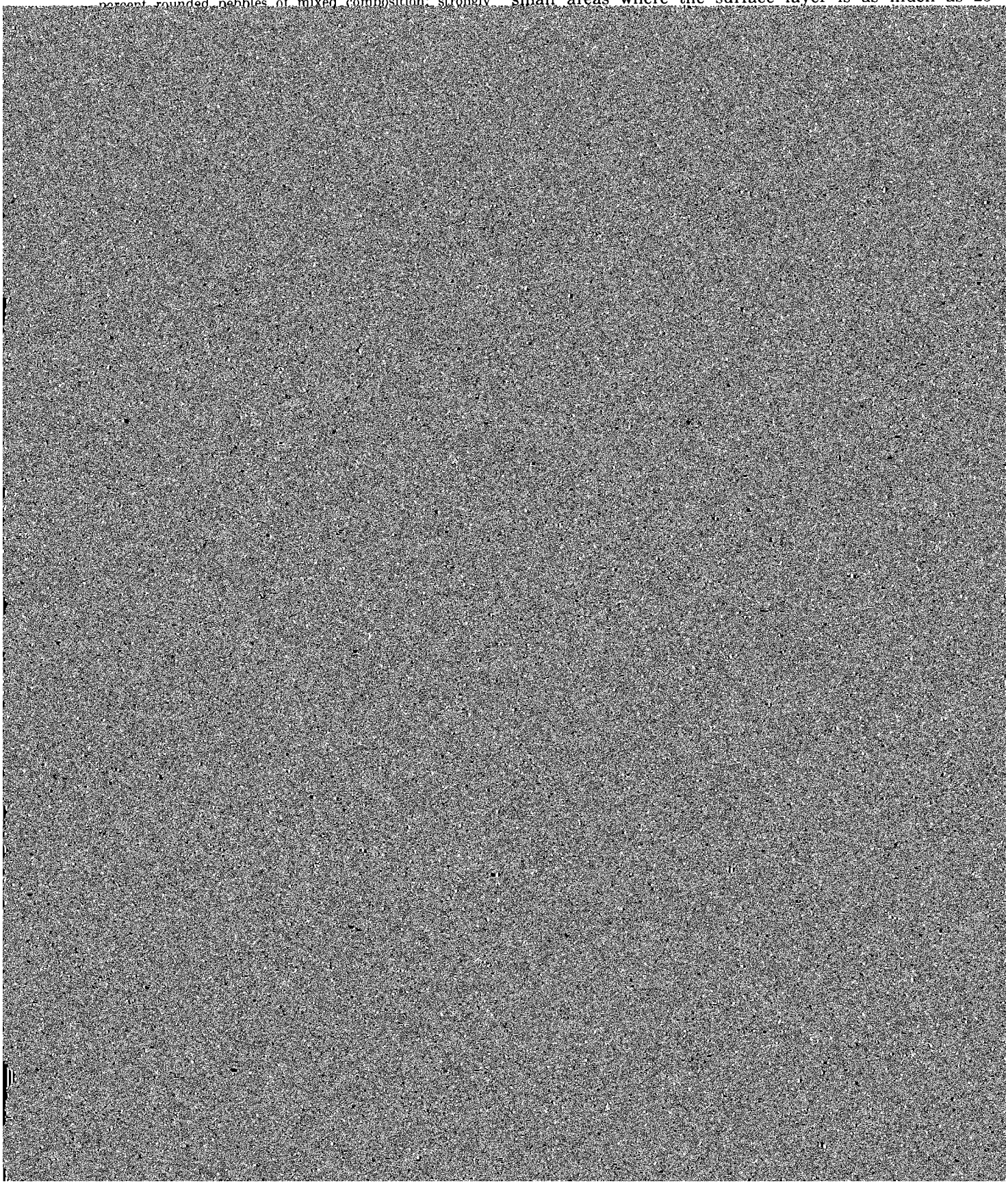
The Bartley series consists of deep, moderately well drained soils that have a firm fragipan in the lower part of the subsoil. These soils are gently sloping to strongly sloping. They are in intermediate positions in the landscape. They formed in material weathered mostly from glacial till composed of granitic gneiss and limestone over limestone bedrock.

In a representative profile in a cultivated area, the surface layer is dark-brown loam about 10 inches thick. The subsurface layer is dark-brown loam about 5 inches thick.

The subsoil is strong-brown loam and dark-brown heavy gneiss and limestone pebbles and cobbles are scattered

percent rounded pebbles of mixed composition; strongly

small areas where the surface layer is as much as 25



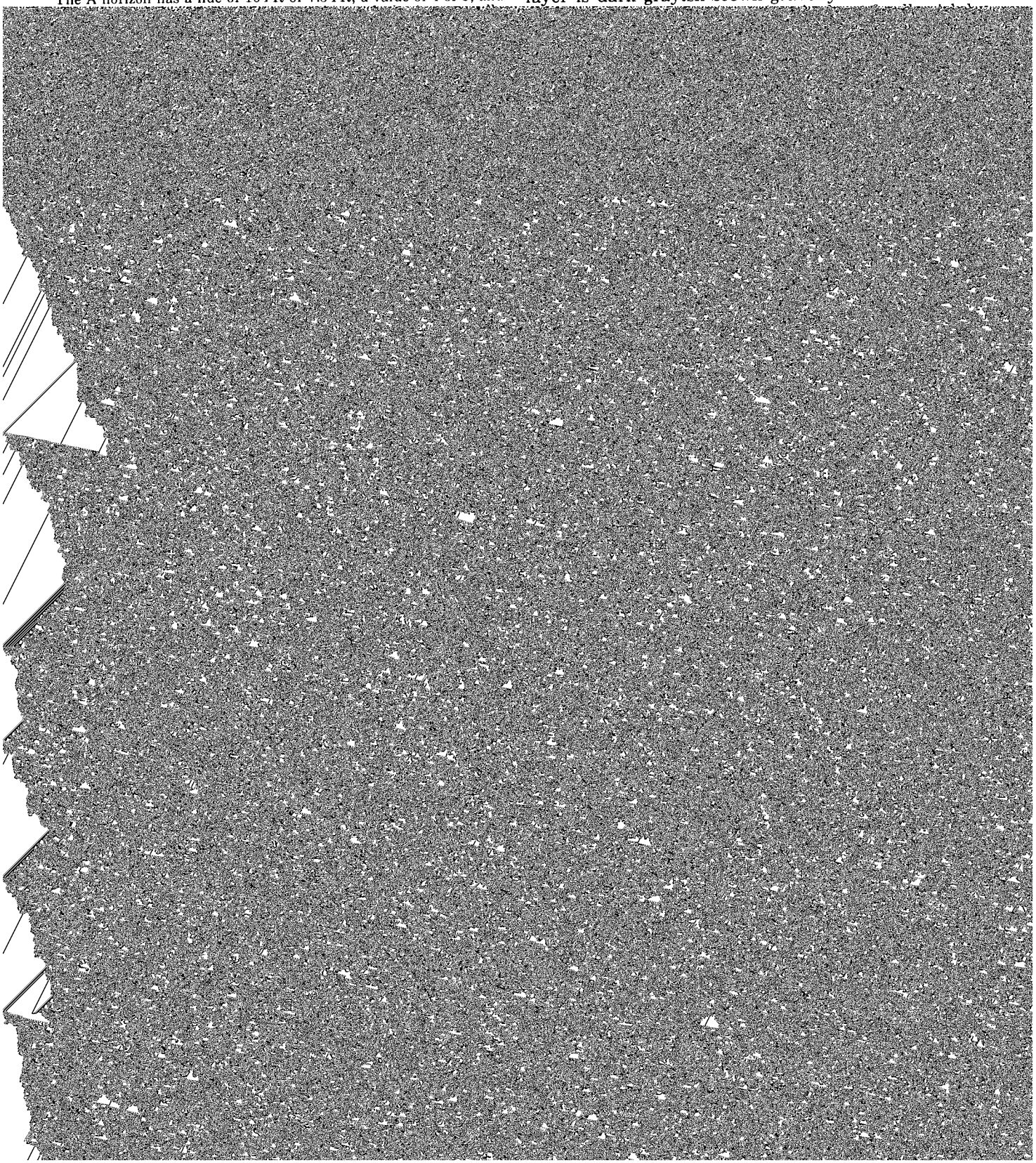
These soils are subject to frequent flooding, mostly in the time it is likely to clod or crust if plowed or cultivated

percent of the volume of the A horizon and the upper part of the B horizon. Coarse fragments of shale, siltstone, or fine-grained sandstone generally increase in number, size, and hardness in the lower part of the B horizon and in the C horizon. Coarse fragments make up 0 to 30 percent of the lower part of the B horizon and 0 to 50 percent of the C horizon.

The A horizon has a hue of 10YR or 7.5YR, a value of 4 or 5, and

soils are gently sloping. They are on undulating uplands in intermediate positions of the landscape. They formed in a thick mantle of weathered granite gneiss till over granite gneiss bedrock.

In a representative profile in a wooded area, the surface layer is dark grayish-brown gravelly loam about 4 inches



In wooded areas the A1 horizon has a hue of 10YR or 7.5YR, a value of 3 or 4, and a chroma of 2.

The B2t and Bx horizons range from brown (7.5YR 4/4) to yellowish brown (10YR 5/6) and have common, distinct, low-chroma mottles. These horizons are typically heavy loam but range to clay loam, gravelly loam, and gravelly clay loam. The Bx horizon has weak or moderate, coarse or very coarse, prismatic structure parting to moderate, medium or coarse, subangular blocky or moderate

in a silty mantle over material weathered from argillite bedrock.

In a representative profile in a wooded area, the surface layer is 4 inches of very dark grayish-brown silt loam. The subsurface layer is brown silt loam about 6 inches thick. The upper 5 inches of the subsoil is friable, yellowish-

The B horizon is mainly yellowish brown (10YR 5/4) or brown (10YR 5/3) but ranges from brown (7.5YR 5/4) to olive brown (2.5Y 4/4). Low-chroma mottles are common to many in the B horizon but are not dominant. This horizon ranges from silt loam to light silty clay loam. The Bx horizon ranges from 12 to 30 inches in thickness and from silty clay loam to loam in texture.

In places the C horizon is channery silt loam that is 20 to 50 percent, by volume, coarse fragments. This horizon ranges from loam to silt loam.

Chalfont soils are associated with Lawrenceville, Croton, Lansdowne, Abbottstown, and Reaville soils.

Chalfont soils have low-chroma mottles nearer to the surface than Lawrenceville soils. They do not have the gray matrix colors that are common in Croton soils. They are deeper over bedrock than Reaville soils and have a fragipan, which is not present in those soils. They have less clay in the B horizon than Lansdowne soils and a thicker, more strongly developed fragipan than Abbottstown soils.

Chalfont silt loam, 2 to 6 percent slopes (CdB).—This gently sloping soil is on broad gently undulating uplands on the north and south sides of the Sourland Mountains. It has the profile described as representative of the series.

Included with this soil in mapping are some areas of nearly level soils and areas of moderately eroded soils that have a surface layer that is a mixture of material from the original brown surface layer and the mottled, yellowish-brown and gray subsoil. Also included are some small areas of Lawrenceville and Croton soils.

The organic-matter content is medium. The surface layer is generally easy to till. Runoff is medium, and the hazard of erosion is slight. Wetness is the main limitation of this soil for crops. Drainage ditches are effective in removing surface water, but tile drains generally are too slow to be practical.

This soil is used for most general field crops, hay, and pasture. Where this soil is adequately drained, it is well suited to hay and pasture consisting of grasses and legumes that tolerate wetness. Contour cultivation and minimum tillage are needed to control runoff and erosion and to maintain the organic-matter content and good tilth. Capability unit IIIw-70; woodland suitability group 3w1.

Chalfont silt loam, 6 to 12 percent slopes (CdC).—This strongly sloping soil is on hillsides on the gently rolling uplands.

Included with this soil in mapping are areas of eroded soils that have material from the mottled, yellowish-brown subsoil mixed into the surface layer by plowing. Also included are some areas of Lawrenceville and Croton soils.

The organic-matter content is medium. The surface layer is generally easy to till. Runoff is medium in cultivated areas, and the hazard of erosion is moderate.

This soil is used mainly for the commonly grown row crops, small grains, hay, and pasture. Where this soil is adequately drained, it is well suited to hay and pasture consisting of grasses and legumes that tolerate wetness. Diversion terraces, contour stripcropping, and minimum tillage are needed to control runoff and erosion and to maintain the organic-matter content and good tilth. Capability unit IIIe-70; woodland suitability group 3w1.

Chalfont stony silt loam, 2 to 6 percent slopes (CeB).—This gently sloping soil is on broad undulating uplands on the north and south sides of the Sourland Mountains. It has a profile similar to the one described as representative of the series, but it has stones scattered 30 to 100 feet apart on the surface.

Included with this soil in mapping are small areas of nonstony soils that have slopes of less than 2 percent. Also

The organic-matter content is medium. The stones interfere with tillage. Runoff is slow, and the hazard of erosion is slight. Wetness and stones are the main limitations of this soil for crops. Open ditches and diversion terraces can be used to remove surface water, but tile drains are generally too slow to be practical.

This soil is generally used for hay or pasture or as woodland. Because of the numerous stones on the surface, cultivation is generally impractical. Grasses and legumes that tolerate wetness grow better on this soil than other plants. Capability unit IIIw-70; woodland suitability group 3w1.

Chalfont stony silt loam, 6 to 12 percent slopes (CeC).—This sloping soil is on hillsides on the gently rolling uplands. It has a profile similar to the one described as representative of the series, but it has stones scattered throughout the soil and on the surface. The stones on the surface are 30 to 100 feet apart.

Included with this soil in mapping are small areas of nonstony soils and Lawrenceville and Lehigh soils.

The organic-matter content is medium. The surface layer is generally in good tilth. Runoff is medium, and the hazard of erosion is moderate.

This soil is generally used for hay or pasture or as woodland. In cultivated areas erosion can be controlled by stripcropping and diversion terraces. Cultivation is impeded by the numerous stones on the surface. Grasses, legumes, and trees that tolerate wetness grow better on this soil than other plants. Capability unit IIIe-70; woodland suitability group 3w1.

Chalfont stony silt loam, 12 to 25 percent slopes (CeE).—This moderately steep to steep soil is on hillsides on the strongly sloping uplands on the north and south sides of the Sourland Mountains. It has a profile similar to the one described as representative of the series, but it contains more stones on the surface and has a thinner profile. The stones are spaced 30 to 100 feet apart. Depth to bedrock is about 3½ to 4½ feet.

Included with this soil in mapping are some small areas of nonstony soils and Lawrenceville and Lehigh soils.

The organic-matter content is medium.

This soil is generally used for pasture or as woodland. Stones and the moderately steep slopes make growing cultivated crops impractical. Water-tolerant trees and grasses and legumes that tolerate wetness grow better in this soil than other plants. Capability unit VIe-70; woodland suitability group 3w1.

Cokesbury Series

The Cokesbury series consists of deep, poorly drained, very stony soils that have a firm fragipan in the lower part of the subsoil. These soils are nearly level and gently sloping. They are in uplands on low positions in the landscape. They formed in a mantle of weathered granite gneiss glacial till.

In a representative profile in a wooded area, the surface layer is 3 inches of friable, very dark gray gravelly loam that contains stones. The subsurface layer is 7 inches of mottled, light brownish-gray gravelly loam. The upper 11 inches of the subsoil is friable, mottled gray clay loam. The lower part of the subsoil, between depths of 21 and 32 inches, is a firm, compact and brittle fragipan of mottled, grayish-brown heavy loam. The substratum, between depths of 32 and 62 inches, is mottled, pale-brown gravelly

strongly acid throughout the profile. Natural fertility is medium. The effective rooting depth is restricted by the fragipan. Permeability is moderate in the surface layer and upper part of the subsoil and slow in the fragipan, and the available water capacity is moderate. These soils have a seasonal high water table at a depth of 0 to 1 foot during winter and early in spring. On the more sloping areas water moves laterally over the fragipan.

Califon soils and some areas of very poorly drained soils. Also included are areas of nonstony soils.

The organic-matter content is high. Excessive wetness and the content of stones restrict tillage operations. Runoff is slow, and the hazard of erosion is slight. Wetness and stoniness are the main limitations for farming.

This soil is generally used as woodland or for pasture. It is poorly suited to small grains, alfalfa, and other deep-

mon clay films on ped faces; strongly acid; gradual, wavy boundary.

Bxg—19 to 33 inches, gray (5YR 6/1) silty clay loam; many, medium, distinct, reddish-brown (2.5YR 4/4) mottles; weak, coarse, prismatic structure; very firm, slightly sticky and slightly plastic; thin common clay films on ped faces and in pores; 10 percent coarse fragments; strongly acid; clear, wavy boundary.

C—33 to 42 inches, dark reddish-brown (2.5YR 3/4) shaly clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and gray (N 6/0) mottles; massive; friable; 30 percent shale fragments; few thin clay films on shale fragments; strongly acid; gradual, wavy boundary.

R—42 inches, dark reddish-brown (2.5YR 3/4) shale bedrock.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock ranges from 3½ to 5 feet, and depth to the fragipan ranges from 15 to 20 inches. Coarse fragments make up 0 to 10 percent of the A and B horizons and 20 to 35 percent of the C horizon. Mottles are in the A horizon or the upper part of the B horizon. They are generally reddish brown (5YR 4/4) and yellowish red (5YR 4/8).

The A horizon ranges from dark grayish brown (2.5Y 4/2) to reddish gray (5YR 5/2).

The B horizon is commonly gray (5YR 6/1) to reddish gray (5YR 5/2) but includes gray (N 5/0 and 10YR 5/1). This horizon ranges from silty clay loam to heavy silt loam.

The thin C horizon is generally between the solum and bedrock. This horizon ranges from dark reddish brown (2.5YR 3/4) to brown (7.5YR 4/4). It is typically shaly clay loam but ranges to silt loam and loam.

Croton soils are near or adjacent to the well-drained Penn and Bucks soils. Nearby, on slight rises and broad flats, are the deep, mottled, somewhat poorly drained Abbottstown soils and the moderately deep, somewhat poorly drained Reaville soils.

Croton soils are more gray than Penn, Bucks, Abbottstown, and Reaville soils. They are deeper over bedrock than Reaville soils.

Croton silt loam, 0 to 2 percent slopes (CrA).—This nearly level soil is in low-lying areas, on broad upland flats in depressions, and in drainageways in the red shale uplands and the Sourland Mountains. It has the profile described as representative of the series.

Included with this soil in mapping are some areas of moderately eroded soils that have a surface layer of silty clay loam. Also included are some areas of Reaville and Abbottstown soils.

The organic-matter content of the surface layer is medium. The surface layer is easy to till. Runoff is slow, and in places water is ponded. The hazard of erosion is slight. Wetness is the most severe limitation for production of crops, but it can be reduced by surface drainage. Open drainage ditches are effective in removing most of the surface water.

If drained, this soil is used for corn, soybeans, spring-sown grains, and water-tolerant grasses and legumes. The slow permeability severely limits the effectiveness of drain tile in most places. Capability unit IVw-80; woodland suitability group 3w1.

Croton silt loam, 2 to 6 percent slopes (CrB).—This gently sloping soil is on slight rises and broad flats in the undulating uplands.

Included with this soil in mapping are some areas of moderately eroded soils that have a finer textured surface layer than this Croton soil. Also included are some areas of Reaville soils and some small areas where slopes are less than 2 percent.

The organic-matter content is medium. The surface layer is generally easy to till. Runoff is medium, and the hazard of erosion is slight. Water flows laterally over the fragipan, causing numerous seeps. Wetness is the major limitation for farming.

If the soil is drained and erosion is controlled, it can be used for corn, soybeans, and moisture-tolerant grasses and legumes. Tile drains generally are not effective. Open ditches, bedding, and diversion terraces are needed to improve the drainage condition. Capability unit IVw-80; woodland suitability group 3w1.

Dunellen Series

The Dunellen series consists of deep, well-drained soils. These soils are nearly level to sloping. They are on stream terraces in intermediate positions in the landscape. They formed in old stream sediment of mixed composition, mostly red sandstone, siltstone, gneiss, basalt, chert, and quartzite. This sediment is believed to be glacial outwash.

In a representative profile in a cultivated area, the surface layer is dark-brown sandy loam 8 inches thick. The subsurface layer is 6 inches of brown sandy loam. The subsoil is reddish-brown and dark reddish-brown sandy loam 18 inches thick. The substratum, between depths of 32 and 70 inches, is stratified, dark reddish-brown sandy loam and loamy sand.

In unlimed areas these soils are strongly acid to a depth of about 42 inches and medium acid below. Natural fertility and the organic-matter content are medium. Permeability is moderate, and the available water capacity is moderate. The effective rooting zone is deep, and the tilth is good. The soils warm up early in spring and can be plowed early.

Most areas of Dunellen soils have been cleared for farming. The native vegetation consists of forests of such hardwood trees as white, red, and black oaks; yellow-poplar; beech; maple; and hickory. The soils are well suited to intensive cultivation of vegetables, fruit, corn, small grains, nursery crops, and alfalfa.

Representative profile of Dunellen sandy loam, 2 to 6 percent slopes, in Franklin Township; 250 yards north of East Millstone Reform Church and 100 yards east of Delaware and Raritan Canal:

Ap—0 to 8 inches, dark-brown (7.5YR 4/2) sandy loam; moderate, medium, granular structure; friable; common fine roots; 3 percent rounded pebbles; medium acid; abrupt, smooth boundary.

A2—8 to 14 inches, brown (7.5YR 4/4) sandy loam; weak, fine, subangular blocky structure; friable; common fine roots; 2 percent rounded pebbles; medium acid; clear, wavy boundary.

B1—14 to 20 inches, reddish-brown (5YR 4/3) sandy loam; weak, medium, subangular blocky structure; friable; few fine roots; 3 percent rounded pebbles; medium acid; clear, wavy boundary.

B2t—20 to 32 inches, dark reddish-brown (5YR 3/4) sandy loam; weak, medium, subangular blocky structure; friable; few fine roots; few, thin, patchy clay films on faces of peds; 5 percent rounded pebbles; strongly acid; gradual, wavy boundary.

C1—32 to 42 inches, dark reddish-brown (5YR 3/4) sandy loam; massive; friable; 10 percent rounded pebbles; strongly acid; gradual, wavy boundary.

IIC2—42 to 70 inches, dark reddish-brown (5YR 3/4) loamy sand; single grained; loose; 10 percent rounded pebbles; medium acid.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock is more than 8 feet. In most places the bedrock is red shale. Coarse fragments of gravel size make up less than 15 percent of the solum and 5 to 50 percent of the C horizon.

The Ap horizon ranges from dark reddish gray (5YR 4/2) to dark brown (7.5YR 3/2). In wooded areas the A1 horizon is commonly dark grayish brown (10YR 4/2).

The B horizon has a hue of 5YR to 7.5YR, a value of 3 or 4, and a chroma of 3 or 4. This horizon is loam, sandy loam, and their gravelly equivalents. In places it contains thin strata of silt loam and clay.

The C horizon has a hue of 2.5YR to 7.5YR, a value of 3 or 4, and

a chroma of 3 or 4. The stratified subhorizons are sandy loam or loamy sand and contain thin strata of material that ranges from silt to clay. In places beds of gravel and cobbles are in the lower part of the substratum.

Dunellen soils occupy high positions on the stream terraces and are adjacent to Birdsboro soils and the moderately well drained, Dunellen variant soils in slight depressions. Where Dunellen soils are adjacent to flood plains, they are next to Rowland and Bowmansville soils.

Dunellen soils are not so fine textured in the B horizon as Birdsboro soils. They do not have the mottles that are common in Dunellen variants. They occupy higher positions than Rowland and Bowmansville soils, which are on flood plains, and they do not have the mottles that are common in those soils.

Dunellen sandy loam, 0 to 2 percent slopes (DnA).—This soil has a profile similar to the one described as representative of the series, but depth to the substratum is about 42 inches.

Included with this soil in mapping are areas where the surface layer is silt loam or loam and small areas of soils that are more than 15 percent gravel. Also included are small areas of somewhat poorly drained soils that need drainage in places.

This soil is used for the commonly grown field crops, vegetables, and hay and pasture plants. Runoff is slow, and the hazard of erosion is slight. Intensive cultivation is possible under a high level of management. Irrigation can be used to advantage, especially for high-value crops. Capability unit I-56; woodland suitability group 2o1.

Dunellen sandy loam, 2 to 6 percent slopes (DnB).—This gently sloping soil is on stream terraces. It has the profile described as representative of the series.

Included with this soil in mapping are areas of eroded Dunellen soils. Also included are areas where the surface brown sandy loam about 27 inches thick. The substratum, between depths of 36 and 60 inches, is mottled, very friable, strong-brown sandy loam.

In unlimed areas these soils are strongly acid or medium acid. Natural fertility is medium. The effective rooting zone is deep. Permeability is moderate throughout the profile, and the available water capacity is moderate. These soils have a seasonal high water table at a depth of ½ foot to 4 feet late in winter and early in spring.

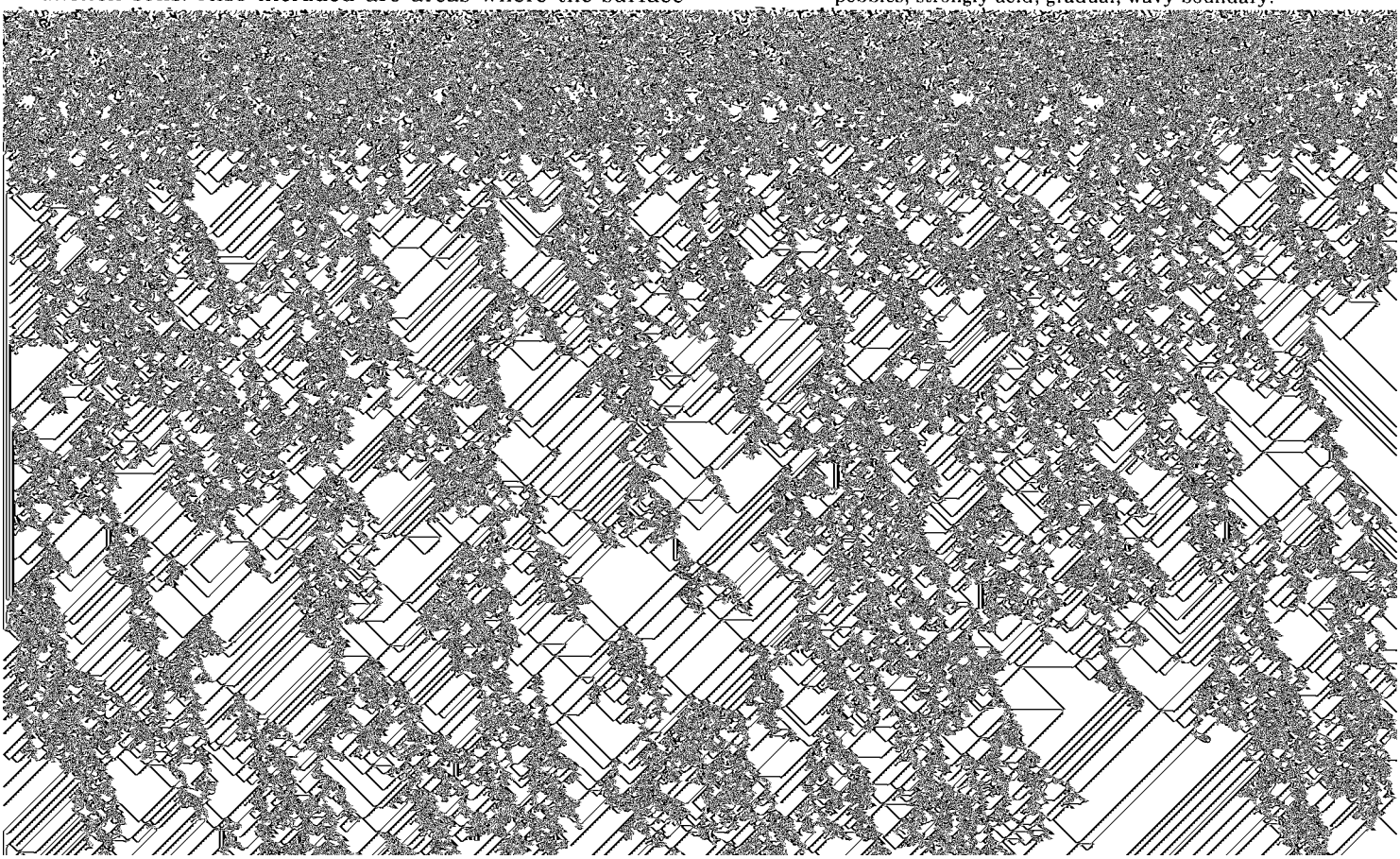
More than half the acreage of the Dunellen moderately well drained variant has been cleared for farming. The native vegetation consists of forests of such deciduous hardwood trees as pin oak, red oak, sweetgum, ash, beech, and hickory. The soils are suited to all general crops, such as corn, soybeans, small grains, hay, and pasture. If high-value crops are to be grown, drainage needs to be improved.

Representative profile of Dunellen sandy loam, moderately well drained variant, in Franklin Township; 30 feet east of Canal Road and 200 feet south of Bunker Hill Road:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) sandy loam; weak, fine, granular structure; friable; common fine roots; 2 percent pebbles; medium acid; abrupt, smooth boundary.

B1—9 to 14 inches, brown (7.5YR 5/4) sandy loam; few, fine, faint, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; friable; common fine roots; 2 percent pebbles; medium acid; clear, wavy boundary.

B21t—14 to 22 inches, brown (7.5YR 5/4) sandy loam; common, medium, distinct, brown (7.5YR 5/2) and strong-brown (7.5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few fine roots; common, thin, patchy clay films on ped faces, in root channels, and in pores; 2 percent pebbles; strongly acid; gradual, wavy boundary.



The organic-matter content of the surface layer is medium. The surface layer is generally easy to till. Wetness early in spring and after heavy rain slightly delays plowing and cultivation. A moderately high water table occurs in this soil in fall and winter and early in spring. Runoff is slow, and ponding occurs in some low-lying areas after heavy rain. The hazard of erosion is slight. Wetness is the main limitation to use of this soil for crops.

This soil is used mainly for corn, soybeans, and hay. Because this soil is moderately permeable, tile drains are effective in lowering the water table. Open ditches are also effective in lowering the water table. Capability unit IIw-73; woodland suitability group 2o1.

Edneyville Series

The Edneyville series consists of deep, well-drained, nonstony and very stony soils. These gently sloping to steep soils are on hills and ridges of the Highlands (fig. 5). They formed in material weathered from granite gneiss.

In a representative profile in a cultivated area, the surface layer is dark-brown gravelly loam 11 inches thick. Between depths of 11 and 15 inches, the subsoil is friable, brown loam; between depths of 15 and 39 inches, it is dark-brown and strong-brown gravelly loam. The substratum, between depths of 39 and 65 inches, is strong-brown gravelly sandy loam. Fractured bedrock is at a depth of 65 inches.

In unlimed areas these soils are strongly acid or very strongly acid in the upper part and strongly acid or medium acid in the lower part. Natural fertility is medium. The effective rooting zone is deep. Permeability is moderate in the subsoil, and the available water capacity is moderate.

About half the acreage of Edneyville soils has been cleared for farming. The native vegetation is forests of such hardwood trees as mixed oaks, yellow-poplar, ash, maple, and hickory. The less sloping Edneyville soils are suited to a wide variety of crops, including vegetables, fruit and nursery crops, corn, soybeans, small grains, hay, and pasture.

Representative profile of Edneyville gravelly loam, 8 to 15 percent slopes, in the northeast corner of intersection of Anderson Hill Road and Stone Fence Road, in Bernardsville:

Ap—0 to 11 inches, dark-brown (10YR 4/3) gravelly loam; moderate, medium, granular structure; friable; many fine roots; 20 percent angular granite gneiss pebbles and cobbles; medium acid; abrupt, smooth boundary.

B1—11 to 15 inches, brown (7.5YR 5/4) loam; weak, medium, subangular blocky structure; friable; many fine roots; 10 percent angular granite gneiss pebbles and cobbles; medium acid; clear, wavy boundary.

B21t—15 to 22 inches, dark-brown (7.5YR 4/4) gravelly loam; weak, medium, subangular blocky structure; friable; few fine roots; 25 percent angular granite gneiss pebbles and cobbles; strongly acid; clear, wavy boundary.

B22t—22 to 39 inches, strong-brown (7.5YR 5/6) gravelly loam; weak, coarse, prismatic structure parting to moderate, medium, subangular blocky; friable; few roots; thin discontinuous clay films on ped faces and in root channels; 30 percent angular granite gneiss pebbles and cobbles; strongly acid; clear, wavy boundary.

Figure 5.—**Stripcropping on gently sloping Edneyville gravelly loam.**

C—39 to 65 inches, strong-brown (7.5YR 5/8) gravelly sandy loam; massive; very friable; very few roots; 40 percent angular granite gneiss pebbles and cobbles; strongly acid; gradual, irregular boundary.

R—65 inches, very pale brown (10YR 7/3) and black (10YR 2/1) highly fractured granite gneiss bedrock.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock is 3½ to more than 6 feet. Coarse fragments make up 15 to 30 percent of the upper part of the solum and 25 and 35 percent of the lower part of the solum and the C horizon.

Hue, value, and chroma in the A horizon range from 10YR 4/3 in cultivated areas to 10YR 3/1 in wooded areas.

The B horizon has a hue of 7.5YR, a value of 4 or 5, and a chroma of 4 to 6. This horizon ranges from loam to sandy clay loam and their gravelly equivalents.

The C horizon ranges from strong-brown (7.5YR 5/8) to yellowish-red (5YR 5/8) gravelly sandy loam or sandy loam.

Edneyville soils border Parker, Califon, and Cokesbury soils. They do not have the high content of cobbles and pebbles that is common in Parker soils, and they do not have the mottles and fragipan that are common in Califon and Cokesbury soils.

Edneyville gravelly loam, 3 to 8 percent slopes (EdB).—This soil has a profile similar to the one described as representative of the series, but it is deeper over bedrock and generally many of the cobbles and stones have been removed from the fields and placed along the edges as a stone fence.

Included with this soil in mapping are some areas of soils that are capped with a thin layer of glacial till and some areas of soils that have lost most of the surface layer described as representative of the series, but bedrock is at a depth of about 4 feet and generally more gravel and cobbles are on the surface.

Included with this soil in mapping are areas where most of the original surface layer has been lost through erosion. Also included are areas of Parker soils.

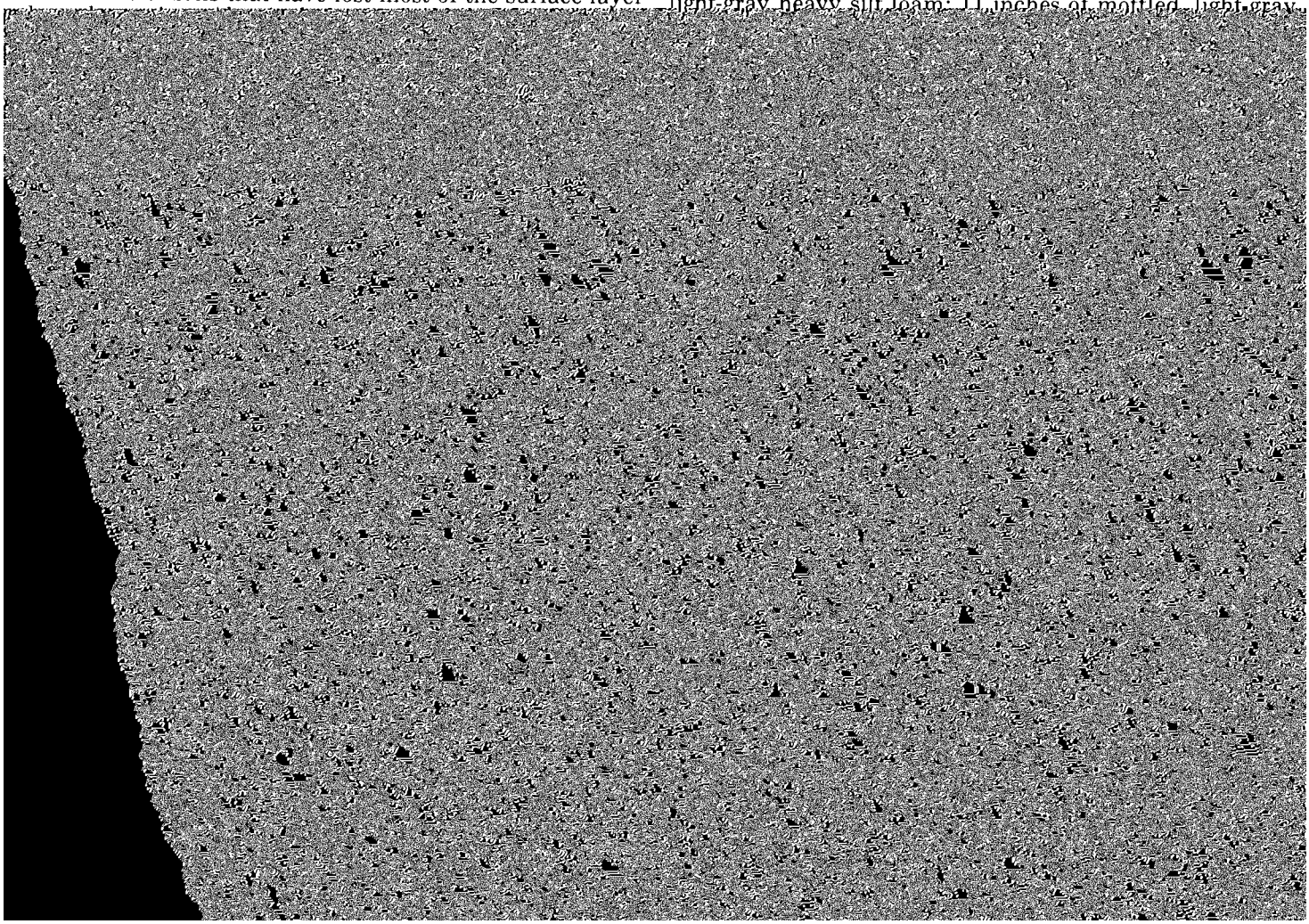
The organic-matter content is low. The surface layer is generally easy to till, but gravel and cobbles interfere with tillage where they make up more than 25 percent of the surface layer. Runoff is very rapid, and the hazard of erosion is severe in cultivated areas.

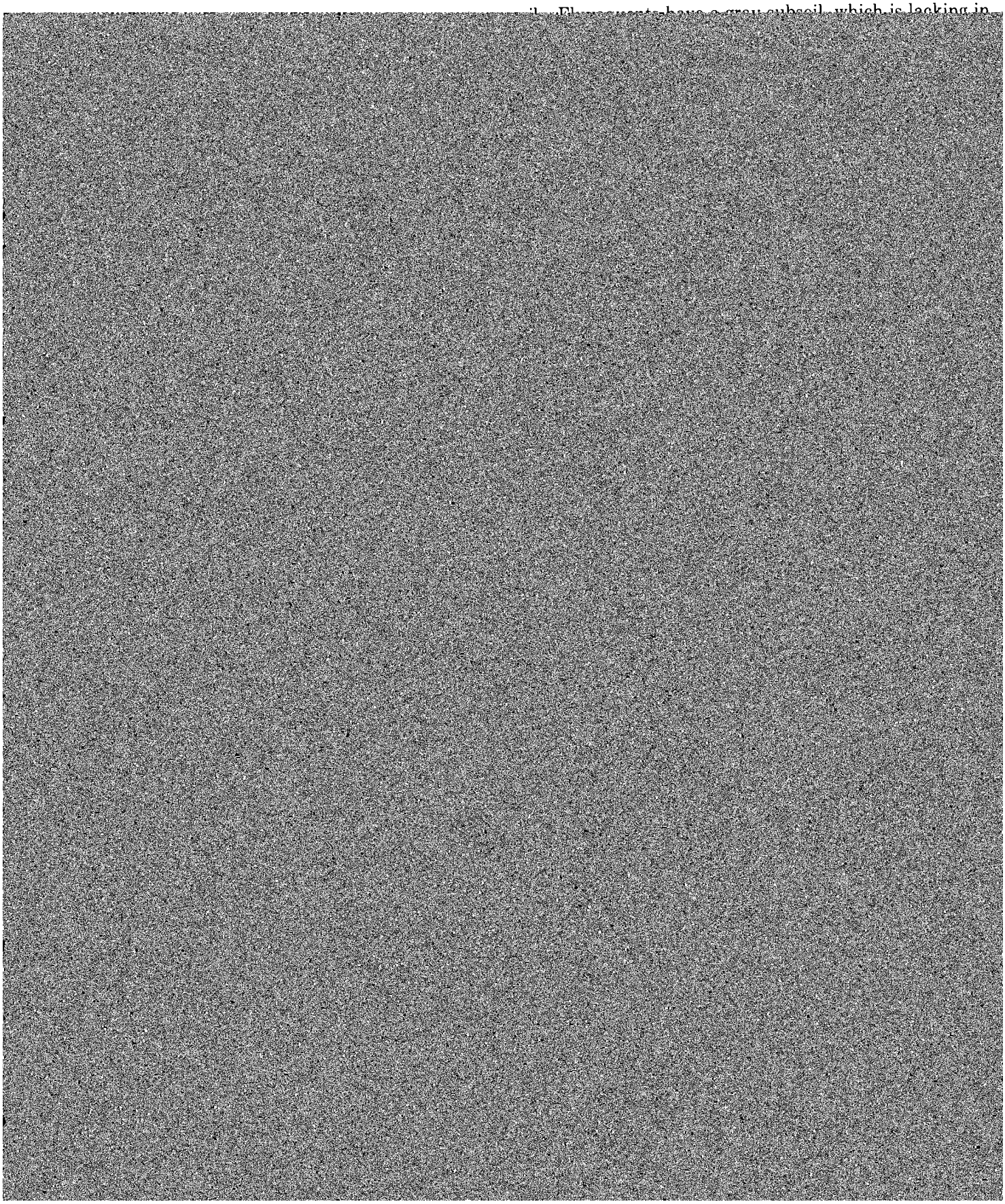
Because erosion is a severe hazard, this soil is poorly suited to such row crops as corn and soybeans. Row crops can be grown occasionally without the risk of severe erosion, if they are alternated with small grains and hay. Capability unit IVe-58; woodland suitability group 2o1.

Elkton Series

The Elkton series consists of deep, poorly drained soils. These nearly level soils are on broad upland flats and in slight depressions in low positions in the landscape. They formed in marine deposits.

In a representative profile in a formerly cultivated area, the surface layer is dark-gray silt loam 9 inches thick. The subsoil, in sequence from the top, is 5 inches of mottled, light-gray heavy silt loam; 11 inches of mottled, light-gray,





coarse, distinct, light brownish-gray (2.5Y 6/2) and yellowish-brown (10YR 5/8) mottles; massive; friable; 5

massive; friable; few fine roots; 75 percent shale fragments; strongly acid; gradual, wavy boundary.

R—18 inches, yellowish-red (5YR 4/6) partly weathered fractured shale bedrock.

Thickness of the solum and depth to bedrock range from 12 to 20 inches. Coarse fragments make up 15 to 60 percent of the solum and 45 to 60 percent of the C horizon.

The A horizon has a hue of 5YR to 10R, a value of 3 or 4, and a chroma of 3 or 4.

The B2 horizon has a hue of 5YR to 10R, a value of 3 or 4, and a chroma of 3 or 4. It ranges from weak, fine and medium, subangular blocky structure to coarse, platy.

The thin C horizon, present in thick profiles, has a hue of 5YR to 10R, a value of 3 or 4, and a chroma of 3 to 6. It is shaly or very shaly silt loam.

Klinesville soils generally are next to the well-drained, moderately deep Penn soils and near the deep, well-drained Bucks and Royce soils. They are associated with Readington and Abbottstown soils. Nearby soils are the mottled, somewhat poorly drained Reaville soils on broad flats and slight rises and the gray, mottled, poorly drained Croton soils along drainageways and in slight depressions.

Klinesville soils are shallower and more shaly than Penn, Bucks, and Royce soils. They do not have the mottled horizon that is commonly in Reaville and Croton soils. They are shallower and more shaly than Readington and Abbottstown soils and do not have the fragipan that is commonly in those soils.

Klinesville shaly loam, 2 to 12 percent slopes (KlC).—This soil is on divides, hilltops, and undulating to gently rolling uplands. It has the profile described as representative of the series.

This soil is better suited to trees than to other uses because the available water capacity is low, runoff is very rapid, and the hazard of erosion is very severe. The use of farm machinery is limited and control of weeds is difficult on these steep and very steep soils. Capability unit VIIe-66; woodland suitability group 4d1.

Lamington Series

The Lamington series consists of deep, poorly drained soils that have a very firm fragipan in the lower part of the subsoil. These soils are nearly level. They are in depressions in stream terraces of the Lamington, Millstone, and Raritan Rivers. Lamington soils formed in old stream sediment that washed mostly from uplands. They are underlain by strata of sand, silt, and gravel over red shale and siltstone.

In a representative profile in a cultivated area, the surface layer is dark reddish-gray silt loam 10 inches thick. The upper part of the subsoil is 3 inches of mottled, pinkish-gray heavy silt loam and 10 inches of pinkish-gray silty clay loam. The lower part of the subsoil, between depths of 23 and 45 inches, is a firm, compact and brittle fragipan of reddish-gray light clay loam. The substratum, between depths of 45 and 60 inches, is stratified sand that contains thin lenses of silt loam.

In unlimed areas these soils are strongly acid or very

The A horizon has a hue of 5YR or 7.5YR, a value of 4 or 5, and a chroma of 1 or 2.

The B1 horizon has a hue of 5YR or 7YR, a value of 5 to 7, and a chroma of 1 or 2. This horizon ranges from silt loam to silty clay loam. The B2tg horizon has a hue of 5YR to 7.5YR, a value of 4 to 7, and a chroma of 1 or 2. It ranges from silty clay loam to clay loam. The Bxg horizon has a hue of 5YR to 7.5YR, a value of 4 to 6, and a chroma of 1 to 6. High-chroma mottles have a value of 3 to 5 and a chroma of 3 to 6. The fragipan is commonly light clay loam but ranges to silt loam or heavy loam. Structure is weak to moderate, very coarse, prismatic parting to medium, angular blocky or moderate, thick platy.

The C horizon has a hue of 10R to 5YR, a value of 4 to 6, and a chroma of 3 to 6. This horizon is sand, sandy loam, and silt loam that contains varying amounts of gravel and cobbles.

Lamington soils are on stream terraces with the well drained Birdsboro soils and the moderately well drained to somewhat poorly drained, mottled Raritan soils. Nearby on the adjacent flood plains are the poorly drained Bowmansville soils and the somewhat poorly drained or moderately well drained Rowland soils.

Lamington soils have a grayer B horizon than Raritan soils. They have a fragipan, which is not present in Birdsboro soils. They are not subject to the frequent flooding that is common on Bowmansville and Rowland soils, and they have a distinctly more clayey B horizon than those soils.

Lamington silt loam (Lo).—This nearly level, poorly drained soil is on old oxbows and stream meanders on low

More than half the acreage of Lansdowne soils has been cleared for farming. The native vegetation consists of forests of such deciduous hardwood trees as pin oak, red, oak, white oak, beech, maple, sweetgum, and ash. The soils are suited to crops that tolerate some wetness. They are used mainly for hay and pasture. Row crops are suited where artificial drainage has been installed. This soil is better suited to such water-tolerant grasses and legumes as birdsfoot trefoil, Ladino clover, reed canarygrass, timothy, and bluegrass than to other plants.

Representative profile of Lansdowne silt loam, 0 to 2 percent slopes, in Montgomery Township; 150 yards east of Unionville Cemetery and 20 feet south of Dutchtown Zion Road:

Ap—0 to 9 inches, dark reddish-brown (5YR 3/3) silt loam; moderate, medium, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary.

B21t—9 to 14 inches, yellowish-red (5YR 4/6) heavy silty clay loam; few, fine, distinct, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; friable, plastic, few fine roots; common, thin, reddish-gray (5YR 5/2) clay films on ped faces, in root channels, and in pores; 2 percent fine rounded pebbles of granite, gneiss, quartzite, and red shale; strongly

Lansdowne silt loam, 0 to 2 percent slopes (LbA).—This nearly level soil is in low-lying areas on broad upland flats and in depressions and drainageways. It has the profile described as representative of the series.

Included with this soil in mapping are areas where the surface layer is silty clay loam. Also included are areas of Reaville and Norton soils.

Excessive wetness reduces the time during which this soil can be plowed and cultivated. It is often too wet early in spring to be worked along with the adjacent well-drained soils. Runoff is very slow, and the hazard of erosion is slight. In places the effective rooting depth of some plants is limited by a seasonal high water table.

This soil is used for the commonly grown field crops, hay, and pasture. If adequately drained, it is well suited to hay and pasture. Open ditches and surface drains are needed to reduce excess water. Drainage is needed if high-value crops are to be grown. Capability unit IIIw-70; woodland suitability group 3w1.

Lansdowne silt loam, 2 to 6 percent slopes (LbB).—This soil has a profile similar to the one described as representative of the series, but in this soil the depth to gray mottles is about 15 inches.

Included with this soil in mapping are areas where the surface layer of eroded soils has some of the finer textured material from the subsoil mixed in with it. These eroded soils crust more easily than the noneroded ones. Also, seed germination is lower and plant growth is slower in the eroded soils. Areas of Reaville and Norton soils are also included in mapping.

Runoff is slow on this soil, and the hazard of erosion is slight.

This soil is used for the commonly grown field crops, hay, and pasture, If the soil is adequately drained, it is well suited to corn, soybeans, and hay. Cover crops and contour cultivation are needed to control runoff and erosion and to maintain the organic-matter content and good tilth. Because these soils have slow permeability in the subsoil, open ditches and surface drainage are more effective than other methods of disposing of excess water. Capability unit IIIw-70; woodland suitability group 3w1.

Lawrenceville Series

The Lawrenceville series consists of deep, moderately well drained soils that have an extremely firm, brittle fragipan in the lower part of the subsoil. These soils are gently sloping to sloping. They are on the undulating uplands near Rocky Hill and on the foot slopes of the Sourland Mountains. They formed in a silty mantle, generally over material weathered from shale, sandstone, basalt, diabase, or metamorphosed shale.

In a representative profile in a cultivated area, the surface layer is dark-brown silt loam 6 inches thick. The subsurface layer is 9 inches of brown silt loam. The upper part of the subsoil, between depths of 15 and 31 inches, is mottled, brown silt loam. The lower part, between depths of 31 and 48 inches, is a firm, compact and brittle fragipan of brown heavy silt loam. Shale bedrock is at a depth of 48 inches.

In unlimed areas these soils are very strongly acid or strongly acid in the upper part and very strongly acid to medium acid in the lower part. Natural fertility and the organic-matter content are medium. The soils are easy to till. The effective rooting depth is restricted by the fragipan. Permeability is moderately slow in the fragipan, and the available water capacity is moderate. These soils have a seasonal perched water table at a depth of 1½ to 4 feet late in fall, in winter, and early in spring. Plowing and cultivation are delayed in spring and following heavy rain.

Most areas of Lawrenceville soils have been cleared for farming. The native vegetation consists of forests of such hardwood trees as white, red, and black oak; yellow-poplar; beech; ash; maple; and hickory. If adequately drained, the soils are well suited to corn, soybeans, small grains, and vegetables and to fruit, nursery plants, and other specialized crops. In undrained areas small grains and alfalfa are subject to frost heaving and winterkill.

Representative profile of Lawrenceville silt loam, 2 to 6 percent slopes, in Hillsborough Township; 30 feet south of intersection of Long Hill Road and Neshanic-Wertsville Road:

Ap—0 to 6 inches, dark-brown (7.5YR 3/2) silt loam; moderate, medium, granular structure; friable; many fine roots; medium acid; abrupt, smooth boundary.

A2—6 to 15 inches, brown (7.5YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; many fine roots; strongly acid; clear, wavy boundary.

B1—15 to 21 inches, brown (7.5YR 4/4) silt loam; few, fine, faint, reddish-yellowish (7.5YR 6/8) mottles; moderate, medium, subangular blocky structure; friable; common fine roots; very strongly acid; clear, wavy boundary.

B2t—21 to 31 inches, brown (7.5YR 4/4) heavy silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, angular blocky structure; firm; few fine roots; 5 percent shale fragments ⅛ inch to 2 inches in diameter; clay films on ped faces and in root channels; very strongly acid; gradual, wavy boundary.

Bx—31 to 48 inches, brown (7.5YR 4/4) heavy silt loam; many, medium, distinct, reddish-yellow (7.5YR 6/6) mottles and common, medium, distinct, pinkish-gray (7.5YR 6/2) and reddish-yellow (7.5YR 6/8) mottles; weak, very coarse, prismatic structure; extremely firm, compact and brittle; 10 percent shale fragments less than 1 inch in diameter; clay films on ped faces; very strongly acid; clear, smooth boundary.

R—48 inches, dusky-red (2.5YR 3/2) fractured shale bedrock.

The solum ranges from 40 to 55 inches in thickness. Depth to bedrock ranges from 4 to 6 feet, and depth to the fragipan ranges from 25 to 35 inches. Coarse fragments make up less than 5 percent of the upper part of the solum and as much as 10 percent of the lower part of the B horizon and the C horizon.

The A horizon has a hue of 7.5YR or 10YR, a value of 3 to 5, and a chroma of 2 or 3.

The B1 and B2 horizons have a hue of 7.5YR to 10YR, a value of 4 or 5, and a chroma of 3 to 6. The Bt horizon ranges from silt loam to light silty clay loam. The Bx horizon has a hue of 7.5YR or 10YR, a value of 3 or 4, and a chroma of 2 to 4. Low- and high-chroma mottles are in the lower part of the B horizon.

The C horizon, present in some profiles, has a hue of 7.5YR to 10YR, a value of 4 to 7, and a chroma of 1 to 4. This horizon includes silt loam, fine sandy loam, and sandy loam.

Lawrenceville soils are adjacent to the somewhat poorly drained Chalfont soils and the poorly drained Croton soils. Nearby on the adjacent uplands are the deep, moderately well drained Readington soils and the deep, somewhat poorly drained Abbottstown soils.

Lawrenceville soils are less gray in the B horizon than Chalfont and Croton soils and less red than Readington soils. Low-chroma mottles are deeper in Lawrenceville soils than they are in Abbottstown soils.

Lawrenceville silt loam, 2 to 6 percent slopes (LeB).—This gently sloping soil is on the lower slopes of broad upland flats and slight depressions along the base of the Sourland Moutains and near Rocky Hill. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of nearly level soils and some small areas of moderately eroded soils. Also included are areas of Chalfont and Croton soils.

This soil is used mainly for corn, soybeans, hay, and pasture. Runoff is slow, and the hazard of erosion is slight. [illegible]

tles; moderate, medium, subangular blocky structure; friable; few fine roots; common moderately thick clay films on ped faces and in pores; 20 percent shale fragments;

in places where bedrock is nearest the surface. Runoff is medium, and the hazard of erosion is moderate.

This soil is used for the commonly grown crops and hay and pasture. It is well suited to perennial hay and pasture consisting of grasses and legumes that tolerate wetness.

yellow (5YR 6/8) mottles; moderate, coarse, prismatic structure parting to moderate, thick, platy; very firm; mottles along root channels and structure faces; stains throughout horizon; less than 15 percent pebbles; strongly acid; gradual, wavy boundary.

IIC—45 to 50 inches, reddish-brown (5YR 4/4) loam; many, coarse,

The organic-matter content is medium. The surface layer is generally easy to till and seldom clods or crusts. Gravel and cobbles, however, interfere with tillage operations where they make up more than 25 percent of the plow layer. Runoff is medium. The hazard of erosion is moderate.

This soil is suited to all the general crops common to the county. Most of the acreage is cultivated or in hay or pasture. In cultivated areas contour stripcropping, terraces, and minimum tillage are needed to maintain the organic-matter content and good tilth and to control runoff and erosion. Capability unit IIIe-51; woodland suitability group 2o1.

Mount Lucas Series

The Mount Lucas series consists of deep, moderately well drained and somewhat poorly drained soils. These nearly level to strongly sloping soils are on hillsides and ridges and on the lower slopes in the Watchung and Sourland Mountains. They formed in material weathered from dark igneous diabase and basalt bedrock.

In a representative profile in a wooded area, the surface layer is dark grayish-brown and grayish-brown silt loam 8 inches thick. Between depths of 8 and 23 inches the subsoil is mottled, light yellowish-brown and yellowish-brown silt loam and heavy silt loam, and between depths of 23 and 35 inches it is mottled, dark-brown light silty clay loam. The substratum, between depths of 35 and 56 inches, is mottled, brown cobbly loam. Hard bedrock is at a depth of 56 inches.

In unlimed areas these soils are strongly acid to slightly acid in the upper part and medium acid to neutral in the lower part. Natural fertility is high. Permeability is moderately slow, and the available water capacity is high. These soils have a seasonal high water table at a depth of 1 foot to 4 feet. Although the seasonal water table restricts the development of some roots, the effective rooting zone is deep. Excessive wetness early in spring and following heavy rain delays plowing and cultivation.

Most areas of Mount Lucas soils are wooded. The native vegetation consists of forests of such deciduous trees as mixed oaks, yellow-poplar, beech, ash, and maple. The soils are not generally suited to intense cultivation because of wetness and stoniness. They are better suited to row crops, hay, and pasture than to other uses. Alfalfa and fall-sown small grains are subject to frost heaving in the somewhat poorly drained areas.

Representative profile of Mount Lucas silt loam, 2 to 6 percent slopes, in Warren Township; 300 feet east of Flintlock Road and 50 feet north of Red Hill Road:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; common very fine roots; 10 percent angular basalt pebbles and cobbles; strongly acid; clear, wavy boundary.

A2—2 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, thick, platy structure; friable; common fine roots; 10 percent angular basalt pebbles and cobbles; strongly acid; gradual, wavy boundary.

B1—8 to 14 inches, light yellowish-brown (10YR 6/4) silt loam; few, medium, faint, light-gray (10YR 7/2) mottles; weak, thin, platy structure; friable; common fine roots; 10 percent angular basalt pebbles and cobbles; strongly acid; gradual, wavy boundary.

B21t—14 to 23 inches, yellowish-brown (10YR 5/4) heavy silt loam; common, medium, distinct, light-gray (10YR 7/2) and light yellowish-brown (10YR 6/4) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; few thin clay films on ped faces and in root channels; 10 percent angular basalt pebbles and cobbles; strongly acid; clear, wavy boundary.

B22t—23 to 35 inches, dark-brown (7.5YR 4/4) light silty clay loam; common, medium, distinct, brown (7.5YR 5/2), dark-brown (7.5YR 4/2), and strong-brown (7.5YR 5/8) mottles; moderate, medium, angular blocky structure; friable; few fine roots; common thin clay films on ped faces and in root channels; many black stains; 10 percent angular basalt pebbles and cobbles; medium acid; clear, smooth boundary.

C—35 to 56 inches, brown (7.5YR 5/4) cobbly loam; common, medium, distinct, grayish-brown (10YR 4/2), light yellowish-brown (10YR 6/4), and strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few thin clay films on ped faces; 25 percent coarse basalt cobbles; medium acid; gradual, wavy boundary.

R—56 inches, black (N 2/0), highly fractured, fine-grained basalt bedrock.

The solum ranges from 30 to 38 inches in thickness. Depth to bedrock ranges from 4 to 6 feet. Coarse fragments make up 5 to 30 percent of the A and B horizons and 20 to 40 percent of the C horizon. They range from pebbles to boulders in size. Depth to low-chroma mottles ranges from 8 to 20 inches.

The A horizon has a hue of 10YR or 7.5YR, a value of 4 or 5, and a chroma of 2 or 3. This horizon is silt loam or gravelly silt loam.

The B horizon has a hue of 10YR to 5YR, a value of 4 or 5, and a chroma of 3 to 6. The Bt horizon is heavy silt loam, silty clay loam, clay loam, and their gravelly equivalents.

The C horizon has a hue of 5YR to 10YR, a value of 4 or 5, and a chroma of 3 or 4. This horizon ranges from loam to sandy loam and their gravelly or cobbly equivalents.

Mount Lucas soils generally are associated with the well-drained, unmottled Neshaminy soils on hillsides and ridges and with the mottled, poorly drained Watchung soils in swales. They are less gray than Watchung soils. Mottling distinguishes Mount Lucas soils from Neshaminy soils.

Mount Lucas silt loam, 2 to 6 percent slopes (MoB).—This gently sloping soil is on slight rises and at the base of slopes and along drainageways in the Watchung and Sourland Mountains. It has the profile described as representative of the series.

Included with this soil in mapping are some areas where coarse fragments make up more than 15 percent of the surface layer. Also included are areas of Watchung and Neshaminy soils.

The organic-matter content of this soil is medium. The surface layer is generally easy to till, but coarse fragments interfere with tillage operations where they make up more than 20 percent of this layer. Runoff is slow. The hazard of erosion is slight. The rooting depth of some plants is limited by the seasonal high water table.

This soil is used mainly for corn, soybeans, apples, and hay and pasture plants. In cultivated areas contour cultivation and minimum tillage help to control runoff and erosion. Wetness has been reduced by surface drains or drain tile. Capability unit IIe-71; woodland suitability group 2w1.

Mount Lucas gravelly silt loam, 6 to 12 percent slopes (MpC).—This soil has a profile similar to the one described as representative of the series, but it has more gravel and cobbles on the surface than that soil, and the depth to bedrock is about 4 feet.

Included with this soil in mapping are some areas of stony soils and a few areas of severely eroded soils that have lost most of their original surface layer through erosion. Also included are areas of Neshaminy and Watchung soils.

The organic-matter content is medium. The surface layer is generally easy to till, but coarse fragments interfere with tillage operations where they make up more than 20 percent of the surface layer. This soil dries out slowly, and seepage at the foot of some slopes persists until early in summer. Tile drains are helpful in areas where

moisture is made excessive by seeps and springs. Runoff is medium, and the hazard of erosion is moderate.

This soil is used mainly for corn, small grains, hay and pasture plants, and as woodland. In cultivated areas stripcropping in combination with minimum tillage and diversion terraces is needed to control runoff and erosion. Cover crops and cropping sequences are needed to maintain organic-matter content and good tilth. Capability unit IIIe-71; woodland suitability group 2w1.

Mount Lucas-Watchung very stony silt loams, 2 to 12 percent slopes (MuB).—This mapping unit is about 65 percent Mount Lucas soils and 35 percent Watchung soils, but the proportion varies somewhat from place to place. The Mount Lucas and Watchung soils occurred generally in such a complex pattern that it was not practical to map them separately at the scale used. These soils are on undulating uplands, on hillsides, and at the base of steeper slopes in the Watchung and Sourland Mountains. They have profiles similar to the ones described as representative of their respective series, but stones are spaced 5 to 30 feet apart on the surface.

Included with these soils in mapping are areas where the surface layer is less than 15 percent gravel and cobbles dry out slowly in spring, and seepage at the foot of some slopes persists until early in summer. Runoff is medium, and the hazard of erosion is moderate.

This mapping unit is mainly in woodland cover. The stones and outcrops make cultivation impractical. The soils are well suited to woodland and fairly well suited to pasture. Where the soils are used for pasture, light machinery is needed for disking, planting, liming, and fertilizing. Moisture-tolerant grasses and legumes are better suited than other plants. Capability unit VIIs-77; woodland suitability group 2w1.

Neshaminy Series

The Neshaminy series consists of deep, well-drained soils. These gently sloping to very steep soils are on hillsides and ridgetops of the Watchung Mountains, the Sourland Mountains, and the gently rolling uplands near Rocky Hill (fig. 7). They formed in material weathered from dark igneous rocks, such as basalt and diabase.

In a representative profile in a wooded area, the surface layer is dark grayish-brown silt loam 4 inches thick. The subsurface layer is 6 inches of brown silt loam. The upper

gravelly clay loam. The substratum, between depths of 46 and 96 inches, is yellowish-red cobbly loam. Fractured bedrock is at a depth of 96 inches.

In unlimed areas these soils are medium acid to strongly acid in the upper part and medium acid in the lower part. Natural fertility is high. Permeability is moderately slow, and the available water capacity is high. The native

fragipan variant to the Neshaminy soils and of the Amwell soils that have a rock substratum.

Neshaminy silt loam, 2 to 6 percent slopes (NeB).—This gently sloping soil is on undulating uplands and low ridges in the Watchung and Sourland Mountains. Basalt or diabase gravel and cobbles are scattered over the

and boulders is not practical for farm use. Capability unit VIIs-61; woodland suitability group 2o1.

Neshaminy-Mount Lucas very stony silt loams, 2 to 12 percent slopes (NkC).—This mapping unit is 50 to 70 percent Neshaminy soils and 30 to 50 percent Mount Lucas soils. These gently sloping to strongly sloping soils are in such an intricate pattern that it is not practical to map them separately at the scale desired. They have profiles similar to the ones described as representative for their respective series; but many stones and boulders, spaced 5 to 30 feet apart, are scattered over the surface (fig. 8) and throughout the profile. In many places the surface layer is gravelly silt loam.

The organic-matter content is medium to high. The high content of stones and a few boulders make plowing impractical. Runoff is slow to medium. The hazard of erosion is slight to moderate.

Most of this mapping unit is wooded. A few small areas are used to grow apples and for pasture. Removing the stones and boulders is generally not practical, but light farm machinery can be used in some areas for planting, liming, and fertilizing. This soil is better suited to woodland and pasture than it is to field crops. Capability unit VIs-61; woodland suitability group 2o1.

Neshaminy-Mount Lucas very stony silt loams, profile. In many areas the surface layer is gravelly silt loam. The stones are generally 5 to 30 feet apart.

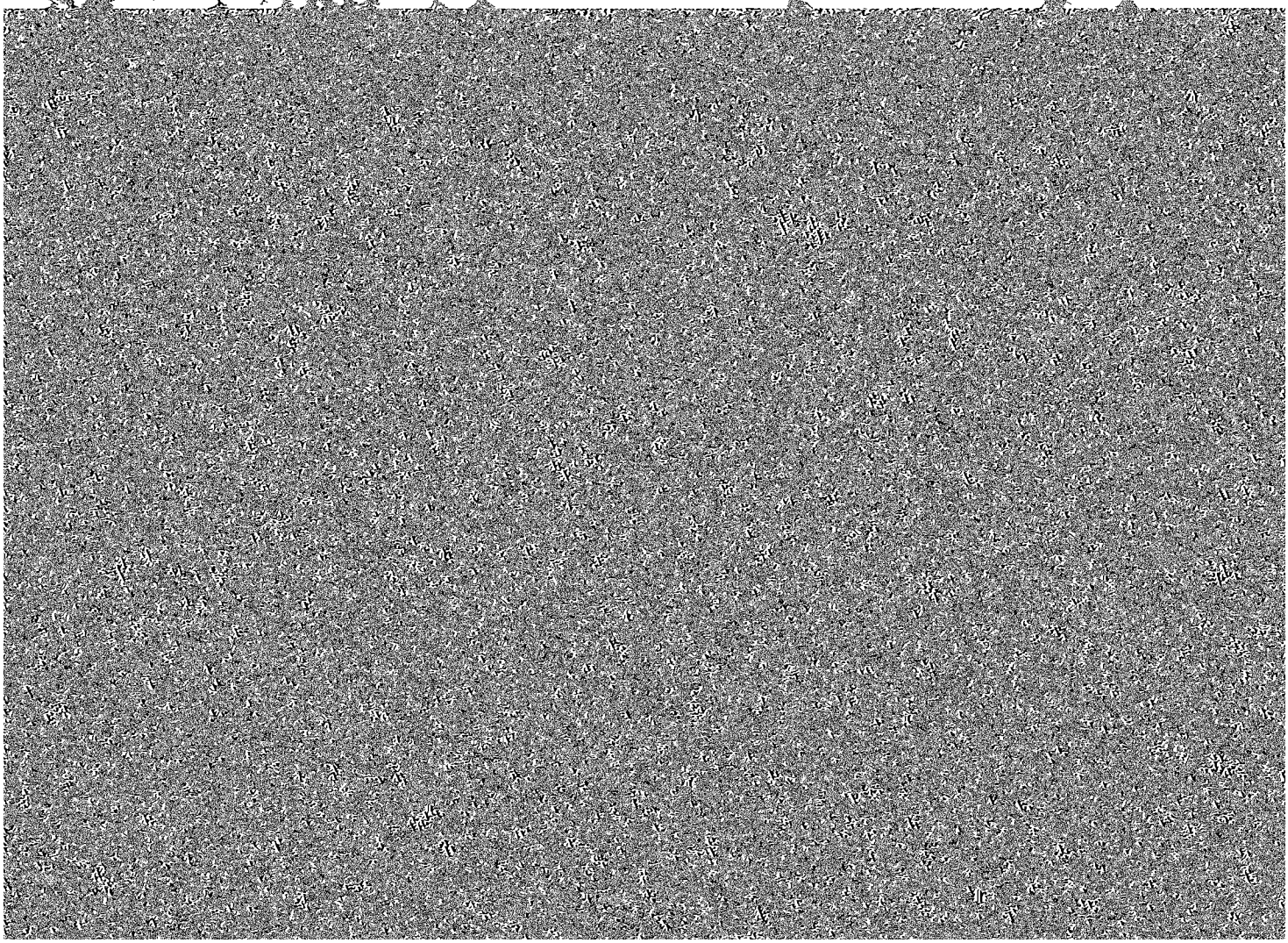
Included with these soils in mapping are areas of soils of the Neshaminy series, fragipan variant, and soils of the Watchung series.

The organic-matter content is medium to high. Runoff is rapid. The hazard of erosion is severe if these soils have been cleared and left bare.

Most areas of this mapping unit are wooded, and the soils are well suited to woodland. A few areas are used for pasture and fruit. Removing the stones and boulders is generally not practical for farm use, but light farm machinery can be used in some areas for disking, planting, fertilizing, and liming. Capability unit VIs-61; woodland suitability group 2o1.

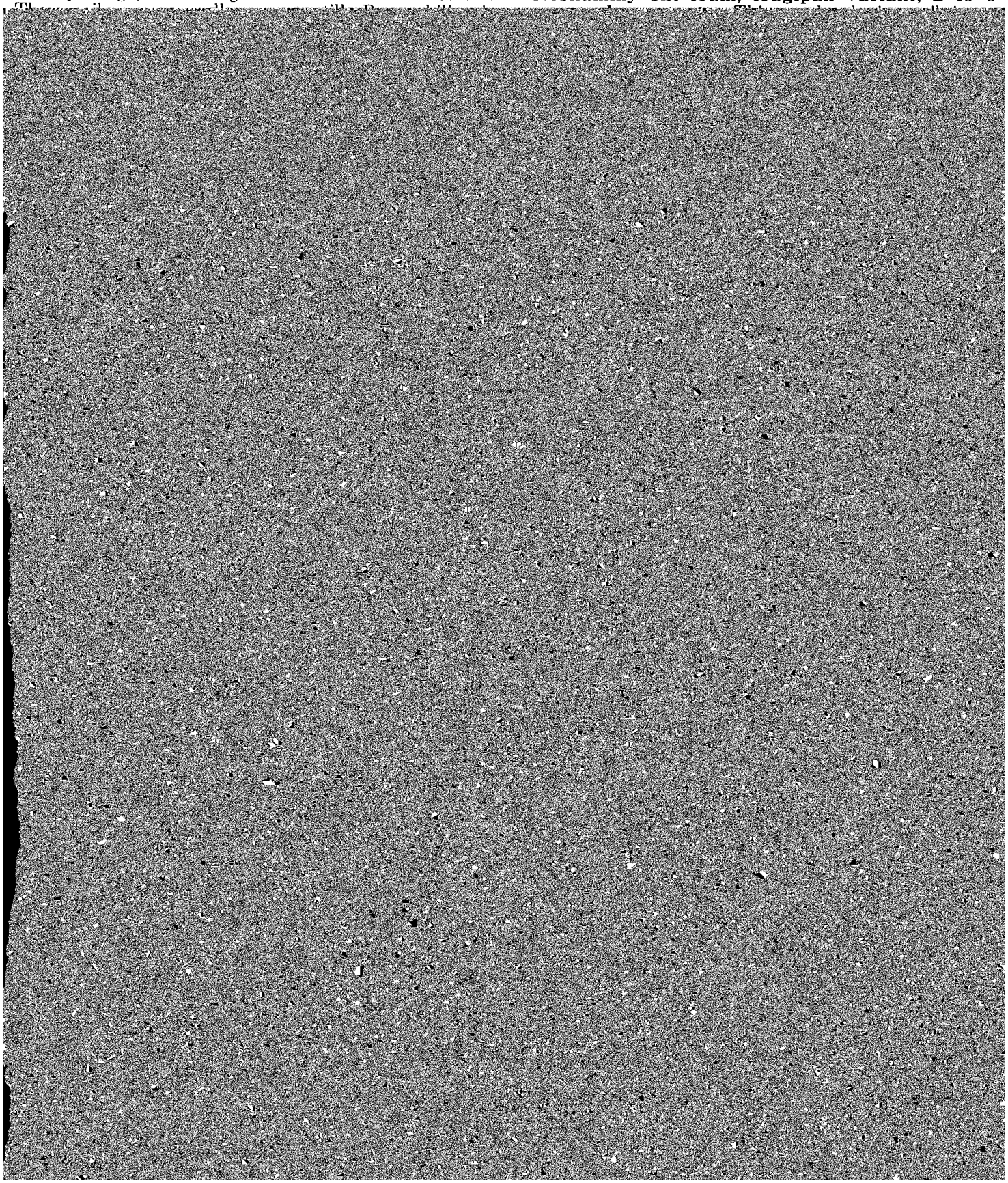
Neshaminy Variant

The Neshaminy variant consists of deep, well-drained and moderately well drained soils. These soils are gently sloping to sloping. They are on hilly uplands and slopes at the base of the Watchung Mountains. The surface layer and most of the subsoil formed in silty and gravelly traprock colluvium, and the lower part of the subsoil formed in residuum derived from basalt or diabase.



fertility is high, and the organic-matter content is medium.

Neshaminy silt loam, fragipan variant, 2 to 6



seed in readily with redcedar. The soils are well suited to corn, soybeans, small grains, vegetables, and nursery and other specialized crops. They are not well suited to potatoes because of the slow permeability.

Representative profile of Norton loam, 0 to 2 percent [illegible] Hill Township: 50 feet south of barn on [illegible]

permeability, the subsoil remains wet for some time after periods of heavy rain.

This soil is used mostly for general field crops, such as corn, soybeans, hay, and pasture. Alfalfa is subject to damage by severe frost heaving. In cultivated areas cropping systems and management of crop residue are needed

lands. They formed in material weathered from granite gneiss.

In a representative profile in a wooded area, the surface layer is very dark grayish-brown very gravelly sandy loam 4 inches thick. The subsurface layer is 3 inches of dark yellowish-brown very gravelly loam. The subsoil is yellowish-brown very gravelly sandy loam that extends to a depth of 26 inches. The substratum, between depths of 26 and 50 inches, is yellowish-brown very cobbly sandy loam. Fractured granite gneiss bedrock is at a depth of 50 inches.

In unlimed areas these soils are very strongly acid or strongly acid. Natural fertility is medium. The rooting zone is deep. Permeability is moderately rapid, and the available water capacity is low.

Less than half the acreage of Parker soils has been cleared for farming. The native vegetation consists of forests of such hardwood trees as yellow-poplar, white oak, black oak, red oak, maple, and hickory. Hemlocks grow on north-facing slopes and in coves of the deep gorges along Ravine Creek. The nonstony Parker soils are fairly well suited to general farm crops, fruit, and trees. The steep, very stony Parker soils are better suited to pasture and woodland than to farming.

Representative profile of Parker very gravelly sandy loam, 3 to 15 percent slopes, in Far Hills Township; on the east side of Lake Road, 2,000 feet north of Ravine Lake dam:

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) very gravelly sandy loam; moderate, fine, granular structure; friable; few fine roots; 55 percent angular pebbles and cobbles of granite gneiss; strongly acid; clear, wavy boundary.

A2—4 to 7 inches, dark yellowish-brown (10YR 4/4) very gravelly loam; moderate, medium, granular structure; friable; few fine and coarse roots; 55 percent angular pebbles and cobbles of granite gneiss; strongly acid; clear, wavy boundary.

B2—7 to 26 inches, yellowish-brown (10YR 5/6) very gravelly sandy loam; weak, medium, subangular blocky structure; friable; few coarse roots; 60 percent angular pebbles [illegible]

series. Granite gneiss, pebbles, and cobbles are scattered over the surface and throughout the profile.

Included with this soil in mapping are some areas of eroded soils. Also included are areas of Edneyville and Califon soils.

The organic-matter content is moderate. The surface layer is generally easy to till, but pebbles and cobbles interfere with tillage. This soil can be plowed and cultivated throughout a wide range of moisture conditions. Low available water capacity in many places limits growth of crops. Runoff is medium, and the hazard of erosion is moderate in cultivated areas.

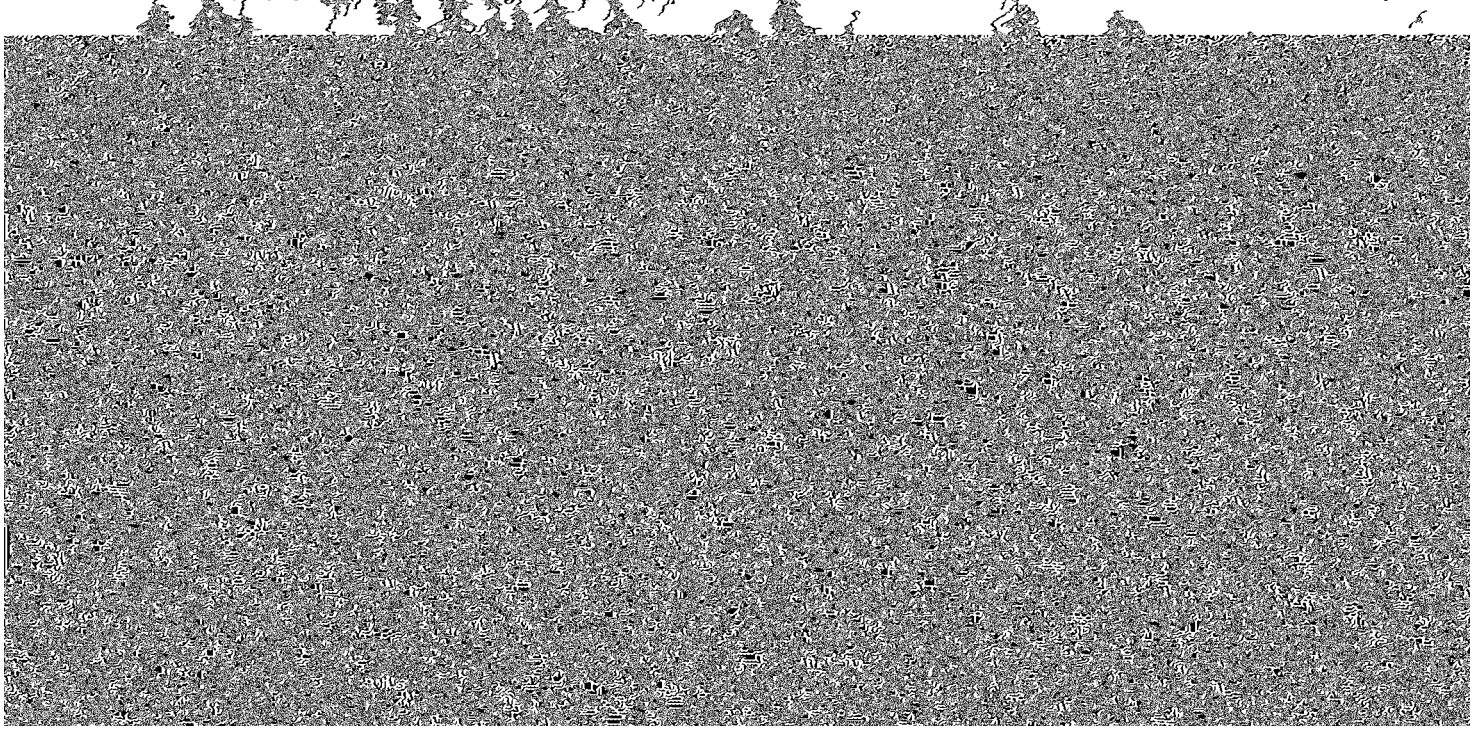
Most areas of this soil are wooded or are abandoned fields that are reverting to woodland. Some areas are used for field crops, fruit, hay, and pasture. This soil is suited to hay and pasture of drought-resistant grasses and legumes. It is only fair for corn, soybeans, and other late-maturing crops. Contour cultivation and stripcropping are needed if this soil is farmed. Capability unit IVs-58; woodland suitability group 3f1.

Parker rocky sandy loam, 25 to 35 percent slopes (PcE).—This soil has a profile similar to the one described as representative of the series, but rock outcrops are common and more pebbles, cobbles, and stones are on the surface of this soil than on the surface of the soil described as representative of the series.

Included with this soil in mapping are areas of very cobbly and stony soils. In some areas stones are 10 to 30 feet apart and patches of exposed bedrock, about 200 feet apart, occupy as much as 4 percent of the surface area. Also included are areas of soils that are moderately deep to bedrock and have slopes of less than 25 percent and some areas of Edneyville soils.

The organic-matter content is medium. Runoff is very rapid. The hazard of erosion is very severe if the soil has been cleared and left without protective cover.

Most of the acreage is wooded, and this soil is well



Parsippany Series

The Parsippany series consists of deep, poorly drained soils. These nearly level soils are on flats in an old glacial lake, Lake Passaic, where they are subject to frequent stream flooding. They formed in glacial lake sediment derived mainly from red shale, granite gneiss, and basalt.

In a representative profile the surface layer is very dark grayish-brown and dark-gray heavy silt loam. The subsoil is about 46 inches thick. In sequence from the top, it is 5 inches of mottled, gray silty clay loam; 9 inches of mottled, gray silty clay; 11 inches of reddish-brown silty clay; and 21 inches of brown and strong-brown silty clay loam. The substratum, between depths of 50 and 70 inches, is reddish-brown heavy silt loam that contains a few strata of very fine sand and silt.

In unlimed areas these soils are medium acid to very strongly acid in the upper layers and slightly acid to neutral in the lower part of the subsoil and in the substratum. Natural fertility is high. Permeability is slow in the subsoil, and the available water capacity is high. These soils have a perched seasonal high water table at or near the surface late in fall, in winter, early in spring, and following periods of heavy rain. Some areas are ponded from winter to spring. Most areas of Parsippany soils are near major streams and are subject to frequent overflow. The stream water rises slowly in these areas and remains high for long periods.

Less than half the acreage of Parsippany soils has been cleared for farming. The native vegetation consists of forests of such mixed deciduous trees as sweetgum, pin oak, white oak, red maple, beech, and hickory. Cultivated areas require drainage, but suitable outlets are difficult to find. Also, because permeability is slow, drainage is difficult. If the soils are adequately drained, they are well suited to corn, soybeans, hay, and pasture. The soils are not suited to alfalfa or fruit. Winter small grains are subject to damage from severe frost heaving. The soils are suitable for dug ponds.

Representative profile of Parsippany silt loam in Warren Township; 250 feet east of Dead River Road and 100 feet south of Dead River, at the edge of a woodlot:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) heavy silt loam; weak, very fine, granular structure; friable; slightly sticky and nonplastic; many fibrous roots and few medium and coarse roots; strongly acid; clear, wavy boundary.

A3g—2 to 4 inches, dark-gray (10YR 4/1) heavy silt loam; moderate, medium and fine, subangular blocky structure; friable, moderate, coarse, subangular blocky structure and weak, very thick, platy; very firm, slightly sticky and slightly plastic; few fine roots; thick reddish-brown (5YR 4/3) clay films and few black (N 2/0) stains on faces of peds; few vertically oriented gray streaks; 3 percent fine gravel composed mostly of traprock, granitic gneiss, and shale; medium acid; gradual, wavy boundary.

B3t—29 to 50 inches, nearly equal proportions of brown (7.5YR 5/4) and strong-brown (7.5YR 5/6) silty clay loam; massive and weak, thick, platy structure; very firm, sticky and plastic; few roots mostly in or near vertically oriented streaks; patchy thick clay films in voids and along some vertical streaks; few, vertically oriented, reddish-brown (5YR 4/3) and brown (7.5YR 5/2) streaks; cut mass sprinkled with black or rust-colored dots; slightly acid; gradual, wavy boundary.

C—50 to 70 inches, reddish-brown (5YR 4/3) varved heavy silt loam that has a few ½- to 1-inch lamellae of very fine sand and silt; neutral.

The solum ranges from 40 to 50 inches in thickness. Depth to bedrock ranges from 4 to 20 feet or more. Coarse fragments make up 0 to 5 percent of the solum and as much as 20 percent of some parts of the C horizon.

The A horizon has a hue of 7.5YR or 10YR, a value of 3 or 4, and a chroma of 1 to 3.

The B horizon has a hue of 10YR to 5YR, a value of 4 to 6, and a chroma of 1 to 4. The B horizon ranges from silty clay loam to clay. It has moderate or strong, medium or coarse, subangular or angular blocky structure. Low- and high-chroma mottles are in the upper part of the B horizon.

The C horizon has a hue of 5YR to 7.5YR, a value of 4 or 5, and a chroma of 3 or 4. This horizon ranges from loamy sand to clay in texture. In places it is as much as 20 percent gravel.

Parsippany soils are near or adjacent to the deep, somewhat poorly drained Whippany soils on slightly higher elevations and the Parsippany very poorly drained variant.

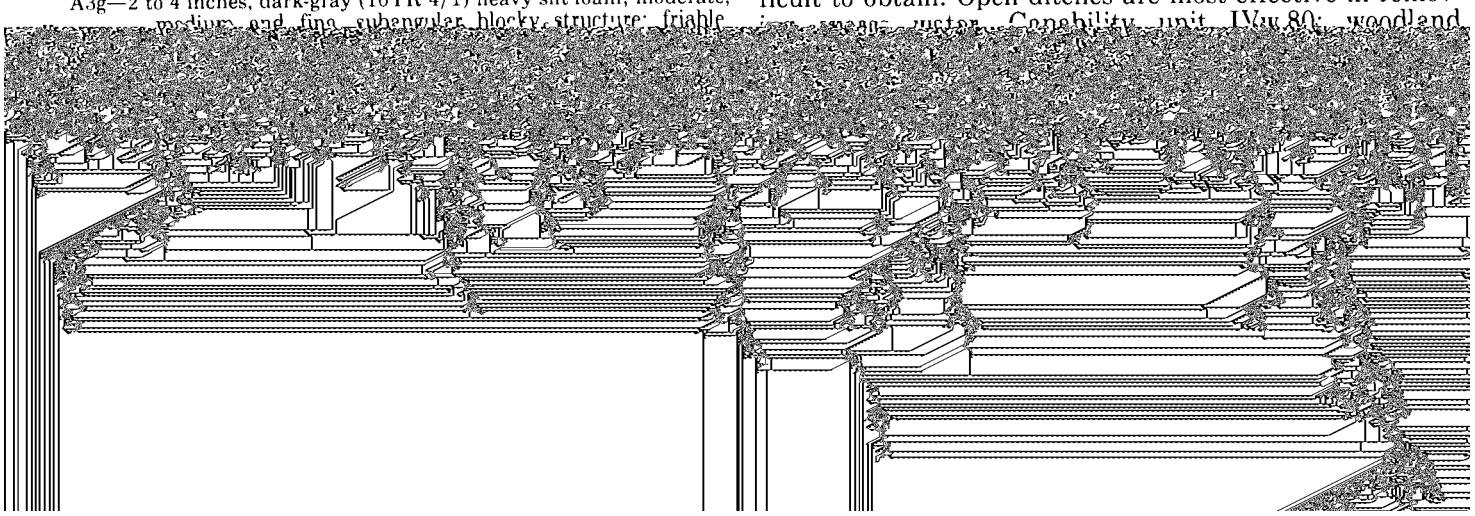
Parsippany soils have a grayer B horizon than Whippany soils. They are not so gray as the soils of the Parsippany variant.

Parsippany silt loam (Ph).—This nearly level soil is on low-lying flats and in slight depressions in the old glacial lake, Lake Passaic.

Included with this soil in mapping are small areas of Whippany soils and small areas of deep silty soils along Lord Sterling Road. Also included are areas of soils that have a surface layer of loam and silty clay loam.

The organic-matter content is moderate to high. The surface layer is generally fairly easy to till. Natural fertility is high. Runoff is very slow, and the hazard of erosion is slight.

This soil is used mainly as woodland and for hay and pasture. Wetness and flooding limit the use of this soil for farming and other purposes. Outlets for drainage are difficult to obtain. Open ditches are most effective in removing [illegible] water. Capability unit IVw-80; woodland



acid in the solum and slightly acid to neutral in the substratum. Natural fertility is high. Permeability is slow in the subsoil, and the available water capacity is high. These soils have a perched seasonal water table at or near the surface in fall, winter, and spring and following periods of heavy rain. Many areas are ponded from early in fall until late in spring. Most areas of these soils are near major streams and are subject to frequent overflow. Water rises slowly in the streams and remains high for long periods. An accumulation of alluvium as much as 10 inches thick is common on these soils.

Very little of the acreage of the soils in the Parsippany variant has been cleared for farming. The native vegetation consists of forests of such mixed deciduous trees as sweetgum, pin oak, white oak, red maple, beech, and hickory. Cultivated areas require drainage. Because of their low position, slow permeability, and inadequate outlets, improved drainage is difficult to establish on these soils. They are well suited to water-tolerant trees, shrubs, and grasses. Dug ponds or impoundments are frequently located on these soils.

Representative profile of Parsippany silt loam, very poorly drained variant, in Warren Township; 40 feet east of Dead River Road, one-fourth mile north of Interstate 78, and 400 feet south of bridge over Dead River:

A1—0 to 6 inches, brown (7.5YR 4/2) silt loam; moderate, medium, granular structure; friable; common fine roots; strongly acid; clear, wavy boundary.

A2g—6 to 11 inches, gray (5Y 5/1) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; friable; common fine roots; strongly acid; clear, wavy boundary.

B21g—11 to 18 inches, gray (5Y 5/1) silty clay; common, fine, distinct, light-gray (5Y 7/1) and yellowish-brown (10YR 5/8) mottles; strong, medium, angular blocky structure; slightly firm; few fine roots along ped faces; few thick clay films on ped faces; strongly acid; clear, wavy boundary.

B22gt—18 to 36 inches, gray (5Y 5/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; strong, medium, angular blocky structure; slightly firm; few fine roots along ped faces; common thin clay films on ped faces; common black organic stains on ped faces; strongly acid; gradual, wavy boundary.

C—36 to 60 inches, dark-gray (N 4/0) silty clay; few, fine, faint, gray (10YR 5/1) mottles; massive; slightly firm; few fine roots; neutral.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock ranges from 10 to 20 feet or more. Coarse fragments make up less than 2 percent of the A and B horizons and as much as 10 percent of the C horizon.

The A horizon has a hue of 7.5YR, 10YR, 2.5Y, or 5Y; a value of 2 to 5; and a chroma of 1 or 2.

The B horizon is typically gray (5Y 5/1) but includes a hue of 2.5Y or 10YR and a chroma of 0 or 1. This horizon is commonly silty clay but in places is clay, clay loam, and silty clay loam.

The C horizon has a hue of 10YR, 2.5Y, 5Y, or is neutral (N/0); a value of 4 or 5; and a chroma of 0 or 1. Typically, this horizon is silty clay, but in places it is silty clay loam or clay.

The Parsippany variant is associated with the poorly drained Parsippany soils at slightly higher elevations. On nearby slight rises and gentle slopes are the moderately well drained and somewhat poorly drained Whippany soils.

Soils of the Parsippany variant have a thick, gray B horizon and a year. Also included are areas of soils that have a surface layer of silty clay loam or clay loam and small areas of Parsippany and Whippany soils.

The organic-matter content is high to very high. Runoff is very slow, and the hazard of erosion is slight.

Wetness and flooding limit the use of this soil for farming and many other purposes. Outlets for drainage are extremely difficult to obtain. Open ditches are most effective in removing excess water. Capability unit VIw-80; woodland suitability group 3w1.

Pattenburg Series

The Pattenburg series consists of deep, well-drained soils. These soils are strongly sloping to moderately steep. They are on rolling and hilly uplands. They formed in material weathered from highly quartzose conglomerate or fanglomerate.

In a representative profile in a cultivated area, the surface layer is dark reddish-brown gravelly loam 8 inches thick. The subsoil is dark reddish-brown gravelly loam 22 inches thick. The substratum, between depths of 30 and 44 inches, is friable, dark reddish-brown very gravelly loam. Fractured bedrock is at a depth of 44 inches.

In unlimed areas these soils are strongly acid. Natural fertility is medium. The rooting zone is deep. Permeability and the available water capacity are moderate.

Less than half the acreage of Pattenburg soils has been cleared for farming, and much of the acreage is presently forest or pasture. The native vegetation consists of forests of such hardwood trees as red, black, chestnut, and white oaks; beech; yellow-poplar; and hickory. The less sloping Pattenburg soils are fairly well suited to general crops.

Representative profile of Pattenburg gravelly loam, 6 to 12 percent slopes, in Bedminster Township; near the intersection of Division Road and Holland Road:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/3) gravelly loam; moderate, fine, granular structure; friable; common fine roots; 20 percent rounded quartzite pebbles and cobbles; medium acid; abrupt, smooth boundary.

B1—8 to 12 inches, dark reddish-brown (5YR 3/4) gravelly loam; weak, fine, subangular blocky structure; friable; few fine roots; 25 percent rounded quartzite pebbles and cobbles; medium acid; clear, wavy boundary.

B2t—12 to 30 inches, dark reddish-brown (5YR 3/4) gravelly loam; weak, medium, subangular blocky structure; friable; few fine roots; 45 percent coarse fragments of rounded quartzite pebbles and cobbles; common thin clay films on most ped faces; strongly acid; clear, wavy boundary.

C—30 to 44 inches, dark reddish-brown (5YR 3/4) very gravelly loam; massive; very friable; 60 percent coarse fragments of rounded quartzite gravel and cobbles; strongly acid; gradual, wavy boundary.

R—44 inches, dark reddish-brown (5YR 3/4) conglomerate bedrock.

The solum ranges from 24 to 36 inches in thickness. Depth to bedrock is 3½ to 5 feet. Coarse fragments make up 15 to 60 percent of the soil.

The A horizon has a hue of 7.5YR to 2.5YR, a value of 3 or 4, and a chroma of 2 to 4 in cultivated areas. In wooded areas it is typically

deep, moderately well drained to somewhat poorly drained Califon soils.

Pattenburg soils contain more gravel and have a thinner profile than Arendtsville and Meckesville soils. They are deeper to bedrock than Penn and Klinesville soils. They do not have the mottles that are commonly in Califon soils.

Pattenburg gravelly loam, 6 to 12 percent slopes (PlC).—This soil is on rolling uplands and hillsides. It has the profile described as representative of the series.

Included with this soil in mapping are some areas of moderately eroded soils in which the dark reddish-brown subsoil has been mixed with the surface layer in plowing. Also included are areas of soils that have a subsoil that is less than 20 percent coarse fragments and areas of Klinesville, Penn, and Arendtsville soils.

The organic-matter content is low to medium. The surface layer is generally easy to till, and the soil can be plowed and cultivated early in spring and soon after light showers. Coarse fragments interfere with tillage operations. This soil is used mainly as woodland and for pasture. Corn and small grains are grown in cultivated areas. Runoff is medium, and the hazard of erosion is moderate. Contour cultivation and stripcropping can be used to control runoff and erosion in farmed areas. Capability unit IIIe-58; woodland suitability group 2o1.

Pattenburg gravelly loam, 12 to 18 percent slopes (PlD).—This moderately steep soil is in the hilly uplands on hillsides and sharp breaks. It has a profile similar to the one described as representative of the series, but it has a thinner subsoil and contains more pebbles and cobbles in the surface layer.

Included with this soil in mapping are some areas where slopes are more than 18 percent. Also included are areas where the subsoil contains less coarse fragments than the subsoil in the representative profile. Some areas of Klinesville and Penn soils are also included.

The organic-matter content is low to medium. The surface layer is easy to till and can be worked throughout a

In unlimed areas these soils are strongly acid in the surface layer and subsoil and strongly acid to slightly acid in the substratum. Natural fertility is medium, and the organic-matter content is moderate. In most places the soil is easy to till. Permeability and the available water capacity are moderate. The effective rooting depth is limited by the shale bedrock.

Most areas of Penn soils have been cleared for farming. The native vegetation consists of forests of such deciduous hardwood trees as white oak, red oak, black oak, beech, maple, and hickory. Redcedar seeds in readily in abandoned fields. The soils are suited to all the general crops, including corn, soybeans, small grains, hay, pasture, and vegetables and to fruit, nursery, and other specialized crops.

Representative profile of Penn silt loam, 2 to 6 percent slopes, in Hillsborough Township; 50 feet west of Willow Road and one-fourth mile north of Homestead Road:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/2) silt loam; moderate, fine, granular structure; friable; common fine roots; 10 percent shale fragments; strongly acid; abrupt, smooth boundary.

B21t—8 to 12 inches, reddish-brown (5YR 4/3) silt loam; weak, fine, subangular blocky structure; friable, slightly sticky and slightly plastic; common fine roots; 10 percent shale fragments; common thin clay films on ped faces and in root channels; strongly acid; gradual, wavy boundary.

B22t—12 to 25 inches, reddish-brown (5YR 4/3) shaly loam; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; few fine roots; common thin clay films on ped faces and in root channels; 25 percent shale fragments; strongly acid; gradual, wavy boundary.

C—25 to 30 inches, dark reddish-brown (2.5YR 3/4) very shaly loam; very weak, fine, subangular blocky structure; friable; 60 percent shale fragments; few fine roots; strongly acid; clear, wavy boundary.

R—30 inches, dark reddish-brown (2.5YR 3/4) shale bedrock.

The solum ranges from 20 to 36 inches in thickness. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments, mostly shale, make up 2 to 30 percent of the A and B horizons and 30 to 70 percent of the C horizon. In places rounded quartzose pebbles are

Figure 9.—**Area of Penn and Klinesville soils. Fractured Brunswick shale is exposed.**

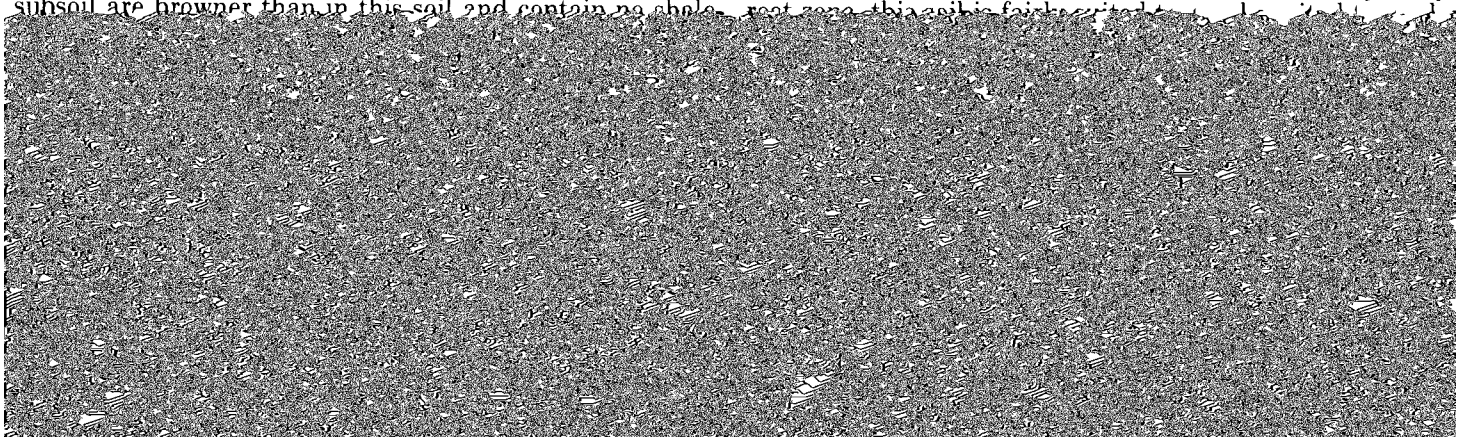
This soil is used mainly to grow corn, soybeans, small grains, vegetables, and hay. Crop yields are reduced in dry years. Supplemental irrigation is needed to increase the growth of high-value crops. Capability unit IIs-65; woodland suitability group 3o1.

Penn silt loam, 2 to 6 percent slopes (PmB).—This gently sloping soil is on undulating uplands. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of soils in which the surface layer and upper part of the subsoil are browner than in this soil and contain no shale. [illegible] shale, 1 inch to 3 inches long, are scattered on the surface and throughout the profile.

Included with this soil in mapping are areas of eroded soils that have lost half of their original surface layer and areas where more than 15 percent of the surface area is covered by shale fragments. Also included are small areas of Royce and Klinesville soils.

Runoff is medium, and the hazard of erosion is moderate. This soil is used mainly for hay and for corn and small-grain silage. Because of the moderately deep root zone this soil is fairly [illegible]



rooting zone, the available water capacity is insufficient during long dry periods. Runoff is slow, and the hazard of erosion is slight. Shale fragments interfere with cultiva-

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) silt loam; moderate, fine, granular structure; friable; many fine roots; 5 percent sandstone fragments; strongly acid; abrupt, smooth

tillage, and diversion terraces are needed to reduce runoff and control erosion. Capability unit IIIe-55; woodland suitability group 2o1.

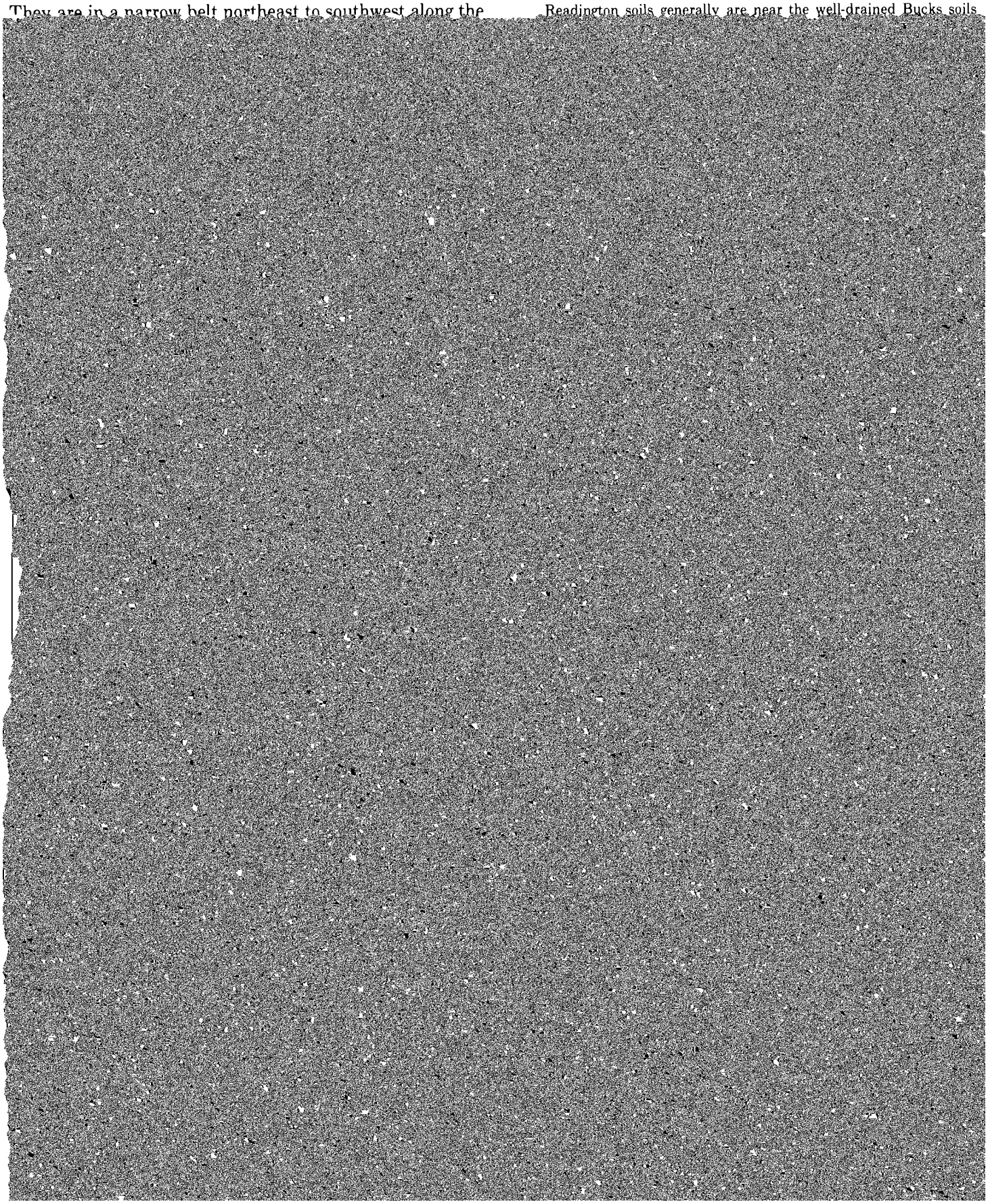
Quakertown silt loam, 12 to 18 percent slopes

percent slopes, in Hillsborough Township; 50 feet south of River Road and three-fourths of a mile east of Beekman Lane:

Ap—0 to 8 inches, dark brown (7.5YR 4/4) silt loam; moderate, fra

They are in a narrow belt northeast to southwest along the

Readington soils generally are near the well-drained Bucks soils



and in root channels; 1 percent rounded pebbles; strongly acid; clear, wavy boundary.

B2t—12 to 21 inches, reddish-brown (5YR 4/3) silty clay loam; common, medium, faint, weak-red (2.5YR 4/2) mottles and common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, angular blocky structure; friable; few fine roots; common thin clay films on ped faces and in root channels; 2 percent gravel and shale fragments; strongly acid; clear, wavy boundary.

C—21 to 27 inches, dark reddish-brown (2.5YR 3/4) very shaly loam; massive; 60 percent shale fragments that have common, thick, pinkish-gray (7.5YR 6/2) silt coatings on faces of shale fragments; strongly acid; clear, wavy boundary.

R—27 inches, dark reddish-brown (2.5YR 3/4) fractured and partly weathered shale bedrock; black (10YR 2/1) stains on faces of shale fragments.

The solum ranges from 17 to 24 inches in thickness. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments make up 2 to 10 percent of the solum and 35 to 70 percent of the C horizon.

The Ap horizon has a hue of 5YR or 7.5YR, a value of 4, and a chroma of 2 to 4.

The Bt horizon has a hue of 2.5YR or 5YR, a value of 4 or 5, and a chroma of 3 or 4. The Bt horizon is light silty clay loam or silt loam.

The C horizon is commonly dark reddish brown (2.5YR 3/4), but in places hue is 5YR. This horizon is shaly loam, shaly silt loam, and their very shaly equivalents.

Reaville soils are associated with the poorly drained Croton soils, the somewhat poorly drained Abbottstown soils, and the well-drained Penn soils.

Reaville soils are shallower to bedrock than Abbottstown and Croton soils and less gray in the B horizon than Croton soils. Mottling in the subsoil distinguishes Reaville soils from Penn soils.

Reaville silt loam, 0 to 2 percent slopes (ReA).—This nearly level soil is in low-lying areas and intermediate positions on broad upland flats. It has the profile described as representative of the series. In most places shale fragments make up 0 to 15 percent of the surface layer.

Included with this soil in mapping are areas where the surface layer is more than 15 percent fragments of red shale. Also included are some small poorly drained seep areas.

Cultivated areas of this soil are used mainly for soybeans, hay, and small-grain silage. Runoff is very slow, and the hazard of erosion is slight. Wetness is the main limitation of this soil for crops. The soil is too wet to be worked early in spring with the adjacent well-drained soils. It dries out rapidly, however, and in some years crop yields may be reduced by lack of available moisture. Wetness caused by spring and seeps can be reduced in places by installing drain tiles if the depth to bedrock is adequate. Diversion terraces are needed to intercept water coming from the slopes above. Capability unit IIIw-76; woodland suitability group 4w1.

Riverhead Series

The Riverhead series consists of deep, well-drained soils. These gently sloping to strongly sloping soils are in undulating uplands. They formed in glacial outwash material, mainly granitic material containing minor amounts of shale, sandstone, and quartzite.

In a representative profile in a wooded area, the surface layer is dark-brown sandy loam 3 inches thick. The subsurface layer is 7 inches of brown sandy loam. The subsoil is 26 inches of strong-brown light sandy loam and sandy loam. The mottled substratum, between depths of 36 and 60 inches, is brown fine sand.

In unlimed areas these soils are very strongly acid or strongly acid. Natural fertility is low. Permeability is moderately rapid, and the available water capacity is moderate.

Most areas of Riverhead soils are in urban areas or woodland, but some areas are cultivated. The native vegetation consists of forests of such hardwood trees as white oak, red oak, beech, maple, and hickory. The soils are suited to all the general crops grown in the county. They are well suited to fruit, vegetable, nursery, and other specialized crops.

Representative profile of Riverhead sandy loam, 3 to 15 percent slopes, in a wooded area of Bernardsville Township; 200 feet west of the intersection of Pennington Avenue and Orchard Street:

A1—0 to 3 inches, dark-brown (7.5YR 3/2) sandy loam; weak, fine, granular structure; very friable; common fine roots; 1 percent rounded pebbles; very strongly acid; clear, wavy boundary.

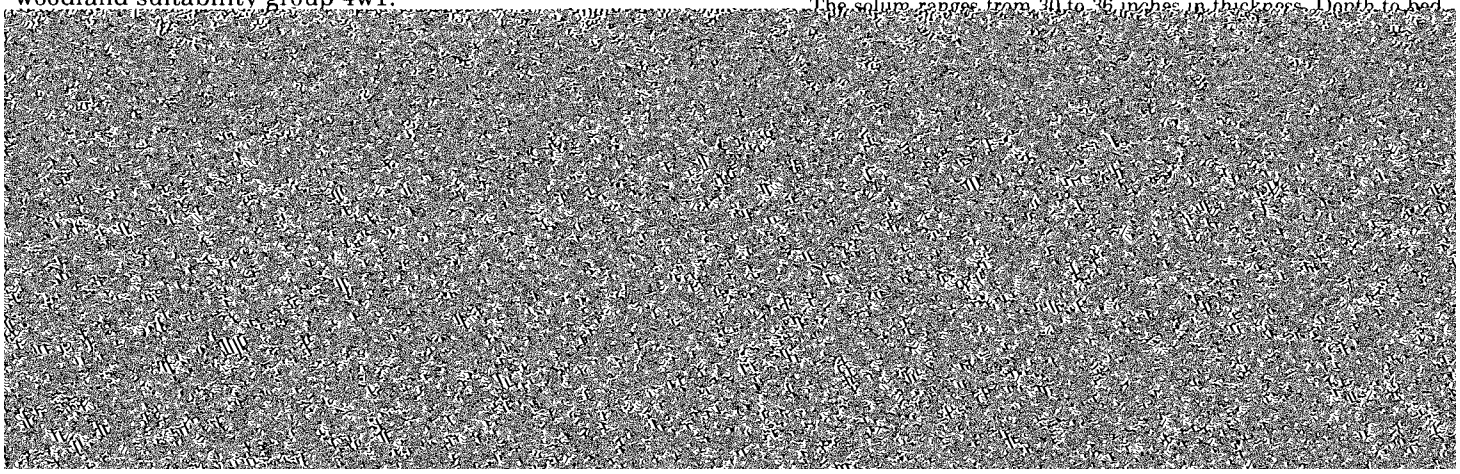
A2—3 to 10 inches, brown (7.5YR 4/4) sandy loam; moderate, medium, granular structure; very friable; common fine roots; 5 percent rounded pebbles; very strongly acid; clear, wavy boundary.

B1—10 to 15 inches, strong-brown (7.5YR 5/6) light sandy loam; weak, fine, subangular blocky structure; very friable; few fine and medium roots; 5 percent rounded pebbles; mica flakes common; very strongly acid; gradual, wavy boundary.

B2—15 to 36 inches, strong-brown (7.5YR 5/6) sandy loam; weak, medium, subangular blocky structure; friable; few fine roots; mica flakes common; sand grains coated; 5 percent rounded pebbles; very strongly acid; gradual, wavy boundary.

C1—36 to 60 inches, strong-brown (7.5YR 5/6) fine sand; common, medium, distinct, pinkish-gray and strong-brown mottles; massive; very friable; mica flakes common; strongly acid.

The solum ranges from 30 to 36 inches in thickness. Depth to bed-



Riverhead sandy loam, 3 to 15 percent slopes (RhC).—This gently sloping to strongly sloping soil is on undulating uplands.

Included with this soil in mapping are some small areas of somewhat poorly drained soils, small areas where the surface layer is loam, some areas where slopes are less than 3 percent, and areas where slopes are more than 15 percent.

The organic-matter content is moderately high in the surface layer. This layer is generally in good tilth, and it warms up early in spring. It can be plowed and cultivated soon after heavy rain, and it does not generally crust or clod. Runoff is slow or medium, and the hazard of erosion is slight or moderate.

This soil is suited to a wide variety of crops, including corn, alfalfa, small grains, soybeans, vegetables, fruit, hay, pasture, and other specialized crops. Contour cultivation, minimum tillage, and cover crops are effective in maintaining the organic-matter content and good tilth and controlling runoff and erosion. Capability unit IIIe-58; woodland suitability group 3o1.

Rowland Series

The Rowland series consists of deep, moderately well drained and somewhat poorly drained soils. These nearly level soils are on flood plains of the rivers and major streams. They are about 3 to 8 feet above normal stream level and are subject to frequent stream overflow (fig. 10). They formed along the Raritan, Lamington, and Millstone Rivers and their tributaries in mixed sediment that washed from upland soils and in the underlying red shale, siltstone, or fine-grained sandstone.

In a representative profile in an area of bluegrass pasture, the surface layer is dark-brown silt loam about 10 inches thick. It is mottled in the lower 7 inches. The subsoil is friable, mottled dark reddish-brown silt loam about 30 inches thick. The substratum, between depths of 40 and 65 inches, is reddish-brown stratified sand and gravel.

In unlimed areas these soils are strongly acid or very strongly acid in the upper part and very strongly acid to medium acid in the substratum. Natural fertility is high. The rooting zone is deep. Permeability is moderate, and the available water capacity is high. The water table is at a depth of 1 foot to 3 feet late in winter and early in spring, and it does not drop much in summer unless the summer is extremely dry. Stream overflow generally occurs several times every spring and after most abnormally heavy rain in any season.

Most areas of Rowland soils have been cleared for farming. The native vegetation consists of forests of such hardwood trees as ash, white and pin oaks, walnut, willow, elm, sycamore, maple, and river birch. Because of flood damage these soils are not well suited to crops. The soils are well suited to pasture. Corn and soybeans are grown on some of the higher positions, but flood damage is likely. Sod production is a special use, but flood damage is likely every year. Flood control is impractical because the watershed is so extensive. These soils are used extensively for parks and are good sites for ground-water ponds.

Figure 10.—**Rowland soils planted to barley. Crops grown on these soils are often damaged by flooding.**

Representative profile of Rowland silt loam in Branchburg Township; in bluegrass pasture along the Raritan River, one-eighth mile north of Lehigh Valley Railroad and one-eighth mile east of County Road 567:

A11—0 to 3 inches, dark-brown (7.5YR 4/2) silt loam; moderate, fine, granular structure; friable; many fine roots; very strongly acid; abrupt, smooth boundary.

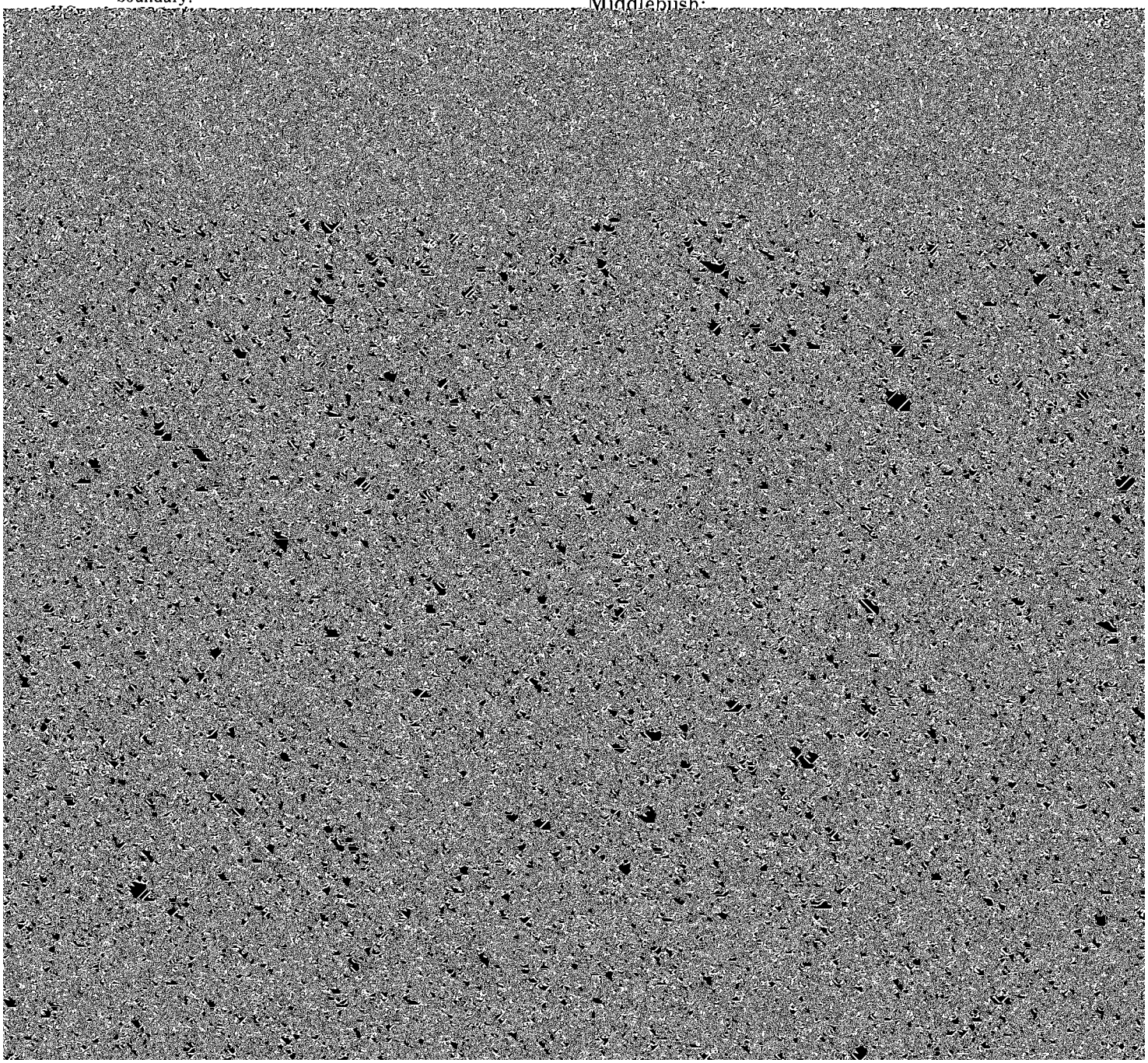
A12—3 to 10 inches, dark-brown (7.5YR 4/2) silt loam; few, fine, faint, dark reddish-brown (5YR 3/4) mottles; moderate, coarse, granular structure; friable; many roots; very strongly acid; gradual, wavy boundary.

B—10 to 40 inches, dark reddish-brown (5YR 3/4) silt loam; few, fine, faint, dark reddish-gray (5YR 4/2) mottles; weak, coarse, subangular blocky structure; friable; few roots; few, thin, discontinuous clay films on ped faces; common black stains on ped faces; very strongly acid; abrupt, wavy boundary.

In unlimed areas these soils are strongly acid to very strongly acid. Natural fertility is medium. The rooting zone is deep. Permeability is moderately slow, and the available water capacity is high.

Most areas of Royce soils have been cleared for farming (fig. 11). The native vegetation consists of forests of such hardwood trees as white, red, and black oaks; ash; beech; maple; and hickory. Idle areas seed in rapidly with redcedar. The soils are well suited to all general crops, including corn, soybeans, small grains, and vegetables, fruits, nursery, and other specialized crops.

Representative profiles of Royce silt loam, 2 to 6 percent slopes, in Franklin Township; south of Amwell Road, 75 yards east of Grouser Road and 1 mile south of Middlebush:



Runoff is slow, and the hazard of erosion is slight.

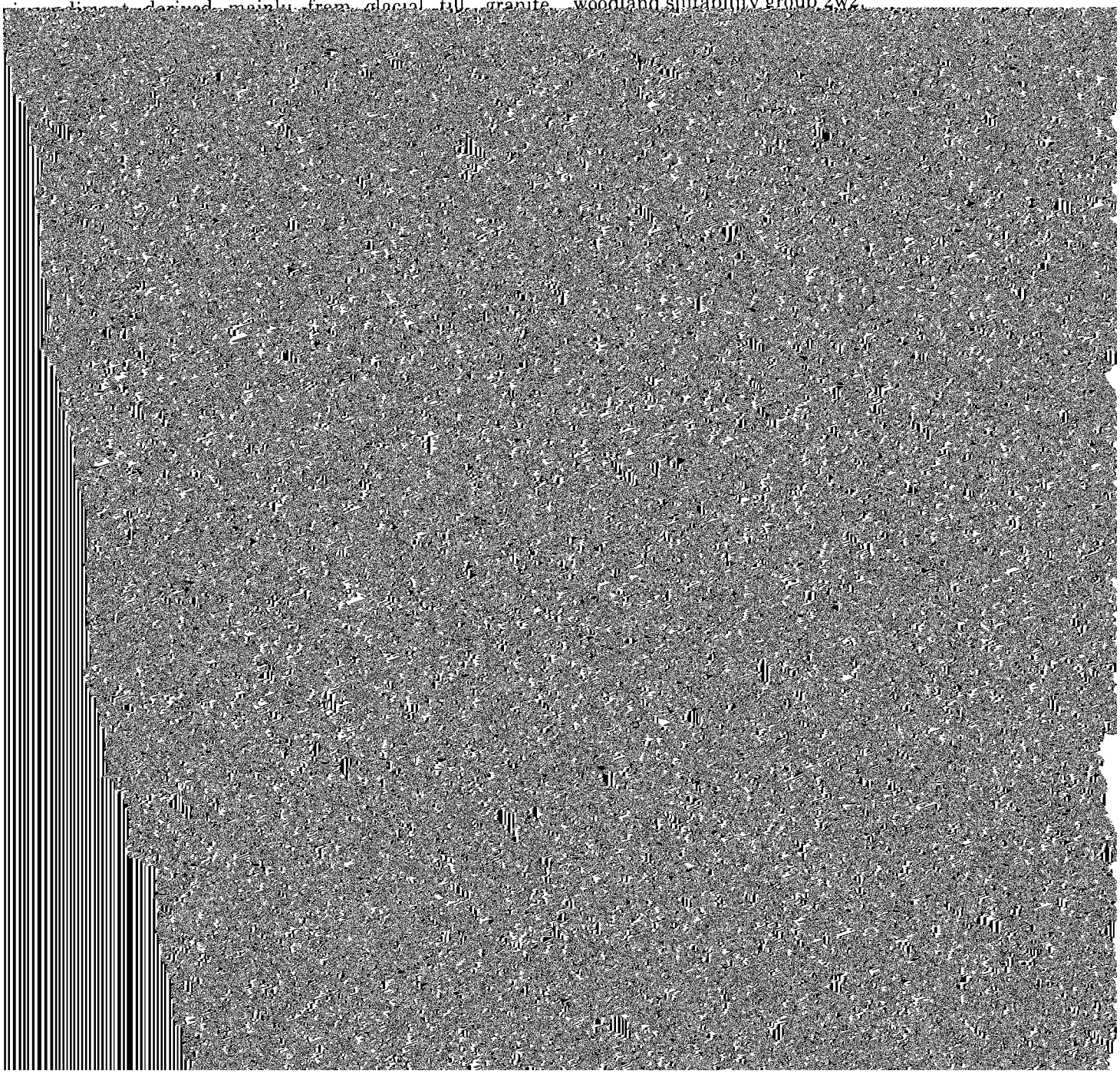
In cultivated areas management is needed that controls runoff and erosion and maintains the organic-matter content. Contour cultivation, terraces, and cropping sequences are needed for these purposes. Capability unit IIe-55; woodland suitability group 2o1.

Udifluvents and Ochrepts

Udifluvents and Ochrepts (UD) consist of deep, somewhat poorly drained, moderately well drained, and well drained loamy soils on flood plains that generally are 3 to 8 feet above normal stream flow. These soils formed in sediment derived mainly from glacial till, granite, hardwoods as ash, white oak, pin oak, walnut, sycamore, maple, river birch, yellow-poplar, and hemlock.

Udifluvents and Ochrepts are associated with such upland soils as Bartley, Cokesbury, Califon, and Edneyville, and Parker and with Fluvaquents on flood plains. Udifluvents and Ochrepts do not have the distinct horizonation that is common in the soils that are on higher positions in the landscape. They do not have the gray subsoil that is commonly in Fluvaquents.

Most areas of these soils have been cleared and are used for pasture. Large areas are reverting to woodland. Because flooding is a hazard, these soils are not farmed and most areas are used for pasture. Capability unit IIw-79; woodland suitability group 2w2.



is under structures or paving. In areas of such high-density developments as town centers, large shopping centers, or extensive industrial parks, about 10 percent of each area is relatively undisturbed soil, and the balance is either under paving and structures or consists of mixed soil material resulting from deep excavations or filling.

Included with this land type in mapping are areas of Penn, Klinesville, Reaville, and Croton soils. Also included are areas surrounding the manmade lakes on the Duke Estates. These areas were subject to deep excavation and filling but have not been developed for residential, commercial, or industrial purposes. Not assigned to a capability unit, woodland suitability group, or a landscape planting group.

Watchung Series

The Watchung series consists of deep, poorly drained soils. These nearly level soils are on low-lying flats and in depressions and drainageways in the Watchung and Sourland Mountains. They formed in material weathered from dark-gray or black igneous rock.

In a representative profile in a cultivated area, the surface layer is very dark brownish-gray silt loam 9 inches thick. In sequence from the top, the subsoil is 4 inches of light brownish-gray silt loam, 12 inches of light brownish-gray heavy silty clay loam, and 11 inches of pinkish-gray heavy silty clay loam. The substratum, between depths of 36 and 60 inches, is mottled, strong-brown gravelly loam.

In unlimed areas these soils are very strongly acid to medium acid in the upper part, strongly acid to slightly acid in the lower part of the subsoil, and slightly acid to

C—36 to 60 inches, strong-brown (7.5YR 5/6) gravelly loam; few, medium, distinct, pinkish-gray (7.5YR 6/2) mottles; weak, coarse, prismatic structure parting to weak, coarse, angular blocky; friable; few moderately thick clay films on ped faces; 15 percent angular diabase fragments; slightly acid.

The solum ranges from 30 to 40 inches in thickness. Depth to bedrock ranges from 5 to 10 feet. Coarse fragments make up 0 to 10 percent of the solum and 10 to 20 percent of the substratum.

The A horizon is typically very dark grayish brown (10YR 3/2), but in places hue is 2.5Y, value is 3 or 4, and chroma is 1 to 3.

The matrix of the B horizon has a hue of 7.5YR to 10YR, a value of 5 or 6, and a chroma of 1 or 2. Mottles of the B horizon include those that have both low and high chromas. The B2 horizon textures include heavy silty clay loam and silty clay.

The C horizon has a hue of 7.5YR or 10YR, a value of 4 to 6, and a chroma of 1 to 6. It generally has low- and high-chroma mottles. This horizon is loam, clay loam, silty clay loam, and their gravelly equivalents.

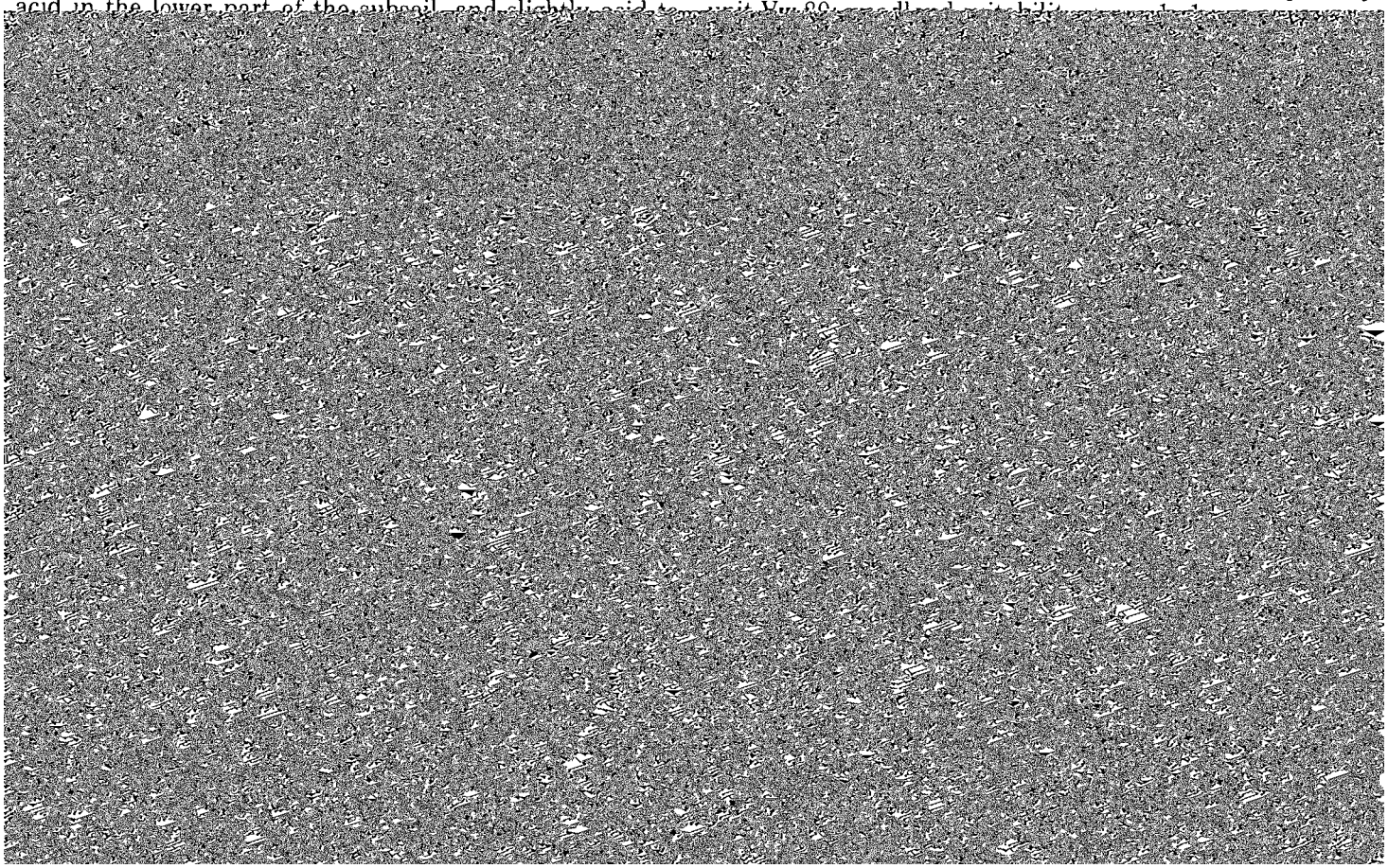
Watchung soils are associated with Mount Lucas and Neshaminy soils. They differ from those soils in having a gray B horizon.

Watchung silt loam (Wc).—This nearly level soil is in narrow bands along drainageways, on low-lying flats, and in depressions in the Watchung and Sourland Mountains.

Included with this soil in mapping are areas where the surface layer is loam or gravelly loam and areas of wooded soils that are stony or very stony in most places. Also included are areas of Mount Lucas and Neshaminy soils.

This soil is used mainly for hay and pasture and as woodland. Runoff is very slow, and water is ponded in the depressions and on the low-lying flats. The hazard of erosion is slight. During the growing season this soil remains wet for a week or two following periods of heavy rain.

Wetness is the main limitation for crops. Surface drainage is needed to remove the excess water. Capability



percent slopes, in Warren Township; 40 feet south of Third Street and one-fourth mile west of Sterling Road:

A1—0 to 4 inches, very dark gray (10YR 3/1) silt loam; moderate, medium, granular structure; friable; many fine roots; medium acid; clear, wavy boundary.

A2—4 to 10 inches, yellowish-brown (10YR 5/4) silt loam; moderate, coarse, granular structure; many fine roots; medium acid; clear, wavy boundary.

B1—10 to 14 inches, yellowish-brown (10YR 5/4) light silty clay loam; common, medium, distinct, dark-gray (10YR 4/1) and light-gray (10YR 6/1) mottles; moderate, fine, subangular blocky structure; friable, plastic when wet; few fine roots; few thin clay films on ped faces and in root channels; strongly acid; gradual, wavy boundary.

B21t—14 to 23 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, dark-gray (10YR 4/1) and light-gray (10YR 6/1) mottles; moderate, medium, subangular blocky structure; firm, plastic; common thin clay films on ped faces; medium acid; gradual, irregular boundary.

B22t—23 to 45 inches, yellowish-brown (10YR 5/6) silty clay; many, medium, distinct, dark-gray (10YR 4/1) and light-gray

town and country planning (*10*). Those who want detailed information about management of the soil can refer to the section "Descriptions of the Soils."

This section is a general guide for managing the soils and does not suggest specific management for individual soils. Detailed information about managing the soils can be obtained from the local staff of the Soil Conservation Service, from the Agricultural Extension Service, or from the Agricultural Experiment Station, Cook College, Rutgers, the State University.

Management of Soils for Crops and Pasture

The principal concerns in managing the soils for crops and pasture are maintaining fertility, controlling erosion, and providing drainage. Practices that fit all of the soils that are suitable for crops and pasture are discussed in the mapping unit descriptions.

slowly permeable in the subsoil. Soils that have a fragipan are difficult to drain, but they can be drained by open ditches and tile drains. Open ditches are more effective if they intercept the water as it moves horizontally on top of the pan. Where tile drains are practical, they generally provide better drainage than open ditches. For drainage by either system, suitable outlets are required.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when used for field crops, the risk of damage when they are so 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.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering.

In the capability system all kinds of soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I to VIII. The numerals indicate progressively greater limitations and narrower choices for practical use.

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 be-

paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Capability unit numbers are assigned locally but are part of a statewide system. Not all of the units in the system are represented by the soils of Somerset County; therefore, the numbers are not consecutive.

Class I. Soils having few limitations that restrict their use.

(No subclasses.)

Capability unit I-51. Nearly level, deep, well-drained loams that formed in glacial till and in material weathered from red shale; on uplands.

Capability unit I-55. Nearly level, deep, well-drained silt loams that formed in old alluvium; on terraces.

Capability unit I-56. Nearly level, deep, well-drained sandy loams that formed in glacial outwash material; on terraces.

Class II. Soils having moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Subclass IIe. Soils subject to moderate erosion unless protected.

Capability unit IIe-51. Gently sloping, deep, well-drained loams and moderately well drained gravelly loams that formed in glacial till and in material weathered from red shale; on uplands.

Capability unit IIe-55. Gently sloping, deep, well-drained silt loams and gravelly loams that formed in old alluvium and in material weathered from quartz conglomerate, diabase, and shale; on uplands and terraces.

Capability unit IIe-56. Gently sloping, deep, well-drained sandy loams that formed in glacial outwash material; on terraces.

Capability unit IIe-58. Gently sloping, deep, well-drained gravelly loams that formed in material weathered from granitic gneiss; on uplands.

Capability unit IIe-65. Gently sloping, moderately deep, well-drained silt loams and shaly

formed in glacial outwash material; on terraces.

Capability unit IIw-79. Nearly level, deep, well-drained, moderately well drained, and somewhat poorly drained loams and sandy loams that formed in recent alluvium; on flood plains.

Subclass IIs. Soils moderately limited by droughtiness.

Capability unit IIs-65. Nearly level, moderately deep, well-drained silt loams that formed in material weathered from shale; on uplands.

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

Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.

Capability unit IIIe-51. Strongly sloping, deep, well drained and moderately well drained loams and gravelly loams that formed in glacial till and in material weathered from shale; on uplands.

Capability unit IIIe-53. Strongly sloping, deep, well-drained gravelly loams that formed in material weathered from quartzite conglomerate or fanglomerate; on uplands.

Capability unit IIIe-55. Strongly sloping and gently sloping to strongly sloping, deep, well-drained silt loams that formed in material weathered from old alluvium and in material weathered from diabase, basalt, sandstone, siltstone, and shale; on terraces and uplands.

Capability unit IIIe-56. Strongly sloping, deep, well-drained sandy loams that formed in glacial outwash material; on terraces.

Capability unit IIIe-58. Strongly sloping and gently sloping to strongly sloping, deep, well-drained sandy loams and gravelly loams that formed in glacial till and in material weathered from quartzose conglomerate and granite gneiss; on uplands.

Capability unit IIIe-65. Strongly sloping, moderately deep, well-drained silt loams and shaly silt loams that formed in material weathered from shale; on uplands.

Capability unit IIIe-70. Strongly sloping, deep, moderately well drained and somewhat poorly drained silt loams, gravelly loams, gravelly silt loams, and stony silt loams that formed in material weathered from metamorphosed shale, diabase, basalt, and argillite; on uplands.

Capability unit IIIe-71. Strongly sloping, deep, moderately well drained and somewhat poorly drained silt loams, loams, and gravelly silt loams, some of which have a fragipan, that formed in material weathered from metamorphosed shale, diabase, basalt, argillite, and shale; on uplands.

Capability unit IIIw-71. Nearly level and gently sloping, deep, somewhat poorly drained soils that have a fragipan and that formed in material weathered from sandstone, siltstone, and shale, and poorly drained soils that formed in acid marine sediment; on uplands.

Capability unit IIIw-76. Nearly level and gently sloping, moderately deep, moderately well drained and somewhat poorly drained soils that formed in material weathered from shale; on uplands.

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

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Capability unit IVe-55. Moderately steep, deep, well-drained silt loams that formed in material weathered from sandstone, siltstone, and argillite; on uplands.

Capability unit IVe-58. Moderately steep and steep, well-drained gravelly loams that formed in material weathered from quartzose conglomerate or fanglomerate and granite gneiss; on uplands.

Capability unit IVe-66. Gently sloping to strongly sloping, shallow, well-drained shaly loams that formed in material weathered from shale, siltstone, or sandstone; on uplands.

Subclass IVw. Soils very severely limited by excess wetness.

Capability unit IVw-80. Nearly level and gently sloping, poorly drained silt loams that formed in lacustrine sediment and in material weathered from shale, siltstone, and sandstone; on uplands.

Capability unit IVw-86. Nearly level, deep, poorly drained silt loams that have a fragipan and that formed in old alluvium; on terraces.

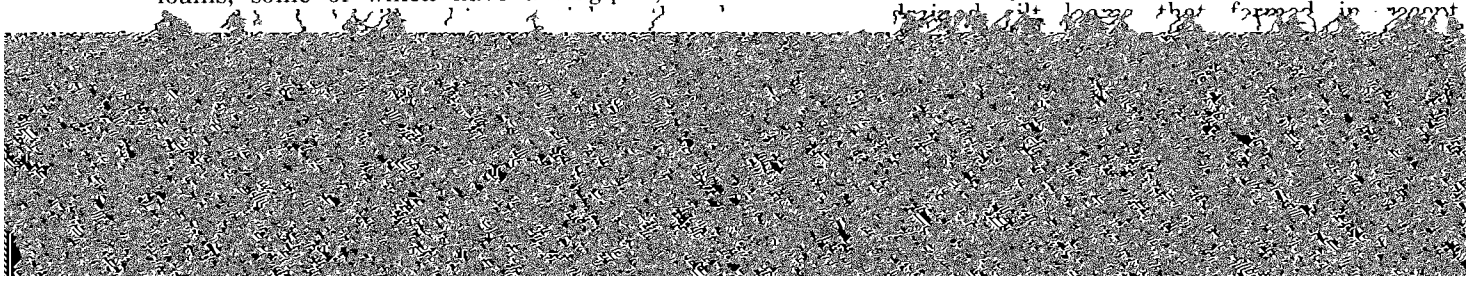
Subclass IVs. Soils very severely limited by droughtiness.

Capability unit IVs-58. Gently sloping to strongly sloping, deep, somewhat excessively drained very gravelly sandy loams that formed in material weathered from granite gneiss; on uplands.

Class V. Soils subject to little or no erosion but having other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat.

Subclass Vw. Soils too wet for cultivation; drainage generally not feasible.

Capability unit Vw-78. Nearly level, deep, moderately well drained to somewhat poorly drained silt loams that formed in recent



Subclass VIe. Soils severely limited, mainly by risk of erosion, unless protective cover is maintained.

Capability unit VIe-66. Moderately steep, shallow, well-drained shaly loams that formed in material weathered from shale; on uplands.

Capability unit VIe-70. Steep, deep, moderately well drained and somewhat poorly drained stony silt loams that formed in a silt loam mantle over material weathered from argillite; on uplands.

Subclass VIw. Soils severely limited by excess water; generally unsuitable for cultivation.

Capability unit VIw-80. Nearly level, deep, very poorly drained silt loams that formed in lacustrine sediment; on uplands.

Capability unit VIw-86. Nearly level, deep, poorly drained silt loams, loams, and sandy loams that formed in recent alluvium and that are subject to frequent flooding; on flood plains.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by their low available water capacity, stoniness, or other characteristics.

Capability unit VIs-22. Steep, deep, somewhat excessively drained and well-drained, very stony soils that formed in material weathered from granite gneiss; on uplands.

Capability unit VIs-61. Gently sloping to moderately steep, deep, well drained, moderately well drained, and somewhat poorly drained very stony silt loams that formed in material weathered from diabase and basalt; on uplands.

Capability unit VIs-75. Gently sloping, deep, moderately well drained to somewhat poorly drained very stony loams that formed in glacial till and in material weathered from granite gneiss; on uplands.

Class VII. Soils having very severe limitations that make them unsuited to cultivation and that restrict their use largely to grazing, woodland, or wildlife habitat.

Subclass VIIe. Soils very severely limited, mainly by risk of erosion unless protective cover is maintained.

Capability unit VIIe-66. Steep to very steep, shallow, well-drained shaly loams that formed in material weathered from shale; on uplands.

Subclass VIIs. Soils very severely limited by low available water capacity, stones, or other soil features.

Capability unit VIIs-60. Very steep, deep, well-

Estimated yields

Estimated productivity indexes, or ratings, of yields are shown in table 2 for the principal crops grown on the soils in Somerset County under two levels of management. The lowest rating is 1, and the highest is 10. Table 3 shows how each rating is converted to a range in yield.

In table 2 the ratings in columns A are based on yields expected under the management used by most farmers in the county. Average management, however, will not meet recommended standards in one or more of the following practices: soil drainage, fertilizer application, weed control, and erosion control. Ratings in columns B are based on yields expected under the best current management for the crop on that soil. The ratings in columns B do not represent the highest yields obtained under ideal conditions but are based on averages of yields obtained over a period of at least 4 years, allowing for exceptional weather and for pests and diseases. The differences between column A and column B for any crop may be the result of a single factor or a combination of factors. In general, all factors must be favorable to obtain the yields represented by the ratings in columns B.

Details of the practices that are recommended to obtain high yields are changed somewhat from year to year. Current, detailed recommendations are published each year in bulletins of the Agricultural Extension Service. In general, the recommended practices are: choosing varieties of crops that are suited to the soil and climate and that are resistant to the common pests and diseases; treating seed by sterilizing or inoculating when appropriate; planting seed at the proper rate and maintaining the proper number of plants per acre; applying fertilizer after choosing the formula, the amount per acre, and the time of application in relation to the soil, crop, plant population, and amount of available water in the soil; applying lime according to soil tests and needs of the crop; controlling pests, diseases, and weeds; installing drainage if the water table interferes with growth of crops; applying practices to control runoff and erosion; planting crops in an appropriate sequence, growing cover crops, and using minimum tillage where applicable; and keeping the soil in good tilth.

Estimates for soils on which records are not available are based on yields from similar soils. The county agricultural agent and other agricultural leaders helped in making all the estimates.

Woodland

The New Jersey Bureau of Forestry reports that about 60,000 acres, or about one-fifth of the county, is in forest. Large wooded areas are in the Sourland and Watchung Mountains and also in the steep Highlands. Idle land

TABLE 2.—*Estimated average yield ratings of principal crops under two levels of management*

[Ratings are from 1, the lowest, to 10, the highest. Yield equivalents for ratings are listed in table 3. Ratings in columns A are for common management; those in columns B are for the best current management. Absence of a rating indicates crop generally is not grown on the soil]

Soil	Corn				Wheat		Oats		Alfalfa		Mixed hay	
	Grain		Silage									
	A	B	A	B	A	B	A	B	A	B	A	B
Abbottstown silt loam, 0 to 2 percent slopes	4	6	4	6	----	----	4	6	----	----	6	8
Abbottstown silt loam, 2 to 6 percent slopes	4	6	4	6	----	----	4	6	----	----	6	8
Amwell gravelly loam, 2 to 6 percent slopes	5	7	5	7	7	8	8	9	6	7	7	8
Amwell gravelly loam, 6 to 12 percent slopes	4	6	4	6	6	7	7	8	5	6	6	7
Amwell gravelly silt loam, rock substratum, 2 to 6 percent slopes	5	7	5	7	7	8	8	9	6	7	7	8
Amwell gravelly silt loam, rock substratum, 6 to 12 percent slopes	4	6	4	6	5	6	7	8	5	6	6	7
Arendtsville gravelly loam, 2 to 6 percent slopes	8	10	8	10	5	7	5	7	4	6	4	6
Arendtsville gravelly loam, 6 to 12 percent slopes	7	9	7	9	4	6	4	6	4	6	4	6
Bartley loam, 3 to 15 percent slopes	7	9	7	9	8	9	8	9	7	9	7	9
Birdsboro silt loam, 0 to 2 percent slopes	8	10	8	10	8	9	9	10	7	9	8	10
Birdsboro silt loam, 2 to 6 percent slopes	8	10	8	10	8	9	9	10	7	9	8	10
Birdsboro silt loam, 6 to 12 percent slopes	7	9	7	9	7	8	8	9	6	8	8	10
Bowmansville silt loam	----	----	----	----	----	----	----	----	----	----	----	----
Bucks silt loam, 2 to 6 percent slopes	8	10	7	9	8	10	8	10	8	10	8	10
Bucks silt loam, 6 to 12 percent slopes, eroded	7	9	6	8	7	9	7	9	7	9	7	9
Califon gravelly loam, 3 to 8 percent slopes	5	7	5	7	6	7	6	7	6	8	7	9
Califon very stony loam, 3 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Chalfont silt loam, 2 to 6 percent slopes	4	6	5	6	----	----	6	8	----	----	6	8
Chalfont silt loam, 6 to 12 percent slopes	4	5	4	5	----	----	----	----	----	----	6	8
Chalfont stony silt loam, 2 to 6 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Chalfont stony silt loam, 6 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Chalfont stony silt loam, 12 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Cokesbury very stony loam, 0 to 8 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Croton silt loam, 0 to 2 percent slopes	2	3	2	3	----	----	----	----	----	----	4	6
Croton silt loam, 2 to 6 percent slopes	2	3	2	3	----	----	----	----	----	----	4	6
Dunellen sandy loam, 0 to 2 percent slopes	8	10	7	9	8	10	9	10	8	10	8	10
Dunellen sandy loam, 2 to 6 percent slopes	7	9	6	8	7	9	8	9	7	9	7	9
Dunellen sandy loam, 6 to 12 percent slopes	6	8	5	7	6	8	7	8	6	8	6	8
Dunellen sandy loam, moderately well drained variant	7	9	6	8	7	9	8	9	7	8	8	9
Edneyville gravelly loam, 3 to 8 percent slopes	7	8	5	6	5	7	7	8	6	8	7	9
Edneyville gravelly loam, 8 to 15 percent slopes	6	7	4	5	4	6	6	8	5	7	6	8
Edneyville gravelly loam, 15 to 25 percent slopes	4	----	----	----	3	5	5	7	4	6	5	7
Elkton silt loam	4	7	4	7	4	7	----	----	----	----	5	8
Fluvaquents	----	----	----	----	----	----	----	----	----	----	----	----
Keyport silt loam, 0 to 2 percent slopes	5	7	5	7	4	6	4	6	3	5	6	8
Keyport silt loam, 2 to 6 percent slopes	5	7	5	7	5	7	4	6	3	5	6	8
Klinesville shaly loam, 2 to 12 percent slopes	----	2	----	2	3	4	4	5	3	4	3	4
Klinesville shaly loam, 12 to 18 percent slopes	----	----	----	----	3	4	3	4	3	4	3	4
Klinesville shaly loam, 18 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Lamington silt loam	2	4	2	4	----	3	----	3	----	----	1	3
Lansdowne silt loam, 0 to 2 percent slopes	4	6	4	6	6	7	7	8	6	7	6	8
Lansdowne silt loam, 2 to 6 percent slopes	4	6	4	6	6	7	7	8	6	7	6	8
Lawrenceville silt loam, 2 to 6 percent slopes	6	7	5	6	7	8	8	9	7	8	8	9
Lawrenceville silt loam, 6 to 12 percent slopes	4	6	4	6	6	7	7	8	6	7	6	8
Lehigh silt loam, 2 to 6 percent slopes	4	5	4	5	----	----	5	6	----	----	5	7
Lehigh silt loam, 6 to 15 percent slopes	3	5	3	5	4	6	4	5	----	----	4	6
Meckesville gravelly loam, 2 to 6 percent slopes	6	8	6	8	8	9	8	9	7	8	8	9
Meckesville gravelly loam, 6 to 12 percent slopes	5	7	5	7	8	9	8	9	7	8	8	9
Mount Lucas silt loam, 2 to 6 percent slopes	5	7	5	7	7	8	8	9	6	7	7	8
Mount Lucas gravelly silt loam, 6 to 12 percent slopes	4	6	4	6	6	7	7	8	5	6	6	7
Mount Lucas-Watchung very stony silt loams, 2 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Neshaminy silt loam, 2 to 6 percent slopes	8	10	8	10	9	10	9	10	8	10	8	10
Neshaminy silt loam, 6 to 12 percent slopes	7	9	7	9	7	9	8	9	6	9	7	10
Neshaminy very stony silt loam, 18 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Neshaminy-Mount Lucas very stony silt loams, 2 to 12 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Neshaminy-Mount Lucas very stony silt loams, 12 to 18 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Neshaminy silt loam, fragipan variant, 2 to 6 percent slopes	8	10	8	10	9	10	9	10	8	10	8	10
Neshaminy silt loam, fragipan variant, 6 to 12 percent slopes	7	9	7	9	7	9	8	9	6	9	7	10
Norton loam, 0 to 2 percent slopes	6	8	5	7	6	8	6	8	5	8	7	9

TABLE 2.—*Estimated average yield ratings of principal crops under two levels of management*—Continued

Soil	Corn				Wheat		Oats		Alfalfa		Mixed hay	
	Grain		Silage		A	B	A	B	A	B	A	B
	A	B	A	B								
Norton loam, 2 to 6 percent slopes	6	8	5	7	6	8	6	8	5	8	7	9
Norton loam, 6 to 12 percent slopes	5	7	4	6	5	7	5	7	4	7	6	8
Norton loam, 6 to 12 percent slopes, eroded	4	7	3	6	4	7	4	7	4	8	6	8
Parker very gravelly sandy loam, 3 to 15 percent slopes	2	3	2	3	4	5	4	5	3	4	3	4
Parker rocky sandy loam, 25 to 35 percent slopes	----	----	----	----	----	----	----	----	----	----	2	3
Parker-Edneyville very stony soils, 15 to 25 percent slopes	----	----	----	----	----	----	----	----	----	----	----	----
Parsippany silt loam	2	4	2	4	----	----	----	----	----	----	2	6
Parsippany silt loam, very poorly drained variant	----	----	----	----	----	----	----	----	----	----	----	----
Pattenburg gravelly loam, 6 to 12 percent slopes	2	4	3	5	3	5	3	5	3	4	3	5
Pattenburg gravelly loam, 12 to 18 percent slopes	----	3	----	----	2	4	2	4	2	3	2	4
Penn silt loam, 0 to 2 percent slopes	5	6	5	6	5	7	6	8	6	8	6	8
Penn silt loam, 2 to 6 percent slopes	5	6	5	6	5	7	6	8	6	8	6	8
Penn silt loam, 6 to 12 percent slopes	3	5	3	5	4	7	4	7	3	7	3	7
Penn shaly silt loam, 2 to 6 percent slopes	5	6	5	6	5	7	6	8	6	8	6	8
Penn shaly silt loam, 6 to 12 percent slopes	4	5	4	6	5	6	5	7	5	7	5	7
Quakertown silt loam, 2 to 12 percent slopes	5	8	5	7	5	8	5	8	6	8	7	9
Quakertown silt loam, 12 to 18 percent slopes	4	7	4	6	4	7	4	7	5	7	6	8
Raritan silt loam, 0 to 4 percent slopes	5	7	4	6	6	7	6	7	6	7	6	8
Readington silt loam, 2 to 6 percent slopes	5	7	4	6	7	8	7	8	4	6	7	8
Reaville silt loam, 0 to 2 percent slopes	3	4	3	4	----	----	4	6	----	----	4	6
Reaville silt loam, 2 to 6 percent slopes	3	4	3	4	----	----	4	6	----	----	4	6
Riverhead sandy loam, 3 to 15 percent slopes	----	----	----	----	5	6	6	7	4	5	4	5
Rowland silt loam	----	----	----	----	----	----	----	----	----	----	4	7
Royce silt loam, 2 to 6 percent slopes	8	10	8	10	8	9	9	10	7	9	8	10
Udifluvents and Ochrepts	----	----	----	----	----	----	----	----	----	----	4	7
Urban land	----	----	----	----	----	----	----	----	----	----	----	----
Watchung silt loam	----	----	----	----	----	----	----	----	----	----	2	3
Whippany silt loam, 0 to 4 percent slopes	4	6	4	6	6	7	7	8	6	7	6	8

termination of average site index. The site index of a given soil is the height, in feet, that the dominant or codominant trees of a given species reach in a natural, essentially unmanaged stand in 50 years. Site index can be converted into approximate expected growth and yield per acre in cords and board feet, as shown in table 4. For Somerset County, conversions of average site index into volumetric growth and yield are based on research by Schnur (*8*) for upland oaks and by McCarthy (*4*) for yellow-poplar.

The second part of the symbol identifying a woodland suitability group is a small letter. In this survey *x, f, w, d,* and *o* are used. Except for the letter o, the small letter indicates an important soil property that imposes a hazard or limitation in managing the soils of the group for trees. The letter *o* shows that the soils have few limitations that restrict their use for trees. The letter *x* means the soils have restrictions or limitations due to stones or rocks. The letter *w* means excessive wetness, either seasonal or all year. The soils have restricted drainage, have a high water table, or are subject to flooding. The letter *d* indicates the soils have restrictions or limitations due to a restricted rooting depth. The soils are shallow over hard rock or have a hardpan or other layers in the soil that restrict roots. The letter *f* shows that the main limitation is coarse fragments that make up more than 35 percent of the soil, thereby reducing the available water capacity in the soil.

The last part of the symbol, another number, differentiates woodland suitability groups that have identical woodland suitability group 2w1, for example, require somewhat different management than soils in group 2w2.

In table 5 each woodland suitability group in the county is rated for various management hazards or limitations. These ratings are slight, moderate, or severe, and they are described in the following paragraphs.

TABLE 3.—*Rating-yield per acre conversion table*

[The symbol > means more than]

Rating	Corn		Wheat	Oats	Hay	
	Grain	Silage			Alfalfa	Mixed hay
	Bu	*Tons*	*Bu*	*Bu*	*Tons*	*Tons*
(1) 1	50–60	10–12	10–15	35–40	1.0–1.5	1.2–1.5
2	60–70	12–14	15–20	40–45	1.5–2.0	1.5–1.8
3	70–80	14–16	20–25	45–50	2.0–2.5	1.8–2.0
4	80–90	16–18	25–30	50–55	2.5–3.0	2.0–2.2
5	90–100	18–20	30–35	55–60	3.0–3.5	2.2–2.5
6	100–110	20–22	35–40	60–65	3.5–4.0	2.5–2.8
7	110–120	22–24	40–45	65–70	4.0–4.5	2.8–3.0
8	120–130	24–26	45–50	70–75	4.5–5.0	3.0–3.2
9	130–140	26–28	50–55	75–80	5.0–5.5	3.2–3.5
10	>140	>28	>55	>80	>5.5	>3.5

[1] A rating of 1 may mean a yield of less than the amount shown; for

TABLE 4.—*Yields from upland oaks and yellow-poplar in fully stocked, natural stands*

Site index	Age of stand	Merchantable volume			
		Upland oaks		Yellow-poplar	
	Years	*Board feet*	*Cords*	*Board feet*	*Cords*
50	30	300	6	----------	----------
	40	1,300	13	----------	----------
	50	2,900	19	----------	----------
	70	7,400	30	----------	----------
60	20	----------	----------	----------	----------
	30	800	10	900	8
	40	2,900	19	2,400	15
	50	5,700	26	5,100	21
	70	11,600	39	----------	----------
70	20	----------	----------	600	7
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

that enable trees to resist being blown down by wind. *Slight* means that most trees withstand the wind; *moderate* means that some trees are expected to blow down during excessive wetness and high wind; and *severe* means that many trees are expected to blow down during periods when the soil is wet and winds are moderate or high.

Table 5 lists suitable species to favor in existing stands and suitable species for planting. The estimated site index in table 5 is the height, in feet, that the dominant or codominant trees reach at 50 years of age on the soils of each group.

Wildlife habitat[2]

Somerset County has abundant and varied wildlife resources enjoyed by residents and visitors throughout the year. The welfare of a wildlife species depends largely on

Elements of wildlife habitat

Each soil is rated in table 6 according to its suitability

sedges, arrowarum, pickerelweed, waterwillow, wetland grasses, and cattails. Not included are submerged or float-

TABLE 5.—*Woodland*

[Urban land (Um) is not assigned to a woodland

Woodland suitability group and mapping-unit symbols	Estimated average site index	Suitable species—	
		To favor in existing stands	For planting
Group 1w1: Deep, poorly drained soils; high available water capacity; slopes range from 0 to 2 percent. Bt, La, Wc.	Pin oak, 85 or more.	Pin oak, sycamore, red maple.	White pine, white spruce.
Group 2o1: Deep, well-drained soils; high or moderate available water capacity; slopes range from 0 to 35 percent. ArB, ArC, BdA, BdB, BdC, BuB, BuC2, DnA, DnB, DnC, Dw, EdB, EdC, EdD, MeB, MeC, NeB, NeC, NhE, NkC, NkD, NmB, NmC, PlC, PlD, QkC, QkD, RyB.	Upland oaks, 75–85; yellow-poplar, 85–95.	Yellow-poplar, red oak, ash.	White pine, yellow-poplar, black walnut, Austrian pine, Norway spruce, larch.
Group 2w1: Deep, moderately well drained and somewhat poorly drained soils on uplands; high or moderate available water capacity; slopes range from 0 to 12 percent. AmB, AmC, AnB, AnC, BaC, CaB, CcB, KfA, KfB, LeB, LeC, MoB, MpC, MuB, WhA.	Upland oaks, 75–85; yellow-poplar, 85–95.	Red oak, yellow-poplar, ash, Virginia pine.	White pine, Norway spruce, yellow-poplar.
Group 2w2: Deep, moderately well drained or somewhat poorly drained soils on flood plains; subject to occasional or frequent flooding; slopes range from 0 to 2 percent. FL, Ro, UD.	Upland oaks, 75–85.	Red oak, ash, pin oak	Pin oak, white pine
Group 3o1: Deep or moderately deep, well-drained soils; low to high available water capacity; slopes range from 0 to 18 percent. NoA, NoB, NoC, NoC2, PmA, PmB, PmC, PnB, PnC, RhC.	Upland oaks, 65–75.	Red oak	White pine, red pine, Virginia pine, shortleaf pine.
Group 3f1: Deep, well-drained soils containing much gravel and cobbles; low available water capacity; slopes range from 3 to 15 percent. PbC.	Upland oaks, 65–75.	Red oak, yellow-poplar, black oak, scarlet oak.	White pine, larch, Austrian pine, Norway spruce.
Group 3w1: Deep, moderately well drained, somewhat poorly drained, and poorly drained soils; moderate or high available water capacity; slopes range from 0 to 18 percent. AbA, AbB, CdB, CdC, CeB, CeC, CeE, CpB, CrA, CrB, Ek, LbA, LbB, LhB, LhC, Ph, Pk, RbA, RcB.	Upland oaks, 65–75; yellow-poplar, 75–85.	Red oak, ash, pin oak, yellow-poplar.	White pine, larch, Norway spruce, white spruce; for Cokesbury and Croton soils use only white pine or white spruce.
Group 3x1: Deep, rocky or very stony, somewhat excessively drained soils; moderate or low available water capacity; slopes range from 15 to 40 percent. PcE, PeD.	Upland oaks, 65–75.	Upland oaks, yellow-poplar.	White pine, yellow-poplar.
Group 4d1: Shallow, excessively drained, shaly soils; low available water capacity; slopes range from 2 to 35 percent. KlC, KlD, KlE.	Upland oaks, 55–65; Virginia pine, 55–65.	Black oak, chestnut oak	Virginia pine, black oak, chestnut oak.
Group 4w1: Moderately deep, moderately well drained and somewhat poorly drained soils; slopes range from 0 to 6 percent.	Upland oaks, 55–65;	Red oak, Virginia pine, redcedar.	Virginia pine, white pine

suitability grouping of soils

suitability group and is not included in this table]

Seedling mortality	Plant competition	Equipment limitations	Erosion hazard	Windthrow hazard
Severe	Severe	Severe	Slight	Slight or moderate.
Slight	Moderate for conifers Severe for hardwoods.	Moderate for EdD and NhE. Slight for others.	Moderate for EdD, NhE, and QkD. Slight for others.	Slight.
Slight	Moderate for hardwoods Severe for conifers.	Slight or moderate	Slight	Slight.
Slight	Moderate for hardwoods Severe for conifers.	Moderate	Slight	Slight.
Slight	Slight for hardwoods Moderate for conifers.	Slight	Slight	Slight.
Moderate	Slight	Slight	Slight	Slight.
Severe for Cokesbury and Croton soils. Slight for others	Moderate or severe for conifers. Slight to severe for hardwoods.	Moderate or severe	Slight	Slight or moderate.
Slight	Severe	Slight	Moderate	Slight.
Slight for KIC and KID Moderate for KIE.	Slight	Moderate	Slight	Slight.
Slight	Moderate	Moderate	Severe for conifers Moderate for hardwoods.	Slight.

have moderate or high available water capacity, such as Neshaminy and Penn soils, are rated *good* (about 90 percent of the county) for development of woodland habitat. Approximately 10 percent of the soils are rated *fair,* including the poorly drained Croton soils. No soils in the county are rated *poor* or *very poor* for woodland wildlife habitat.

Wetland wildlife.—Ducks, geese, herons, shore birds, mink, and muskrat are familiar examples of birds and mammals that normally make their homes in wet areas, such as ponds, marshes, and swamps.

Most of Somerset County, or about 80 percent, is not suited to the development of habitat for wetland wildlife. The nearly level, poorly drained soils (about 3 percent), such as Croton soils and Parsippany very poorly drained variant, are rated *good.* Poorly drained soils that have a slight slope, such as Bowmansville, Elkton, and Watchung soils, make up the 16 percent rated *fair* for wetland habitat. Only 1 percent of the county's soils are rated *poor* for this use.

Each rating under "Kinds of Wildlife" in table 6 is based on the ratings listed for the habitat elements in the first part of the table. For openland wildlife the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous plants, and hardwood and coniferous trees. The rating for woodland

TABLE 6.—*Suitability ratings of the soils for wildlife habitat and for kinds of wildlife*

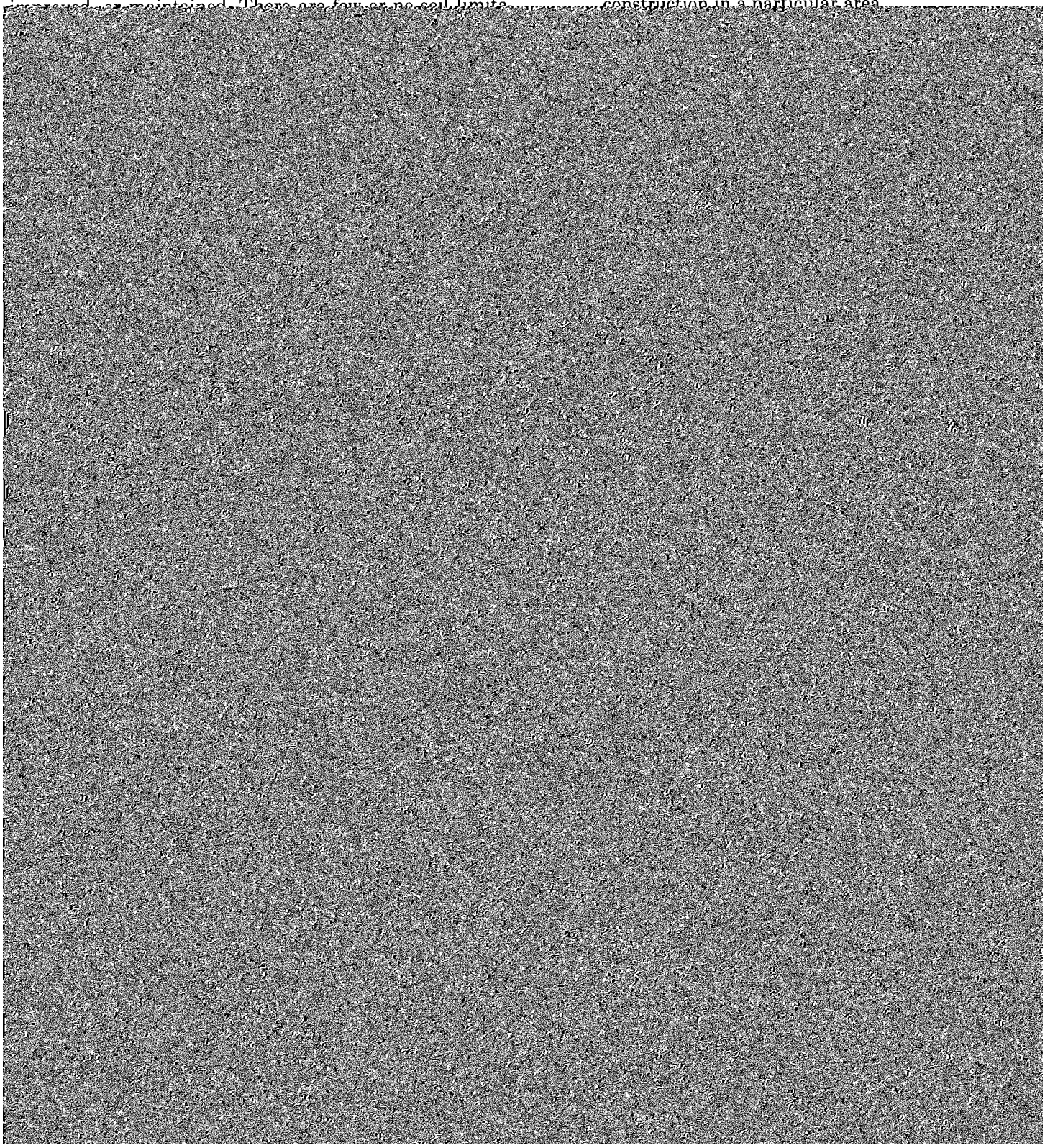
Soil series and map symbols	Elements of wildlife habitat						Classes of wildlife		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood and coniferous woody plants	Wetland food and cover plants	Shallow-water areas	Openland	Woodland	Wetland
Abbottstown:									
AbA	Fair	Good	Good	Good	Fair	Poor	Good	Good	Good.
AbB	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Amwell:									
AmB, AmC, AnB, AnC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Arendtsville:									
ArB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ArC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bartley: BaC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Birdsboro:									
BdA, BdB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BdC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Bowmansville: Bt	Poor	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Bucks:									
BuB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BuC2	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Califon:									
CaB	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CcB	Very poor.	Poor	Good	Good	Poor	Very poor.	Poor	Good	Very poor.
Chalfont:									
CdB, CdC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CeB, CeC, CeE	Poor	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
Cokesbury: CpB	Very poor.	Poor	Fair	Fair	Poor	Very poor.	Poor	Fair	Very poor.
Croton:									
CrA	Poor	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
CrB	Poor	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Dunellen:									
DnA, DnB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
DnC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Dunellen variant: Dw	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Edneyville:									
EdB, EdC	Fair	Good	Good	Fair	Poor	Very poor.	Good	Fair	Very poor.
EdD	Poor	Fair	Good	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Elkton: Ek	Poor	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
Fluvaquents: FL	Very poor.	Poor	Poor	Fair	Good	Fair	Poor	Fair	Fair.
Keyport:									
KfA	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
KfB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Klinesville: KlC, KlD, KlE	Poor	Poor	Fair	Poor	Very poor.	Very poor.	Poor	Good	Very poor.
Lamington: La	Poor	Fair	Fair	Fair	Good	Poor	Fair	Fair	Fair.
Lansdowne:									
LbA	Fair	Good	Good	Good	Fair	Fair	Good	Good	Fair.
LbB	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lawrenceville:									
LeB	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
LeC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Lehigh: LhB, LhC	Fair	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

wildlife is based on the ratings listed for grasses and legumes, wild herbaceous plants, and hardwood and coniferous trees. For wetland wildlife the rating is based on the ratings shown for wetland food and cover plants and shallow-water areas.

On soils rated *good,* habitat is generally easily created, improved, or maintained. There are few or no soil limita-

ance of structures on the same or similar kinds of soil in other locations.

6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.



group index numbers, is given in table 7 for all soils mapped in the survey area.

USDA texture is determined by the relative proportions of sand, silt, and clay in soil material that is less than 2.0 millimeters in diameter. "Sand," "silt," "clay," and some of the other terms used in the USDA textural classification are defined in the Glossary.

Soil properties significant to engineering

Several estimated soil properties significant in engineering are given in table 7. These estimates are made for typical soil profiles, by layers sufficiently different to have different significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kind of soil in other counties. Following are explanations of some of the columns in table 7.

Depth to bedrock is distance from the surface of the soil to the upper surface of the rock layer.

Depth to seasonal high water table is distance from the surface of the soil to the highest level that ground water reaches in the soil in most years.

Soil texture is described in table 7 in the standard terms.

dries out or swells when it gets wet. Extent of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling causes much damage to building foundations, roads, and other structures. A high shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Test data

All engineering test data in this survey are from sampling and testing by the College of Engineering, Rutgers University (*6, 7*). Table 9 contains engineering test data for some of the major soil series in Somerset County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Moisture-density or compaction data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is

TABLE 7.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in the first column of this table. Absence of data indicates that soil is too vari

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Abbottstown: AbA, AbB	3½–4½	½–1½	0–9	Silt loam	ML or CL	A-4 or A-6	0–2
			9–19	Silty clay loam	ML or CL	A-4 or A-6	0–2

significant to engineering

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	USDA texture	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Cokesbury: CpB	>5	0–1	0–10	Gravelly loam	ML or CL	A-4 or A-6	0–10
			10–21	Clay loam	ML or CL	A-4 or A-6	0–10
			21–32	Loam	ML or CL	A-4 or A-6	0–10
			32–62	Gravelly sandy loam	SM, SC, ML, or CL	A-4, A-6, or A-2	5–10
Croton: CrA, CrB	3½–5	0–1	0–14	Silt loam	ML or CL	A-4 or A-6	0–2
			14–19	Silt loam, silty clay loam	ML or CL	A-4 or A-6	0–2
			19–33	Silty clay loam	ML or CL	A-4 or A-6	0–2
			33–42	Shaly clay loam	ML or CL	A-4 or A-6	0–5
			42	Red shale bedrock.			
Dunellen: DnA, DnB, DnC	>5	>4	0–14	Sandy loam	SM or SC	A-2 or A-4	0–2
			14–42	Sandy loam	SM, SC, ML, or CL	A-4 or A-2	0–2
			42–70	Loamy sand	SM	A-1 or A-2	0–10
Dunellen variant: Dw	>5	½–4	0–14	Sandy loam	SM or SC	A-2 or A-4	0–2
			14–36	Sandy loam	SM, SC, ML, or CL	A-2 or A-4	0–2
			36–60	Sandy loam	SM, ML, SC, or CL	A-2 or A-4	0–2
Edneyville: EdB, EdC, EdD	3½–>5	>4	0–11	Gravelly loam	SM, SC, ML, or CL	A-2 or A-4	0–2
			11–39	Gravelly loam, gravelly sandy clay loam.	SM, SC, ML, or CL	A-4 or A-6	0–5
			39–65	Gravelly sandy loam, sandy loam.	SM or SC	A-2 or A-4	0–5
			65	Granite bedrock.			
Elkton: Ek	>5	0–1	0–10	Silt loam	ML or CL	A-4 or A-6	0
			10–38	Silty clay loam, silty clay	CL, MH, CH, or ML	A-6 or A-7	0
			38–63	Silty clay loam	SM, SC, CL, CH, ML, or MH	A-6 or A-7	0
Fluvaquents: FL. Most properties are too variable to be estimated.	>6	0–1	----	----	----	----	----
Keyport: KfA, KfB	>8	1½–4	0–14	Silt loam	ML or CL	A-4 or A-6	0
			14–46	Clay loam	ML, CL, MH, or CH	A-6 or A-7	0
			46–60	Clay loam	ML, CL, MH, CH, SM, or SC	A-4, A-5, A-6, or A-7	0
Klinesville: KlC, KlD, KlE	1–1½	>4	0–7	Shaly loam	ML, CL, SM, or SC	A-2, A-4, or A-6	0–10
			7–18	Shaly loam	GM, GP, SM, SC, ML, CL, or GC	A-1, A-2, or A-4	10–30
			18	Weathered red shale bedrock.			
Lamington: La	>5	0–1	0–10	Silt loam	ML or CL	A-4 or A-6	0
			10–23	Silt loam, silty clay loam	ML or CL	A-4, A-6, or A-7	0
			23–45	Clay loam	ML or CL	A-4 or A-6	0
			45–60	Stratified sand, silt loam	SM	A-2	0

significant to engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit[1]	Plasticity index[2]	Permeability	Available water capacity	Reaction[3]	Shrink-swell potential
No. 4	No. 10	No. 40	No. 200						

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	USDA texture	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Lansdowne: LbA, LbB	>3½	1–2½	0–9	Silt loam	ML or CL	A-4 or A-6	0–5
			9–44	Silty clay loam, silty clay, clay.	ML or CL	A-6 or A-7	0–5
			44–55	Shaly clay loam	ML, CL, SM, or SC	A-4	5–10
			55	Red shale bedrock.			
Lawrenceville: LeB, LeC	4–>5	1½–4	0–15	Silt loam	ML or CL	A-4 or A-6	0
			15–31	Silt loam	ML or CL	A-4 or A-6	0
			31–48	Silt loam	ML or CL	A-4 or A-6	0
			48	Shale bedrock.			
Lehigh: LhB, LhC	3½–5	½–4	0–12	Silt loam	ML or CL	A-4 or A-6	0–5
			12–34	Silt loam, shaly silty clay loam.	ML or CL	A-4 or A-6	0–5
			34–45	Very shaly silt loam	GM or GC	A-2, A-4, or A-6	0–20
			45	Metamorphosed shale.			
Meckesville: MeB, MeC	4–>5	1½–4	0–11	Gravelly loam, loam	ML or CL	A-4	0–5
			11–26	Clay loam	ML or CL	A-4 or A-6	0–5
			26–45	Clay loam	ML or CL	A-4 or A-6	0–5
			45–50	Loam	ML or CL	A-4	0–5
			50–60	Gravelly and cobbly conglomerate.			
*Mount Lucas: MoB, MpC, MuB. For Watchung part of	4–6	1–4	0–8	Silt loam	ML or CL	A-4 or A-6	0–15
			8–35	Silt loam, silty clay loam	ML or CL	A-4 or A-6	0–15
			35–56	Cobbly loam	SM, SC, ML,	A-2, A-4,	0–5

significant to engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit[1]	Plasticity index[2]	Permeability	Available water capacity	Reaction[3]	Shrink-swell potential
No 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
						Inches per hour	*Inches per inch of soil*	*pH*	
95–100	85–100	80–90	65–90	25–45	10–15	0.6–2.0	0.22–0.25	5.1–6.0	Low.
90–100	85–100	80–100	70–95	25–45	10–15	<0.2	0.16–0.20	5.1–6.0	Moderate.
70–95	70–90	65–75	40–60	25–45	10–15	0.6–2.0	0.14–0.18	5.1–6.0	Low.
95–100	95–100	95–100	80–90	20–35	5–12	0.6–2.0	0.20–0.24	4.5–5.5	Low.
95–100	95–100	95–100	80–90	20–35	5–12	0.6–2.0	0.18–0.22	4.5–5.5	Low.
95–100	90–100	90–100	80–90	20–35	5–12	0.2–0.6	0.10–0.18	4.5–6.0	Low.
90–100	85–95	80–90	60–85	20–35	5–12	0.2–2.0	0.22–0.26	5.1–6.0	Low.
80–90	70–90	60–80	50–80	20–40	5–15	<0.2–0.6	0.14–0.18	5.1–6.0	Low to moderate.
40–75	20–60	20–50	20–50	20–35	5–12	2.0–6.0	0.08–0.12	5.1–6.0	Low.
85–95	70–90	60–80	55–75	20–35	3–10	0.6–2.0	0.18–0.22	5.1–5.5	Low.
80–95	70–90	60–80	50–80	25–35	5–15	0.6–2.0	0.14–0.18	5.1–5.5	Moderate.
80–95	70–90	65–85	55–75	25–35	5–12	<0.2	0.06–0.10	5.1–5.5	Moderate.
90–100	70–90	70–85	50–65	20–30	5–10	0.6–2.0	0.06–0.10	5.1–5.5	Low.
90–100	80–100	80–100	60–95	20–40	5–15	0.2–2.0	0.12–0.22	5.1–6.5	Low.
95–100	85–100	70–95	55–75	20–35	5–20	0.2–0.6	0.16–0.20	5.6–6.0	Moderate.
90–100	60–80	60–80	30–55	20–35	5–15	0.6–2.0	0.10–0.18	5.6–6.0	Low.
70–100	70–100	70–95	55–90	20–40	5–15	0.6–2.0	0.20–0.27	5.1–6.0	Low.
60–100	60–100	60–95	50–90	20–40	5–20	0.2–2.0	0.18–0.24	5.6–6.0	Moderate.
70–90	60–90	55–80	40–55	20–35	5–15	0.6–2.0	0.13–0.17	5.6–6.0	Low.
80–100	75–95	70–85	50–65	20–35	5–15	0.6–2.0	0.18–0.24	5.1–6.0	Low.
80–100	75–95	70–90	55–75	20–35	5–20	0.6–2.0	0.14–0.20	5.1–6.0	Moderate.
70–90	65–85	60–80	50–65	20–35	5–15	<0.2	0.08–0.12	5.1–6.0	Low.
95–100	90–100	75–90	60–90	20–40	8–12	0.2–2.0	0.18–0.22	4.5–5.5	Low.
95–100	90–100	85–100	60–95	30–45	10–20	<0.2	0.14–0.18	4.5–6.0	Moderate.
90–100	40–100	40–70	40–65	25–40	8–12	0.2–2.0	0.10–0.15	4.5–6.0	Low.
50–70	40–70	20–50	15–30	15–25	3–10	2.0–6.0	0.05–0.10	4.5–5.5	Low.
50–65	40–65	20–55	15–30	15–25	5–10	2.0–6.0	0.05–0.10	4.5–5.5	Low.
50–65	40–45	20–30	15–25	15–25	3–10	>6.0	0.04–0.08	4.5–5.5	Low.

TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to— Bedrock	Depth to— Seasonal high water table	Depth from surface	USDA texture	Classification Unified	Classification AASHTO	Coarse fraction greater than 3 inches
	Feet	*Feet*	*Inches*				*Percent*
Parsippany variant: Pk	>5	0	0–6	Silt loam	ML or CL	A-6, A-7, A-4, or A-5	0
			6–36	Silty clay	CL or ML	A-6 or A-7	0
			36–60	Silty clay	CL or ML	A-6 or A-7	0
Pattenburg: PlC, PlD	3½–5	>5	0–12	Gravelly loam	SM or GM	A-4	0–5
			12–30	Gravelly loam	GM, GC, SM, or SC	A-2 or A-4	0–5
			30–44	Very gravelly loam	GM, GC, SM, or SC	A-1, A-2, or A-4	0–5
			44	Weathered conglomerate bedrock.			
Penn: PmA, PmB, PmC, PnB, PnC.	1½–3½	>5	0–8	Silt loam, shaly silt loam	ML or CL	A-4	0–5
			8–25	Silt loam, shaly loam	ML or CL	A-4 or A-6	0–10
			25–30	Very shaly loam	GM, GC, SM, or SC	A-2, A-4, A-1, A-5, A-6, or A-7	0–20
			30	Shale bedrock.			
Quakertown: QkC, QkD	3½–5	>5	0–13	Silt loam	ML or CL	A-4 or A-6	0–5
			13–36	Silt loam	ML or CL	A-4 or A-6	0–10
			36–45	Channery fine sandy loam	ML, CL, GM, or GC	A-6 or A-4	5–15
			45	Sandstone bedrock.			
Raritan: RbA	>5	½–3	0–15	Silt loam	ML or CL	A-4	0
			15–28	Clay loam	ML or CL	A-4 or A-6	0
			28–46	Clay loam	ML or CL	A-4 or A-6	0
			46–60	Stratified sand, loamy sand, gravel.	SM, GM, SC, or GC	A-2 or A-4	0–10
Readington: RcB	3½–>5	1½–4	0–13	Silt loam	ML or CL	A-4	0
			13–25	Silt loam	ML or CL	A-4 or A-6	0
			25–44	Silt loam, shaly silt loam	ML or CL	A-4 or A-6	0
			44	Shale bedrock.			
Reaville: ReA, ReB	1½–3½	½–3	0–12	Silt loam	ML or CL	A-4, A-5, A-6, or A-7	0
			12–21	Silty clay loam	ML or CL	A-4 or A-6	0–5
			21–27	Very shaly loam	GM or GC	A-2, A-4, or A-6	5–20
			27	Shale bedrock.			
Riverhead: RhC	>5	>5	0–10	Sandy loam	SM or SC	A-2 or A-4	0–2
			10–36	Sandy loam	SM or SC	A-2 or A-4	0–2
			36–60	Fine sand	SM or SC	A-4, A-2 or A-3	0–5
Rowland: Ro	>4	1–3	0–10	Silt loam	ML or CL	A-4 or A-6	0–2
			10–40	Silt loam	ML or CL	A-4 or A-6	0–2
			40–65	Sand, gravel	SM or SC	A-2	0–5
Royce: RyB	3½–6	>5	0–8	Silt loam	ML or CL	A-4 or A-6	0–2
			8–30	Silt loam, clay loam	ML or CL	A-6	0–2
			30–48	Shaly loam	ML or CL	A-6 or A-7	0–2
			48	Red shale bedrock.			
Udifluvents and Ochrepts: UD. Most properties too variable to be estimated.	>6	1–5					

significant to engineering—Continued

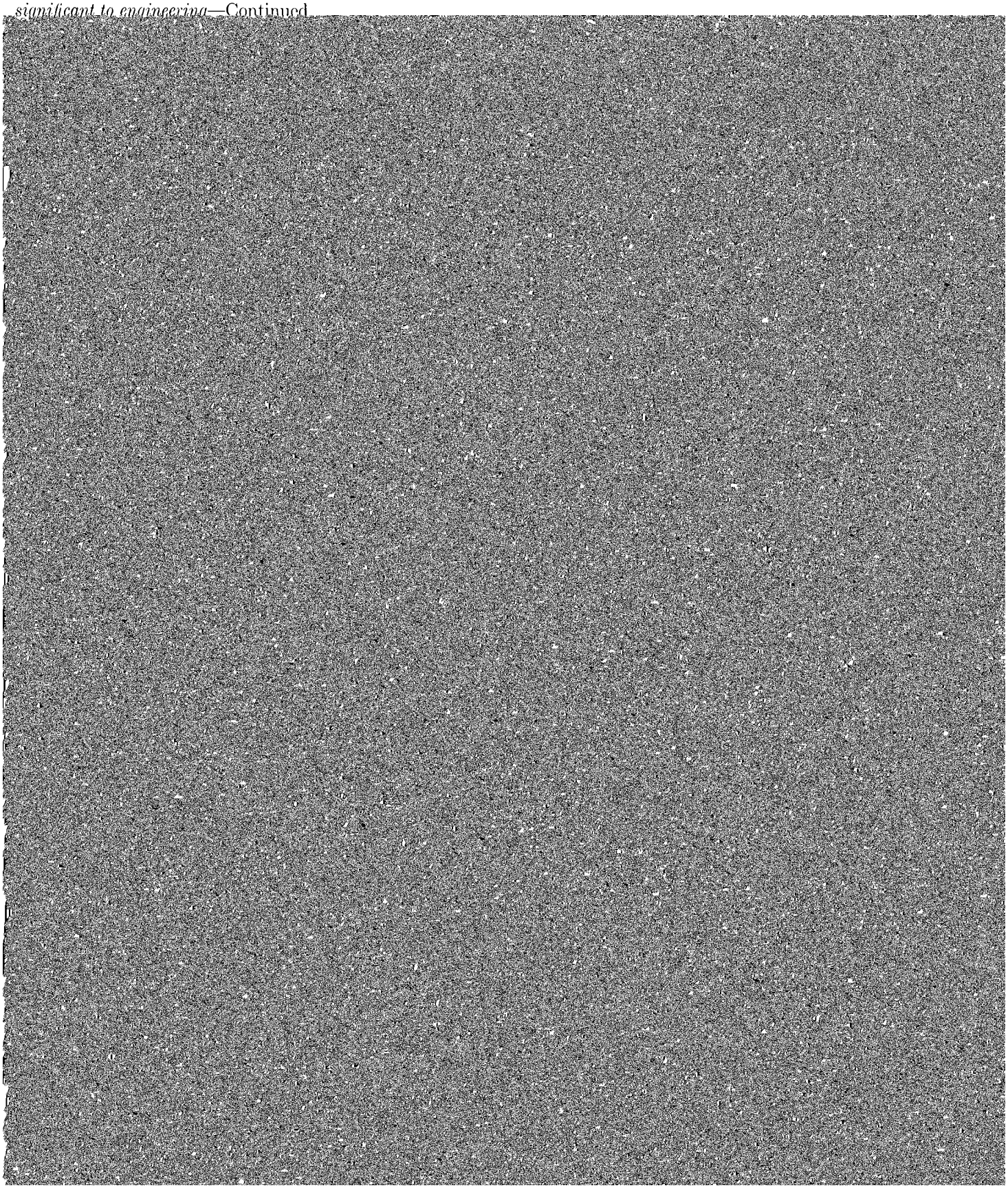


TABLE 7.—*Estimated soil properties*

Soil series and map symbols	Depth to—		Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches
	Bedrock	Seasonal high water table			Unified	AASHTO	
	Feet	*Feet*	*Inches*				*Percent*
Urban land: Um. Properties too variable to be estimated.							
Watchung: Wc	>5	0–1	0–13	Silt loam	ML or CL	A-5, A-7, A-4, or A-6	0–10
			13–36	Silty clay loam	ML or CL	A-6 or A-7	0–5
			36–60	Gravelly loam	ML or CL	A-4 or A-6	0–5
Whippany: WhA	>5	½–1½	0–10	Silt loam	ML or CL	A-4 or A-6	0–1
			10–45	Silty clay loam, silty clay	ML or CL	A-6 or A-7	0–1
			45–60	Silty clay loam	ML or CL	A-6 or A-4	0–1

[1] NL means nonliquid.
[2] NP means nonplastic.

TABLE 8.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in such other series that appear in

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs: Pond reservoir areas
Abbottstown: AbA, AbB.	Good: seasonal high water table at a depth of ½ foot to 1½ feet.	Unsuitable: none present.	Poor: ML or CL material; seasonal high water table at a depth of ½ foot to 1½ feet limits excavation.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; high potential frost action.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; shattered bedrock may permit seepage losses.
Amwell: AmB, AmC, AnB, AnC.	Poor: excessive gravel.	Unsuitable: excessive fines.	Fair: ML or CL material.	Seasonal high water table perched at a depth of 1 foot to 4 feet; high potential frost action.	Seasonal high water table perched at a depth of 1 foot to 4 feet; fractured bedrock may permit seepage losses.
Arendtsville: ArB, ArC	Poor: excessive gravel.	Unsuitable: excessive fines.	Fair for ML or CL material. Good for GM or SM material.	Moderate potential frost action.	Permeable substratum may permit seepage losses.

significant to engineering—Continued

Percentage less than 3 inches passing sieve—				Liquid limit[1]	Plasticity index[2]	Permeability	Available water capacity	Reaction[3]	Shrink-swell potential
No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)						
						Inches per hour	*Inches per inch of soil*	*pH*	
95–100	90–100	70–100	70–90	30–45	5–15	0.2–2.0	0.14–0.26	4.5–6.0	Low.
95–100	90–100	80–95	70–90	30–55	12–25	<0.2	0.10–0.15	5.1–6.5	Moderate.
90–100	80–90	65–85	50–80	25–40	8–15	0.2–2.0	0.12–0.24	6.1–7.3	Low.
95–100	95–100	75–90	70–80	30–40	10–15	0.6–2.0	0.18–0.26	5.1–6.0	Low.
95–100	95–100	90–100	65–90	35–45	15–20	<0.2	0.14–0.24	5.1–6.0	Moderate.
95–100	95–100	90–100	70–90	30–40	10–15	<0.2–0.6	0.14–0.20	5.6–7.3	Moderate.

[3] Unlimed soil.
[4] Additional water is available from the seasonal high water table.

interpretations of the soils

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to

TABLE 8.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs: Pond reservoir areas
Bartley: BaC	Fair: moderate gravel.	Unsuitable: excessive fines.	Fair: seasonal high water table perched at a depth of 2 to 4 feet.	Seasonal high water table perched at a depth of 2 to 4 feet; moderate potential frost action.	Moderately slow permeability in fragipan; limestone bedrock may permit seepage losses.
Birdsboro: BdA, BdB, BdC.	Good	Fair: sand and gravel beds normally at a depth of 4 to 5 feet; occurrence and thickness variable.	Fair: ML, CL, or SM material to a depth of 4½ feet.	Moderate potential frost action.	Pervious substratum.
Bowmansville: Bt	Poor: poorly drained; frequent flooding.	Unsuitable: excessive fines.	Poor to fair: ML or CL material; seasonal high water table at a depth of 0 to 1 foot limits excavation; hazard of stream overflow.	Frequent flooding; seasonal high water table at a depth of 0 to 1 foot; high potential frost action.	Pervious substratum; seasonal high water table at a depth of 0 to 1 foot; frequent flooding.
Bucks: BuB, BuC2	Good	Unsuitable: none present.	Fair: ML or CL material.	Moderate potential frost action; rippable shale bedrock at a depth of 3½ to 5 feet.	Pervious bedrock may permit seepage losses.
Califon: CaB, CcB	Poor: high gravel and stone content.	Unsuitable: excessive fines.	Fair for CaB: ML or CL material. Poor for CcB: high stone content.	Moderate potential frost action; seasonal high water table perched at a depth of ½ foot to 2½ feet; CcB has high stone content.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; pervious substratum may permit seepage losses; CcB has high stone content.
Chalfont: CdB, CdC, CeB, CeC, CeE.	Good for CdB or CdC. Poor for CeB, CeC, or CeE: high stone content.	Unsuitable: excessive fines.	Poor to fair for CdB or CdC: ML or CL material. Poor for CeB, CeC, or CeE: high stone content.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; bedrock at a depth of 3½ to more than 5 feet; high potential frost action.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; pervious shale bedrock at a depth of 3½ to more than 5 feet.
Cokesbury: CpB	Poor: high stone content; poorly drained.	Unsuitable: excessive fines.	Fair to poor: ML or CL material; high stone content.	Seasonal high water table perched at a depth of 0 to 1 foot; high potential frost action; high stone content.	Seasonal high water table perched at a depth of 0 to 1 foot.

of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued Embankments and dikes	Drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading	Shallow excavations
Good stability and compaction characteristics; seasonal high water table perched at a depth of 2 to 4 feet.	Lateral seepage over fragipan; moderately slow permeability.	Moderate intake rate; moderate available water capacity.	Depth to fragipan is 24 to 36 inches.	Seasonal high water table perched at a depth of 2 to 4 feet.	Seasonal high water table perched at a depth of 2 to 4 feet.	Seasonal high water table perched at a depth of 2 to 4 feet; limestone bedrock at a depth of more than 5 feet.
Fair to poor stability and compaction characteristics; medium to low resistance to piping.	Not needed	Moderate intake rate; moderate permeability; high available water capacity.	(1)	(1)	Fair trafficability.	(1)
Fair to poor stability and compaction characteristics; low resistance to piping.	Seasonal high water table at a depth of 0 to 1 foot; moderately slow permeability; frequent flooding.	Seasonal high water table at a depth of 0 to 1 foot; moderate intake rate; drainage needed.	Not needed	Not needed	Seasonal high water table at a depth of 0 to 1 foot; frequent flooding.	Seasonal high water table at a depth of 0 to 1 foot; frequent flooding; bedrock at a depth of 3½ to more than 7 feet.
Fair to poor stability and compaction characteristics; medium resistance to piping.	Not needed	High available water capacity; moderate or moderately slow intake rate.	(1)	(1)	Fair trafficability; clods severely.	Rippable shale bedrock at a depth of 3½ to more than 5 feet.
Fair to good stability and compaction characteristics; CcB has high stone content.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; slow permeability in pan; depth to fragipan is 20 to 30 inches.	High available water capacity; moderate intake rate above pan.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; depth to root-restricting pan is 20 to 30 inches.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; depth to root-restricting pan is 20 to 30 inches.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; poor trafficability.	Seasonal high water table perched at a depth of ½ foot to 2½ feet; hard bedrock at a depth of more than 6 feet.
Fair to poor stability and compaction characteristics; CeB, CeC, and CeE have high stone content.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; slow permeability in fragipan; depth to pan is 15 to 22 inches; CeB, CeC, and CeE have high stone content.	Moderate to moderately slow intake rate; moderate available water capacity; CeB, CeC, and CeE have high stone content.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; CeB, CeC, and CeE have high stone content.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; CeB, CeC, and CeE have high stone content.	Seasonal high water table perched at a depth of ½ foot to 1½ feet; poor trafficability.	Seasonal high water table perched at depth of ½ foot to 1½ feet; bedrock at a depth of 3½ to more than 5 feet.
Fair to good stability and compaction characteristics; high stone content.	Seasonal high water table perched at a depth of 0 to 1 foot; depth to pan is 20 to 25 inches; slow permeability in fragipan; high stone content.	High available water capacity; seasonal high water table perched at a depth of 0 to 1 foot; needs drainage; high stone content.	Not needed	Not needed	Seasonal high water table perched at a depth of 0 to 1 foot.	Seasonal high water table perched at a depth of 0 to 1 foot.

TABLE 8.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs: Pond reservoir areas
Croton: CrA, CrB	Poor: poorly drained.	Unsuitable: none present.	Fair to poor: ML or CL material; seasonal high water table perched at a depth of 0 to 1 foot.	Seasonal high water table perched at a depth of 0 to 1 foot; high potential frost action.	Seasonal high water table perched at a depth of 0 to 1 foot; shale bedrock at a depth of 3½ to 5 feet; slow permeability.
Dunellen: DnA, DnB, DnC.	Good	Fair for sand below a depth of 3½ feet; gravel occurrence unpredictable.	Fair: SM, SC, ML, or CL material to a depth of 3 feet. Good below a depth of 3 feet.	Moderate potential frost action.	Pervious substratum permits excessive seepage; seasonal high water table at a depth of 4 feet or more.
Dunellen variant: Dw	Good	Poor for sand and gravel: thickness and occurrence unpredictable.	Fair: SM or ML material; seasonal high water table at a depth of ½ foot to 4 feet.	Seasonal high water table at a depth of ½ foot to 4 feet; moderate potential frost action.	Pervious substratum permits excessive seepage; seasonal high water table at a depth of ½ foot to 4 feet.
Edneyville: EdB, EdC, EdD.	Poor: high gravel content.	Unsuitable: excessive fines.	Good: SM, SC, ML, or CL material.	Moderate potential frost action.	Pervious substratum permits seepage losses.
Elkton: Ek	Poor: poorly drained.	Unsuitable: none present.	Poor: ML, CL, or CH material.	Seasonal high water table at a depth of 0 to 1 foot; high potential frost action.	Impervious material; seasonal high water table at a depth of 0 to 1 foot.
Fluvaquents: FL	Poor: poorly drained; hazard of flooding.	Unsuitable: loamy material; excessive fines.	Fair: ML or CL material; seasonal high water table at a depth of 1 foot to 3 feet.	Seasonal high water table at a depth of 0 to 1 foot; hazard of flooding; high potential frost action.	Seasonal high water table at a depth of 0 to 1 foot; hazard of flooding.
Keyport: KfA, KfB	Good: seasonal high water table may prevent accessibility.	Unsuitable: none present.	Poor: ML, CL, or CH material.	Seasonal high water table at a depth of 1½ to 4 feet; high potential frost action.	Impervious material; seasonal high water table at a depth of 1½ to 4 feet.
Klinesville: KlC, KlD, KlE.	Poor: high shale content; limited material; bedrock at a depth of 1 foot to 1½ feet.	Unsuitable: none present.	Poor: limited material; bedrock at a depth of 1 foot to 1½ feet.	Rippable shale bedrock at a depth of 1 foot to 1½ feet; moderate potential frost action; KlE has steep slopes.	Pervious shale bedrock at a depth of 1 foot to 1½ feet.
[illegible]	[illegible]	[illegible]	Poor: ML or CL [illegible]	Seasonal high water [illegible]	Slow permeability [illegible]

of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued Embankments and dikes	Drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading	Shallow excavations
Fair to poor stability and compaction characteristics.	Seasonal high water table perched at a depth of 0 to 1 foot; slow permeability in fragipan at a depth of 15 to 23 inches.	Moderate available water capacity; moderately slow intake rate; slow permeability in fragipan; needs drainage.	Not needed	Not needed	Seasonal high water table perched at a depth of 0 to 1 foot.	Seasonal high water table perched at a depth of 0 to 1 foot; rippable bedrock at a depth of 3½ to 5 feet.
Fair stability and compaction characteristics; medium to high resistance to piping.	Not needed	Moderately rapid intake rate; moderate available water capacity.	(1)	(1)	(1)	(1)
Fair stability and compaction characteristics; low resistance to piping.	Seasonal high water table at a depth of ½ foot to 4 feet.	Moderate intake rate; moderate available water capacity.	Not needed	Not needed	Seasonal high water table at a depth of ½ foot to 4 feet.	Seasonal high water table at a depth of ½ foot to 4 feet; sidewalls collapse readily.
Fair stability and compaction characteristics.	Not needed	Moderate intake rate; moderate available water capacity.	(1)	(1)	(1)	Bedrock at a depth of 3½ to 5 feet.
Fair to poor stability and compaction	Seasonal high water table at a depth of 0 to 1	Moderately slow to moderate intake rate;	Not needed	Not needed	Seasonal high water table at a depth of 0 to 1	Seasonal high water table at a depth of

TABLE 8.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs: Pond reservoir areas
Lansdowne: LbA, LbB	Good	Unsuitable: none present.	Poor: ML or CL material.	Seasonal high water table perched at a depth of 1 foot to 2½ feet; shale bedrock at a depth of 3½ to 5 feet; high potential frost action.	Pervious substratum and bedrock may permit seepage losses.
Lawrenceville: LeB, LeC.	Good	Unsuitable: none present.	Fair: ML or CL material.	Seasonal high water table at a depth of 1½ to 4 feet; high potential frost action.	Pervious substratum and bedrock may permit seepage losses.
Lehigh: LhB, LhC	Fair: shale fragments.	Unsuitable: none present.	Fair: ML, CL, or GC material.	Seasonal high water table at a depth of ½ foot to 4 feet; high potentential frost action.	Seasonal high water table at a depth of ½ foot to 4 feet; fractured bedrock may permit seepage losses.
Meckesville: MeB, MeC.	Poor: high gravel content.	Unsuitable: excessive fines.	Fair: ML or CL material.	Moderate potential frost action; bedrock at a depth of 4 to more than 5 feet.	Pervious substratum and bedrock may permit seepage losses.
*Mount Lucas: MoB, MpC, MuB. For Watchung part of MuB, see Watchung series.	Good for MoB. Poor for MpC and MuB: high gravel and stone content.	Unsuitable: excessive fines.	Fair: ML or CL material.	Seasonal high water table at a depth of 1 foot to 4 feet; high potential frost action.	Pervious substratum may permit seepage losses.
*Neshaminy: NeB, NeC, NhE, NkC, NkD. For Mount Lucas part of NkC and NkD, see Mount Lucas series.	Good for NeB and NeC. Poor for NhE, NkC, and NkD: high stone content.	Unsuitable: excessive fines.	Fair: ML or CL material.	Hard bedrock at a depth of 4 to more than 5 feet; moderate potential frost action; NhE, NkC, and NkD have high stone content.	Hard bedrock at a depth of 4 to more than 5 feet; pervious substratum permits seepage losses in places.
Neshaminy variant: NmB, NmC.	Fair: moderate gravel content.	Unsuitable: excessive fines.	Fair: ML or CL material.	Bedrock at a depth of 3½ to 4½ feet; moderate potential frost action.	Bedrock at a depth of 3½ to 4½ feet; fractured bedrock may permit seepage losses.

of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued Embankments and dikes	Drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading	Shallow excavations
Fair to poor stability and compaction characteristics; high resistance to piping.	Slow permeability; seasonal high water table perched at a depth of 1 foot to 2½ feet.	Moderate available water capacity; moderate intake rate; slow permeability; seasonal high water table perched at a depth of 1 foot to 2½ feet.	Fair to poor stability; dense subsoil.	Seasonal high water table perched at a depth of 1 foot to 2½ feet; high available water capacity.	Seasonal high water table perched at depth of 1 foot to 2½ feet; poor trafficability; dense clay subsoil.	Seasonal high water table perched at a depth of 1 foot to 2½ feet; rippable bedrock at a depth of 3½ to 5 feet.
Fair to poor stability and compaction characteristics; medium resistance to piping.	Moderately slow permeability in fragipan at a depth of 25 to 35 inches; seasonal high water table at a depth of 1½ to 4 feet.	Moderate intake rate; seasonal high water table at a depth of 1½ to 4 feet; moderate available water capacity.	Poor to fair stability; erodibility.	Seasonal high water table at a depth of 1½ to 4 feet; moderate available water capacity.	Seasonal high water table at a depth of 1½ to 4 feet; poor trafficability.	Seasonal high water table at a depth of 1½ to 4 feet; rippable bedrock at a depth of 4 to more than 5 feet.
Fair stability and compaction characteristics; high shale content in places.	Seasonal high water table at a depth of ½ foot to 4 feet; slow permeability.	Moderately slow or moderate intake rate; moderate available water capacity.	Seasonal high water table at a depth of ½ foot to 4 feet; shale bedrock at a depth of 3½ to 5 feet.	Seasonal high water table at a depth of ½ foot to 4 feet; shale bedrock at a depth of 3½ to 5 feet.	Seasonal high water table at a depth of ½ foot to 4 feet; poor trafficability.	Seasonal high water table at a depth of ½ foot to 4 feet; rippable bedrock at a depth of 3½

TABLE 8.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs: Pond reservoir areas
Norton: NoA, NoB, NoC, NoC2.	Good	Unsuitable: none present.	Fair: ML or CL material.	Moderate potential frost action; rippable shale bedrock at a depth of 3½ to more than 5 feet.	Bedrock at a depth of 3½ to more than 5 feet; fractured bedrock may permit seepage losses.
*Parker: PbC, PcE, PeD. For Edneyville part of PeD, see Edneyville series.	Poor: excessive stones, cobbles, or gravel.	Poor for sand and gravel: PcE and PeD have moderate or high stone content.	Good to poor for GM or SM material depending on proportion of stones; stone-free material is stable and compacts well.	Bedrock at a depth of 4 to more than 5 feet; PcE and PeD have moderate or high stone content.	Rapid permeability in substratum; PcE and PeD have moderate or high stone content.
Parsippany: Ph	Poor: poorly drained.	Unsuitable: none present.	Poor: ML or CL material; high proportion of fines.	Frequent flooding; seasonal high water table at a depth of 0 to 1 foot; high potential frost action.	Seasonal high water table at a depth of 0 to 1 foot; slow permeability in subsoil; broad, unconfined areas.
Parsippany variant: Pk	Poor: very poorly drained.	Unsuitable: none present.	Poor: ML or CL material; high proportion of fines.	Frequent flooding; seasonal high water table at the surface most of the year; high potential frost action.	Seasonal high water table at the surface most of the year; slow permeability in subsoil; broad, unconfined areas.
Pattenburg: PlC, PlD	Poor: excessive gravel content.	Unsuitable: excessive fines; small amount of gravel.	Good: GM, GC, SM, or SC material; coarse-fragment content increases with depth.	Bedrock at a depth of 3½ to 5 feet; moderate potential frost action.	Pervious substratum may permit seepage losses.
Penn: PmA, PmB, PmC, PnB, PnC.	Good for PmA, PmB, and PmC. Poor for PnB and PnC: excessive shale content.	Unsuitable: none present.	Poor: dominantly ML or CL material; supply limited; bedrock at a depth of 1½ to 3½ feet.	Bedrock at a depth of 3½ to 5 feet; moderate potential frost action.	Pervious soil and bedrock permit seepage losses.
Quakertown: QkC, QkD.	Good	Unsuitable: none present.	Fair: ML or CL material; high potential frost action.	Bedrock at a depth of 3½ to 5 feet; moderate potential frost action.	Pervious bedrock may permit seepage losses.
Raritan: RbA	Good	Fair for sand and gravel below a depth of 4 feet; [illegible]	Fair: ML or CL material.	Moderate potential frost action; seasonal high water table at a depth [illegible]	Seasonal high water table at a depth of ½ foot to 3 feet; pervious [illegible]

of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued Embankments and dikes	Drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading	Shallow excavations
Fair stability and compaction characteristics; moderate shrink-swell potential.	Not needed	Moderate or moderately slow intake rate; slow permeability; high available water	Fair stability; hazard of erosion.	High available water capacity.	Fair trafficability; plastic subsoil.	Bedrock at a depth of 3½ to more than 5 feet.

TABLE 8.—*Engineering interpretations*

Soil series and map symbols	Suitability as a source of—			Soil features affecting—	
	Topsoil	Sand and gravel	Road fill	Road location	Reservoirs
					Pond reservoir areas
Readington: RcB	Good	Unsuitable: none present.	Fair: ML or CL material.	Seasonal high water table perched at a depth of 1½ to 3 feet; moderate potential frost action.	Seasonal high water table perched at a depth of 1½ to 3 feet; pervious shale bedrock at a depth of 3½ to more than 5 feet.
[illegible] RoA, RoB	Good: seasonal	Unsuitable: none	Poor: ML or CL	Seasonal high water	Seasonal high water

of the soils—Continued

Soil features affecting—Continued						
Reservoirs—Continued Embankments and dikes	Drainage	Irrigation	Terraces and diversions	Grassed waterways	Winter grading	Shallow excavations
Fair stability and compaction characteristics; hazard of piping.	Seasonal high water table perched at a depth of 1½ to 3 feet; slow permeability.	Moderate intake rate; slow permeability in fragipan.	Seasonal high water table perched over fragipan at a depth of 1½ to 3 feet; lateral movement of water above fragipan.	Moderate available water capacity; seasonal high water table perched at a depth of 1½ to 3 feet.	Poor trafficability; seasonal high water table perched at a depth of 1½ to 3 feet.	Seasonal high water table perched at a depth of 1½ to 3 feet; bedrock at a depth of 3½ to more than 5 feet.
Fair stability and compaction characteristics; variable shale content.	Seasonal high water table at a depth of ½ foot to 3 feet; moderately slow permeability.	Seasonal high water table at a depth of ½ foot to 3 feet; moderately slow permeability.	Fair to poor stability; shale bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table at a depth of ½ foot to 3 feet; shale bedrock at a depth of 1½ to 3½ feet.	Seasonal high water table at a depth of ½ foot to 3 feet; poor trafficability.	Rippable bedrock at a depth of 1½ to 3½ feet; seasonal high water table at a depth of

TABLE 9.—*Engineering*

[Tests performed by the College of Engineering, Rutgers University.

	Sampling site		Test results

test data

Absence of data indicates the determination was not made.

TABLE 9.—*Engineering*

Soil	Sampling site			Depth	Test results		
					Sieve analysis		
					Cumulative percentage passing—		
	Site number	Latitude	Longitude		¾ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)
				Inches			
Mount Lucas gravelly silt loam:							
[illegible]	14	74°32′25″	40°34′55″	0–6	75	66	65

test data—Continued

[illegible]

for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; and resistance to water erosion, soil slipping, and soil blowing. A soil suitable for these structures provides outlets for runoff and is not difficult to vegetate.

Waterway layout and construction are affected by such soil properties as texture, depth, and erodibility of the soil material; presence of stones or rock outcrops; and the steepness of slopes. Other factors affecting waterways are seepage, natural soil drainage, available water capacity, susceptibility to siltation, and the ease of establishing and maintaining vegetation.

Winter grading is affected chiefly by soil features that are relevant to moving, mixing, and compacting soil when temperatures are below freezing.

Shallow excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries are those that generally require digging or trenching to a depth of less than 6 feet. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or big stones, and freedom from flooding.

Town and Country Planning

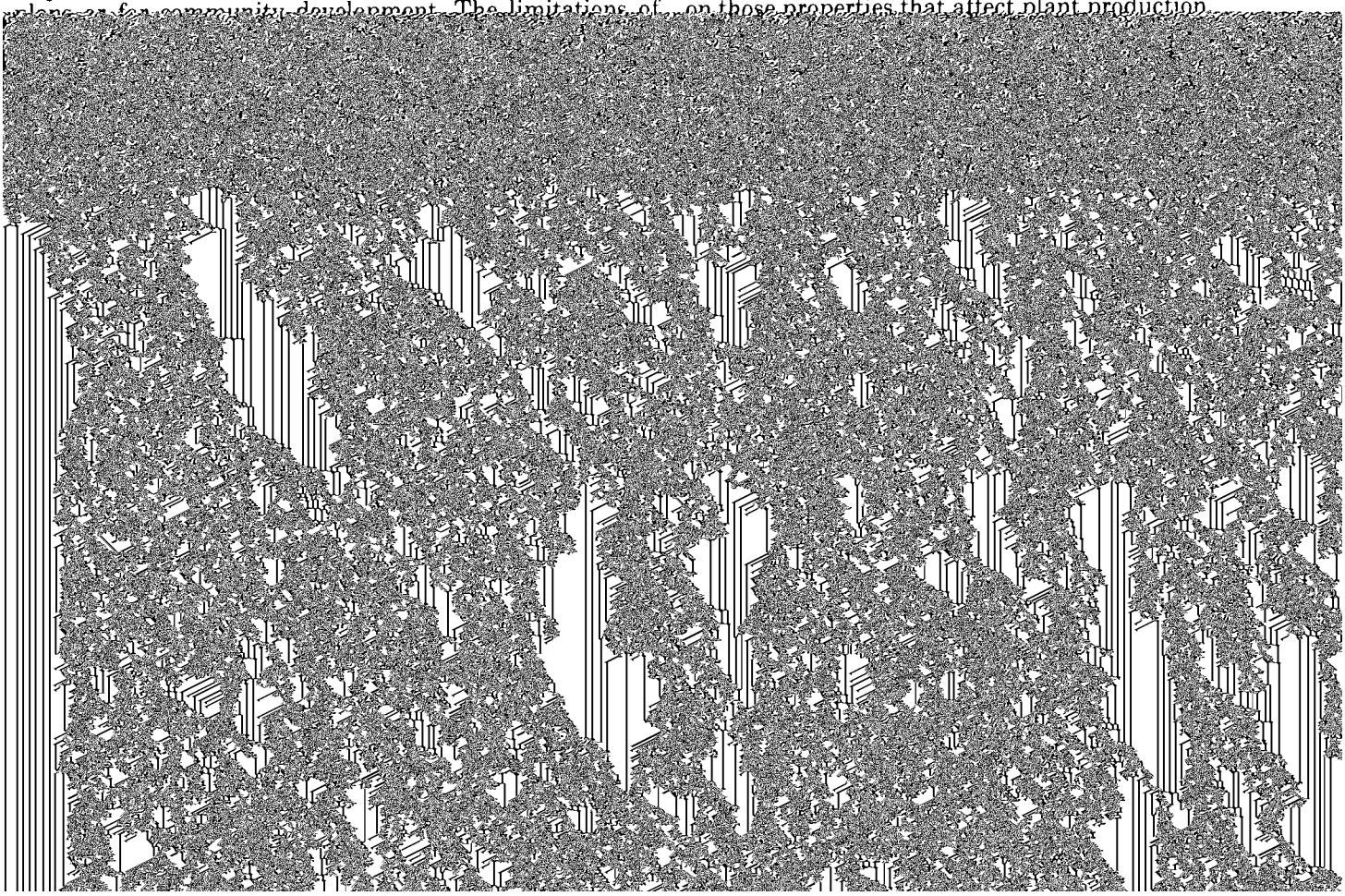
This section is mainly for land planners, municipal officials, developers, and owners or users of land who are responsible for the preparation or evaluation of land-use plans or for community development. The limitations of

for bacteria to decompose the solids. A lagoon has a nearly level floor, and sides, or embankments, of compacted soil material. The assumption is made that the embankment is compacted to medium density and the pond is protected from flooding. Properties are considered that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic matter, and slope, and if the floor needs to be leveled, depth to bedrock becomes important.

Sanitary landfills ratings are based on soil properties above a depth of 5 feet. Onsite investigations are needed to determine soil and water conditions below that depth. The ratings are an indication as to where onsite investigation would be most profitable. Sanitary landfill ratings are based on the trench method. All soils that have a seasonal high water table within 5 feet of the surface were rated severe because of the hazard of ground-water pollution. Soils that have a small amount of water perched over a fragipan were rated slight or moderate, depending on the amount of water. Soils that have rapid permeability in the substratum were rated severe because of the hazard of ground-water pollution.

Local roads and streets ratings are based on the assumption the roads and streets will be paved. The ratings also apply in general to parking lots. Slope, depth to bedrock, and content of stones and boulders are somewhat more critical for parking lots than for roads and streets, however, because of the more extensive grading required.

Lawns, landscaping, and golf fairways ratings are based on those properties that affect plant production.



trees and evergreen shrubs. The soils in a landscape planting group can be identified by referring to the "Guide to Mapping Units" at the back of this survey. No landscape planting group has been assigned to gravel pits, quarries, or Urban land.

The lists of plants in tables 11 through 14 are only partial ones, and the soils in the county are suited to many other plants as well. Many of the plants serve the dual purpose of landscaping and of providing food and cover for wildlife. If more detail is needed and pertinent landscaping plans are desired, landowners and others should communicate with local landscape specialists.

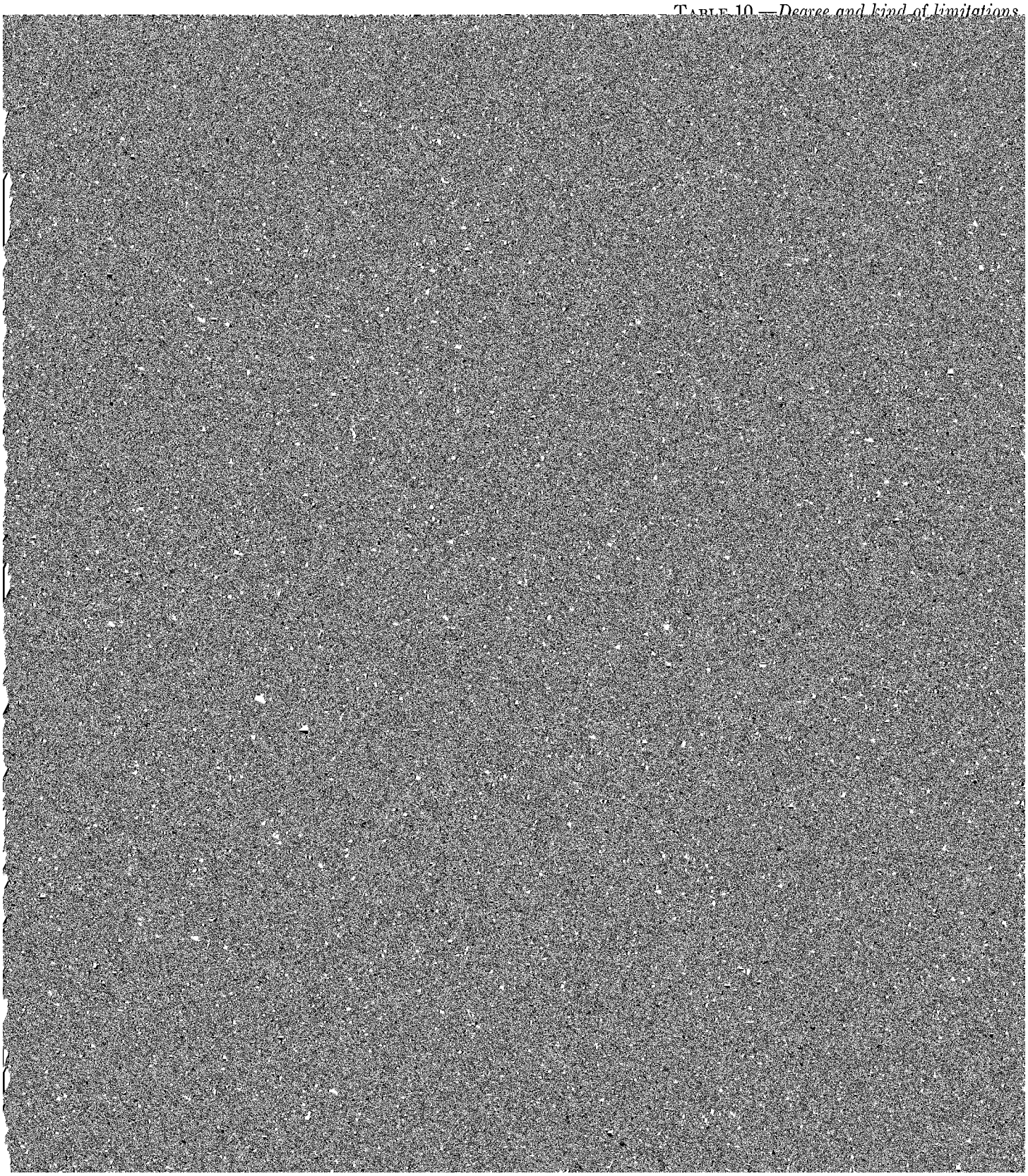
ture has promoted the accumulation of organic matter in the surface layer of the soils. More detailed information on climate is in the section "Physiography and Relief."

Plant and animal life

Plants, micro-organisms, earthworms, and other forms of life on and in the soil are active factors in soil formation. The kinds of plants and animals depend on the climate, the parent material, the age of the soil, and the presence of other organisms.

All the soils in Somerset County formed under forests,

TABLE 10.—*Degree and kind of limitations*



of soils used for community development

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet; high potential frost action.	Moderate: seasonal high water table at a depth of ½ foot to 1½ feet.	Severe: seasonal high water table at a depth of ½ foot to 1½ feet.	Moderate: water table above a depth of 20 inches for short period during season of use.	Moderate: water table below a depth of 20 inches during season of use.	Moderate: water table below a depth of 20 inches during season of use.
Severe: seasonal high water table perched at a depth of 1 foot to 4 feet; high potential frost action.	Moderate: seasonal high water table perched at a depth of 1 foot to 4 feet.	Severe: seasonal high water table perched at a depth of 1 foot to 4 feet.	Slight: water table below a depth of 20 inches during season of use.	Moderate: water table below a depth of 20 inches during season of use.	Slight: water table below a depth of 20 inches during season of use.
Severe: seasonal high water table perched at a depth of 1 foot to 4 feet; high potential frost action.	Moderate: seasonal high water table perched at a depth of 1 foot to 4 feet.	Severe: seasonal high water table perched at a depth of 1 foot to 4 feet; strongly sloping.	Moderate: strongly sloping.	Moderate: water table below a depth of 20 inches during season of use.	Slight: water table below a depth of 20 inches during season of use.
Moderate: potential	Moderate: high	Severe: high	Moderate: moder-	Moderate: moder-	Moderate: moder-

TABLE 10.—*Degree and kind of limitations of*

Soil series and map symbols	Foundations for dwellings— With basements	Foundations for dwellings— Without basements	Septic-tank absorption fields	Sewage lagoons	Sanitary landfills[1]
Bowmansville: Bt	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.
Bucks:					
BuB	Slight: rippable bedrock at a depth of 3½ to more than 5 feet.	Moderate: frost action potential.	Moderate: bedrock at a depth of 3½ to more than 5 feet.	Moderate: gently sloping; bedrock at a depth of 3½ to more than 5 feet.	Severe: rippable bedrock at a depth of 3½ to more than 5 feet.
BuC2	Moderate: strongly sloping; rippable bedrock at a depth of 3½ to more than 5 feet.	Moderate: strongly sloping.	Moderate: strongly sloping; bedrock at a depth of 3½ to more than 5 feet.	Severe: strongly sloping.	Severe: rippable bedrock at a depth of 3½ to more than 5 feet.
Califon:					
CaB	Severe: seasonal high water table perched at a depth of ½ foot to 2½ feet; lateral seepage over fragipan; foundation and interceptor drains generally needed.	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet.	Severe: slow permeability; seasonal high water table perched at a depth of ½ foot to 2½ feet.	Moderate: gently sloping.	Moderate: seasonal high water table perched at a depth of ½ foot to 2½ feet.
CcB	Severe: seasonal high water table perched at a depth of ½ foot to 2½ feet; lateral seepage over fragipan; strongly sloping; very stony.	Severe: seasonal high water table perched at a depth of ½ foot to 2½ feet; lateral seepage over fragipan; very stony.	Severe: slow permeability; seasonal high water table perched at a depth of ½ foot to 2½ feet; very stony.	Moderate: gently sloping.	Moderate: seasonal high water table perched at a depth of ½ foot to 2½ feet; very stony.
Chalfont:					
CdB, CeB	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet.	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet; high frost action potential.	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet; slow permeability.	Moderate: gently sloping.	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet; bedrock at a depth of 3½ to more than 5

soils used for community development—Continued

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; seasonal water table at a depth of 0 to 1 foot.	Severe: hazard of stream overflow; water table above a depth of 20 inches during season of use.	Severe: hazard of stream overflow.	Severe: water table above a depth of 20 inches during season of use.
Moderate: potential frost action.	Slight	Moderate: gently sloping.	Slight	Slight	Slight.
Moderate: potential frost action.	Moderate: strongly sloping.	Severe: strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Severe: high potential frost action; seasonal high water table perched over fragipan.	Moderate: seasonal high water table at a depth of ½ foot to 2½ feet.	Severe: seasonal high water table at a depth of ½ foot to 2½ feet; moderate gravel content.	Slight: water table below a depth of 20 inches during season of use.	Moderate: water table below a depth of 20 inches during season of use.	Moderate: water table below a depth of 20 inches during season of use.
Severe: high potential frost action; seasonal high water table perched over fragipan.	Moderate: very stony.	Severe: seasonal high water table perched at a depth of ½ foot to 2½ feet; very stony.	Moderate: very stony.	Moderate: very stony.	Moderate: water table above a depth of 20 inches for short periods during season of use; very stony.
Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet; high potential frost action.	Moderate: seasonal high water table perched at a depth of ½ foot to 1½ feet.	Severe: seasonal high water table perched at a depth of ½ foot to 1½ feet.	Moderate: water table below a depth of 20 inches during season of use.	Severe: water table above a depth of 20 inches during season of use.	Moderate: seasonal high water table perched at a depth of ½ foot to 1½ feet.
Severe: seasonal high water table perched at	Moderate: seasonal high water table	Severe: seasonal high water table	Moderate: water table below a	Severe: water table above a depth of	Moderate: seasonal high water table

TABLE 10.—*Degree and kind of limitations of*

Soil series and	Foundations for dwellings—			

soils used for community development—Continued

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot; very stony.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot; very stony.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.
Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.	Severe: seasonal high water table perched at a depth of 0 to 1 foot.
Moderate: potential frost action.	Slight	Slight for DnA. Moderate for DnB: gently sloping.	Slight	Slight	Slight.
Severe: seasonal high water table at a depth of ½ foot to 4 feet.	Moderate: seasonal high water table at a depth of ½ foot to 4 feet.	Moderate: seasonal high water table at a depth of ½ foot to 4 feet.	Slight: seasonal high water table below a depth of 20 inches during season of use.	Moderate: seasonal high water table below a depth of 20 inches during season of use.	Slight: seasonal high water table below a depth of 20 inches during season of use.
Moderate: moderate potential frost action.	Moderate: moderate gravel content.	Severe: excessive gravel content.	Slight	Slight	Slight.
Moderate: strongly sloping; moderate potential frost action.	Severe: strongly sloping.	Severe: high gravel content; strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Severe: steep	Severe: steep	Severe: steep	Severe: steep	Severe: steep	Moderate: steep

TABLE 19.—*Degree and kind of limitations of*

soils used for community development—Continued

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: water table above a depth of 20 inches during season of use.	Severe: water table above a depth of 20 inches during season of use.	Severe: water table above a depth of 20 inches during season of use.
Severe: seasonal high water table at a depth of 1 foot to 2½ feet; high potential frost action.	Moderate: seasonal high water table at a depth of 1 foot to 2½ feet.	Severe: seasonal high water table at a depth of 1 foot to 2½ feet.	Moderate: water table above a depth of 20 inches for short periods during season of use.	Severe: water table above a depth of 20 inches during season of use.	Moderate: water table above a depth of 20 inches during season of use.
Severe: seasonal high water table at a depth of 1½ to 4 feet; high potential frost action.	Slight	Moderate: seasonal high water table at a depth of 1½ to 4 feet; gently sloping.	Slight	Moderate: moderately slow permeability.	Slight.
Severe: seasonal high water table at a depth of 1½ to 4 feet; high potential frost action.	Moderate: strongly sloping.	Severe: strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Severe: seasonal high water table at a depth of ½ foot to 4 feet; high potential frost action.	Moderate: seasonal high water table at a depth of ½ foot to 4 feet.	Severe: seasonal high water table at a depth of ½ foot to 4 feet.	Moderate: water table above a depth of 20 inches for short periods during season of use.	Moderate: water table below a depth of 20 inches during season of use.	Moderate: water table above a depth of 20 inches for short periods during season of use.
Severe: seasonal high water table at a depth of ½ foot to 4 feet; high potential frost action.	Moderate: seasonal high water table at a depth of ½ foot to 4 feet; strongly sloping.	Severe: seasonal high water table at a depth of ½ foot to 4 feet; strongly sloping.	Moderate: water table above a depth of 20 inches for short periods during season of use; strongly sloping.	Moderate: strongly sloping.	Moderate: water table above a depth of 20 inches for short periods during season of use.
Moderate: moderate potential frost action.	Slight	Severe: moderate gravel content on surface.	Slight	Moderate: moderately slow permeability.	Slight.
Moderate: moderate potential frost action; strongly sloping.	Moderate: strongly sloping.	Severe: high gravel content; strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Severe: seasonal high water table at a depth of 1 foot to 4 feet; high potential frost action.	Slight	Moderate: seasonal high water table at a depth of 1 foot to 4 feet; gently sloping.	Slight	Slight	Slight.
Severe: seasonal high water table at a depth of 1 foot to 4 feet; high potential frost action.	Moderate: strongly sloping; moderate gravel content.	Severe: strongly sloping; excessive gravel content on surface.	Moderate: strongly sloping; moderate gravel content.	Moderate: strongly sloping.	Slight

TABLE 10.—*Degree and kind of limitations of*

Soil series and map symbols	Foundations for dwellings—		Septic-tank absorption fields	Sewage lagoons	Sanitary landfills[1]
	With basements	Without basements			
Mount Lucas—Continued					
MuB	Severe: seasonal high water table at a depth of 0 to 2½ feet; hard bedrock at a depth of 3½ to more than 5 feet; high stone	Severe: seasonal high water table at a depth of 0 to 2½ feet; high stone content.	Severe: seasonal high water table at a depth of 0 to 2½ feet; hard bedrock at a depth of 3½ to more than 5 feet.	Severe: hard bedrock at a depth of 3½ to more than 5 feet; seasonal high water table at a depth of 0 to 2½ feet.	Severe: hard bedrock at a depth of 3½ to more than 5 feet; seasonal high water table at a depth of 0 to 2½ feet.

soils used for community development—Continued

Local roads	Lawns, landscaping		Picnic and	Campsites for	

TABLE 10.—*Degree and kind of limitations of*

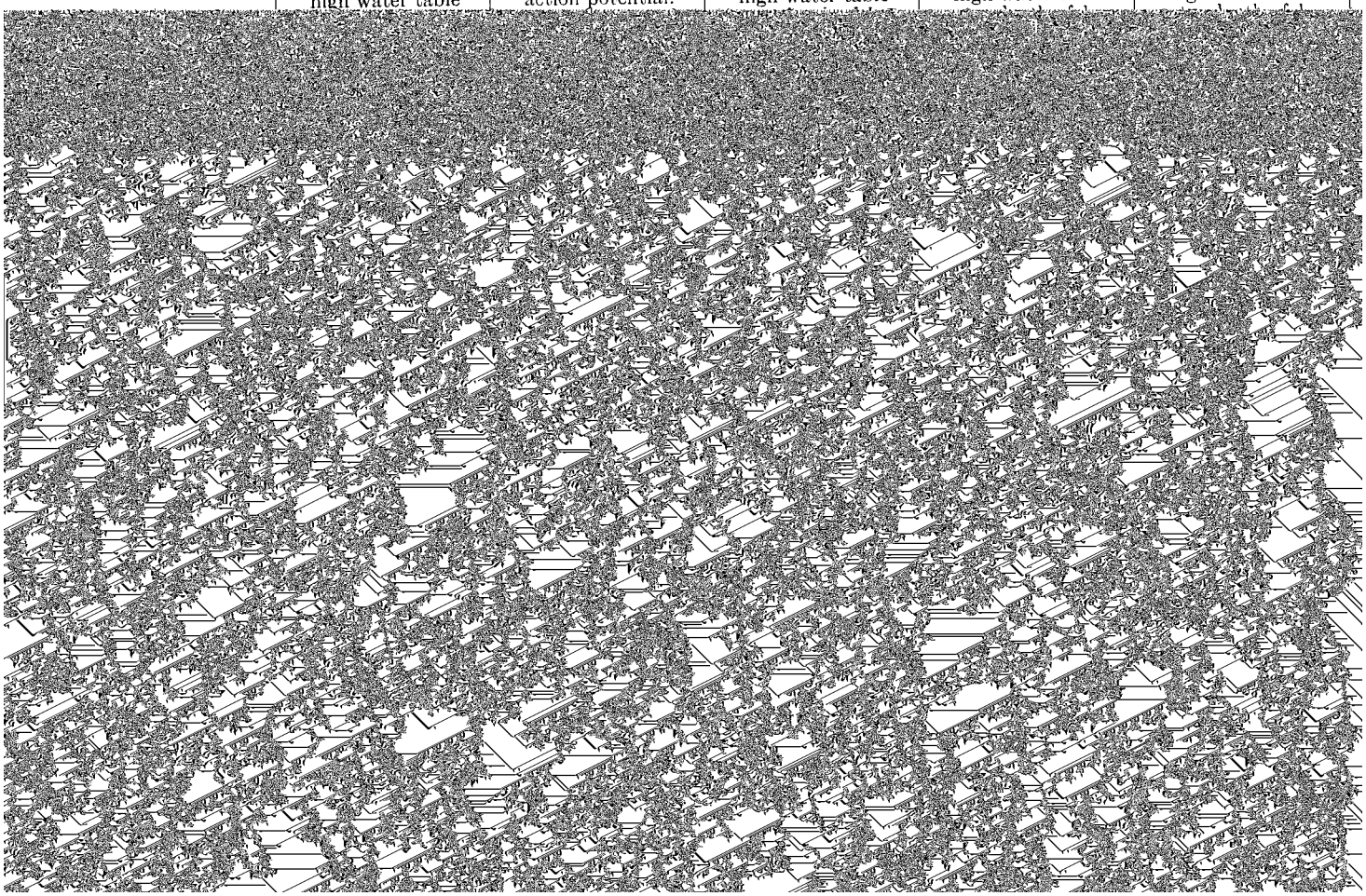
Soil series and map symbols	Foundations for dwellings—		Septic-tank absorption fields	Sewage lagoons	Sanitary landfills[1]
	With basements	Without basements			
Norton:					
NoA	Slight	Moderate: frost action potential.	Severe: slow permeability in subsoil.	Slight: rippable bedrock at a depth of 3½ to more than 5 feet.	Moderate where bedrock is at a depth of more than 6 feet: moderately fine texture. Severe where bedrock is at a depth of less than 6 feet.
NoB	Slight	Moderate: frost [illegible]	Severe: slow per- [illegible]	Moderate: gently [illegible]	Moderate where [illegible]

soils used for community development—Continued

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Moderate: moderate potential frost action.	Slight	Moderate: slow permeability.	Slight	Moderate: slow permeability.	Slight.

TABLE 10.—*Degree and kind of limitations of*

Soil series and map symbols	Foundations for dwellings—		Septic-tank absorption fields	Sewage lagoons	Sanitary landfills[1]
	With basements	Without basements			
Penn:					
PmA, PmB, PnB	Moderate: rippable bedrock at a depth of 1½ to 3½ feet.	Moderate: frost-action potential.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.
PmC, PnC	Moderate: rippable bedrock at a depth of 1½ to 3½ feet; strongly sloping.	Moderate: strongly sloping; frost-action potential.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.	Severe: rippable bedrock at a depth of 1½ to 3½ feet.
Quakertown:					
QkC	Moderate: strongly sloping.	Moderate: strongly sloping.	Moderate: moderately slow permeability; strongly sloping.	Severe: strongly sloping.	Severe: rippable bedrock at a depth of 3½ to 5 feet.
QkD	Moderate: moderately steep; bedrock at a depth of 3½ to 5 feet.	Moderate: moderately steep.	Severe: moderately steep.	Severe: moderately steep.	Severe: bedrock at a depth of 3½ to 5 feet.
Raritan: RbA	Severe: seasonal high water table	Severe: high frost-action potential.	Severe: seasonal high water table	Severe: seasonal high water table	Severe: seasonal high water table



soils used for community development—Continued

Local roads and streets	Lawns, landscaping, and golf fairways	Athletic fields	Picnic and play areas	Campsites for trailers and tents	Paths and trails
Moderate: moderate potential frost action.	Moderate: bedrock at a depth of 1½ to 3½ feet.	Moderate: bedrock at a depth of 1½ to 3½ feet.	Slight	Slight	Slight.
Moderate: moderate potential frost action.	Moderate: bedrock at a depth of 1½ to 3½ feet; strongly sloping.	Severe: strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Moderate: moderate potential frost action; strongly sloping.	Moderate: strongly sloping; moderately slow permeability.	Severe: strongly sloping.	Moderate: strongly sloping.	Moderate: strongly sloping.	Slight.
Severe: moderately steep.	Severe: moderately steep.	Severe: moderately steep.	Severe: moderately steep.	Severe: moderately steep.	Moderate: moderately steep.
Severe: high potential frost action; hazard of stream overflow on low terraces.	Moderate: seasonal high water table at a depth of ½ foot to 3 feet; hazard of stream overflow on low terraces.	Moderate: seasonal high water table at a depth of ½ foot to 3 feet; moderately slow permeability.	Moderate: water table above a depth of 20 inches for short periods during season of use.	Moderate: water table below a depth of 20 inches during season of use; hazard of stream overflow on low terraces.	Moderate: water table in places is above a depth of 20 inches for short periods during season of use; hazard of stream overflow on low terraces.
Severe: high potential frost action; seasonal high water table perched at a depth of 1½ to 4 feet.	Slight	Moderate: seasonal high water table perched at a depth of ½ to 4 feet; gently sloping.	Slight	Moderate: moderately slow permeability.	Slight.
Severe: seasonal high water table at a depth of ½ foot to 3 feet;	Moderate: seasonal high water table at a depth of ½	Severe: seasonal high water table at a depth of ½	Slight: water table below a depth of 20 inches during	Moderate: water table below a depth of 20 inches	Moderate: water table below a depth of 20 inches

TABLE 10.—*Degree and kind of limitations of*

Soil series and map symbols	Foundations for dwellings—		Septic-tank absorption fields	Sewage lagoons	Sanitary landfills[1]
	With basements	Without basements			
Udifluvents and Ochrepts: UD.	Severe: hazard of frequent stream overflow.	Severe: hazard of frequent stream overflow.	Severe: hazard of frequent stream overflow.	Severe: hazard of frequent stream overflow.	Severe: hazard of frequent stream overflow.
Urban land: Um. Too variable to rate.					
Watchung: Wc	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.	Severe: seasonal high water table at a depth of 0 to 1 foot.
Whippany: WhA	Severe: seasonal high water table at a depth of ½ foot to 1½ feet.	Severe: seasonal high water table at a depth of ½ foot to 1½ feet; high frost-action potential.	Severe: seasonal high water table at a depth of ½ foot to 1½ feet; slow permeability.	Slight	Severe: seasonal high water table at a depth of ½ foot to 1½ feet.

[1] Onsite deep studies of the underlying strata, water table, and hazards of aquifer pollution need to be made for landfills deeper than 5 or

Relief

Somerset County has nearly all of its acreage in the Piedmont Plateau. Only about 6 percent, or 11,800 acres, is in the Highlands. Elevation ranges from 10 feet along the Raritan River near Somerset to 857 feet on a hill north of Bernardsville.

The Piedmont area in the county is made up of gently undulating and moderately sloping upland plains and narrow flood plains along the major streams. A steep ridge, Sourland Mountain, is in the southern part of the county near Neshanic. A pair of V-shaped steep ridges (Watchung Mountains) extends from the vicinity of Watchung through Martinsville and Chimney Rock to Pluckemin. Blufflike escarpments are adjacent to some streams, such as at Dock Watch Hollow and Millington Gorge.

The Highland area is made up of moderate slopes on the uplands that drop abruptly to the bordering lowlands of the Piedmont Plateau. Some streams and drainageways

soils used for community development—Continued

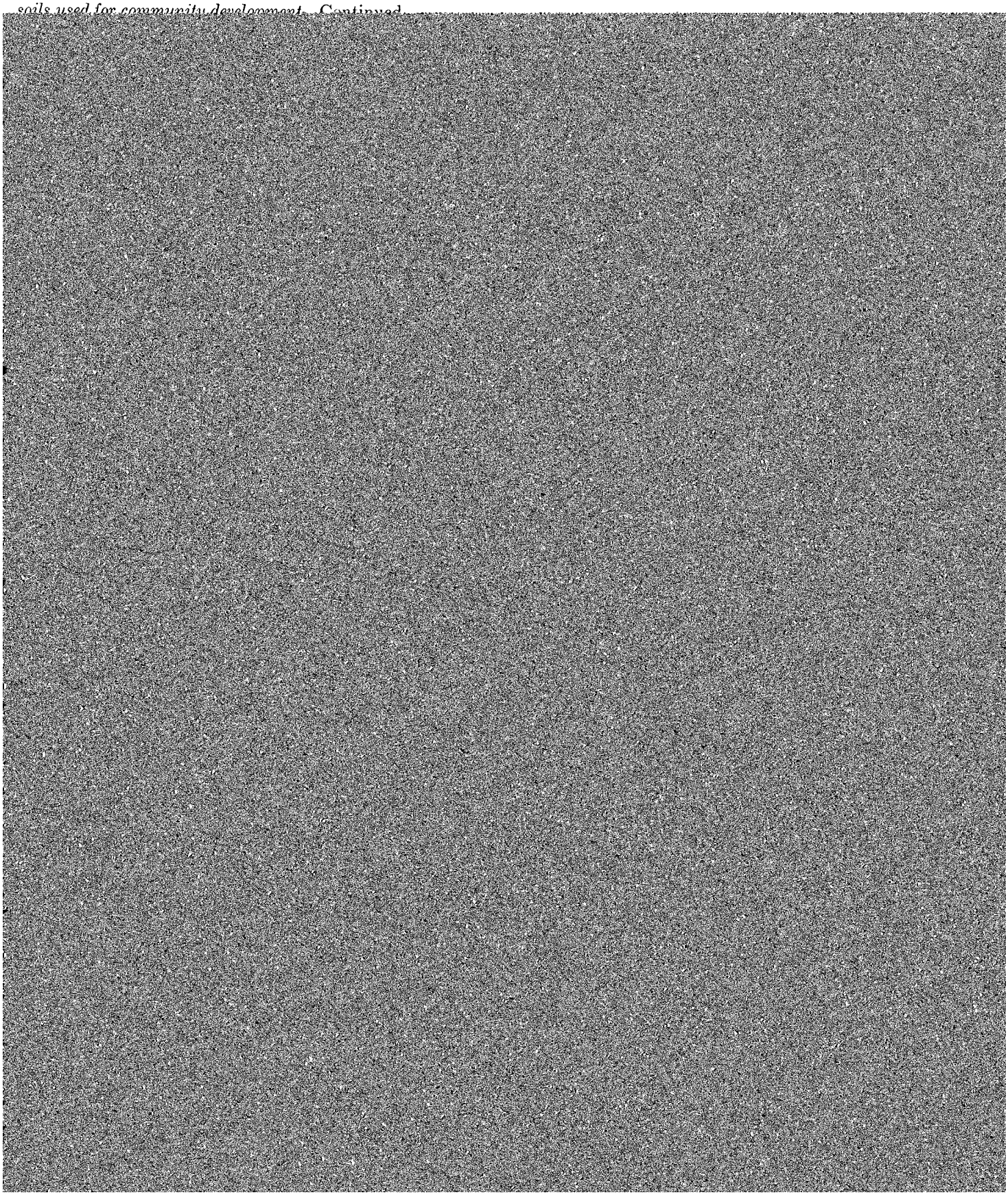


TABLE 11.—*Guide for landscape planting of deciduous trees*

[The letter "x" indicates species is desirable for the features indicated. The symbol > means more than]

Common and botanical names of deciduous trees	Landscape planting groups	Shape of mature trees	Ornamental features				Growth rate	Potential height
			Flower	Fruit	Shade	Autumn foliage		
								Feet
Ash, white (*Fraxinus americana*)	2, 3	Round			x	x	Rapid	>50
Basswood (*Tilia americana*)	2, 3	Round			x		Rapid	>50
Beech (*Fagus grandifolia*)	2, 3	Round	x		x		Slow	>50
Birch, paper (*Betula papyrifera*)	2, 3	Round		x		x	Rapid	>50
Chestnut, Chinese (*Castanea molissima*)	3	Round		x			Rapid	25–50
[illegible]	3	Round	x			x	Moderate	15–25

TABLE 12.—*Guide for landscape planting of deciduous shrubs*

Common and botanical names of deciduous shrubs	Landscape planting groups	Uses						Potential height
		Wildlife food	Ornamental	Autumn foliage	Screen	Windbreak	Critical area	
								Feet
Arrowwood (*Viburnum dentatum*)	1, 2, 3	x	x	x	x			10–15
Autumn-olive, cardinal (*Elaeagnus umbellata*)	3	x	x		x	x	x	10–15
Azalea, flame (*Rhododendron calendulaceum*)	3		x					10–15
Bayberry (*Myrica caroliniensis*)	2, 3	x	x					6–10
Blackhaw (*Viburnum prunifolium*)	2, 3	x					x	15–20
Coralberry (*Symphoricarpos orbiculatus*)	2, 3	x					x	2–6
Cranberry, highbush (*Viburnum trilobum*)	2, 3	x	x					10–15
Dogwood:								
Redosier (*Cornus stolonifera*)	1, 2, 3	x	x	x	x			10
Silky (*Cornus amomum*)	1, 2, 3	x	x	x				10
Firethorn, laland (*Pyracantha coccinea lalandi*)	3	x						10–20
Forsythia (*Forsythia species*)	3		x		x		x	10–15
Honeysuckle:								
Amur (*Lonicera maacki*)	3	x	x		x		x	10–15
Tatarian (*Lonicera tatarica*)	3	x	x		x		x	10–15
Privet, Amur (*Ligustrum amurense*)	3		x		x	x	x	15–20
Winterberry (*Ilex verticillata*)	1, 2, 3		x					10

TABLE 13.—*Guide for landscape planting of evergreen trees*

Common and botanical names of evergreen trees	Landscape planting group	Uses					Potential height
		Ornamental	Windbreak	Screen	Critical area	Growth rate	
							Feet
Arborvitae:							
American or northern white-cedar (*Thuja occidentalis*)	2, 3	x	x	x		Slow	>50
Oriental (*Thuja orientalis*)	2, 3	x	x	x		Slow	>50
Hemlock, eastern (Canada) (*Tsuga canadensis*)	3	x	x	x		Moderate	>50
Larch:							
European (*Larix decidua*)	3					Rapid	>50
Japanese (*Larix leptolepis*)	3				x	Rapid	>50
Pine:							
Austrian (*Pinus nigra*)	3	x	x	x		Rapid	>50
White (*Pinus strobus*)	1, 2, 3		x	x		Rapid	>50
Spruce:							
Norway (*Picea abies*)	2, 3	x	x	x		Moderate	>50
White (*Picea glauca*)	1, 2, 3		x	x		Moderate	>50

TABLE 15.—*Relationships of the soil series according to physiographic position, parent material, dominant texture, and drainage*

Position, parent material, and dominant texture	Excessively drained, somewhat excessively drained, and well drained	Moderately well drained	Somewhat poorly drained	Poorly drained and very poorly drained
Soils on uplands:				
Soils that formed chiefly in residual material—				
Weathered from underlying red Triassic shale:				
Shallow to rock, loamy-skeletal subsoil	Klinesville			
Moderately deep to rock, fine-loamy subsoil	Penn	Reaville	Reaville	
Deep to rock, fine-loamy subsoil		Readington	Abbottstown	Croton.
Weathered from underlying gray Triassic sandstone or shale, fine-loamy subsoil	Quakertown			
Weathered from red Triassic conglomerate:				
Loamy-skeletal subsoil	Pattenburg			
Fine-loamy subsoil	Arendtsville			
Weathered from underlying metamorphosed shale, fine-loamy subsoil		Lehigh	Lehigh	Croton.
Weathered from underlying dark-gray diabase or basalt (traprock), fine-loamy subsoil	Neshaminy	Mount Lucas	Mount Lucas	Watchung.
Weathered from underlying granitic gneiss:				
Loamy-skeletal subsoil	Parker			
Fine-loamy subsoil	Edneyville	Califon	Califon	Cokesbury.
Soils that formed in transported material—				
Silt loam loess mantle underlain by weathered Triassic shale, fine-loamy or fine-silty subsoil	Bucks[1]	Lawrenceville	Chalfont	
Weathered basalt colluvium underlain by shale or basalt bedrock, fine-loamy subsoil	Neshaminy	Amwell	Amwell	

TABLE 16.—*Soils classified according to the current system of classification*

Series	Family	Subgroup	Order
Abbottstown	Fine-loamy, mixed, mesic	Aeric Fragiudalfs	Alfisols.
Amwell	Fine-loamy, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Arendtsville	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Bartley	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.
Birdsboro	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Bowmansville	Fine-loamy, mixed, nonacid, mesic	Aeric Fluvaquents	Entisols.
Bucks	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Califon	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Chalfont	Fine-silty, mixed, mesic	Aquic Fragiudalfs	Alfisols.
Cokesbury	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols.
Croton	Fine-silty, mixed, mesic	Typic Fragiaqualfs	Alfisols.
Dunellen	Coarse-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Dunellen variant	Coarse-loamy, mixed, mesic	Aquic Hapludults	Ultisols.
Edneyville	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols.
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols.
Klinesville	Loamy-skeletal, mixed, mesic	Lithic Dystrochrepts	Inceptisols.
Lamington	Fine-loamy, mixed, mesic	Typic Fragiaquults	Ultisols.
Lansdowne	Fine, mixed, mesic	Aquultic Hapludalfs	Alfisols.
Lawrenceville	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Lehigh	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Meckesville[1]	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Mount Lucas	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Neshaminy	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Neshaminy variant	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.
Norton	Fine, mixed, mesic	Ultic Hapludalfs	Alfisols.
Parker	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Parsippany	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Parsippany variant	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols.
Pattenburg	Loamy-skeletal, mixed, mesic	Typic Hapludults	Ultisols.
Penn	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Quakertown	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Raritan	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Readington	Fine-loamy, mixed, mesic	Typic Fragiudalfs	Alfisols.
Reaville	Fine-loamy, mixed, mesic	Aquic Hapludalfs	Alfisols.
Riverhead	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Rowland	Fine-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Royce	Fine-loamy, mixed, mesic	Humic Hapludults	Ultisols.
Watchung	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols.
Whippany	Fine, mixed, mesic	Aquic Hapludalfs	Alfisols.

[1] These soils are taxadjuncts to the Meckesville series. They are outside the defined range for the series in that they are yellower in the upper part of the B horizon, have mottles within a depth of 20 inches, and have a granitic gneiss component.

FAMILY. Soil families are established within a subgroup mainly on the basis of properties important to the growth of plants or on the behavior of soils when used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on, that are used as family differentiae (table 16). An example is the fine-loamy, mixed, mesic family of Typic Fragiaquults.

Physiography and Relief

Somerset County is in two physiographic divisions in New Jersey. That part of the county north of Bernardsville, Far Hills, and Bedminster is known as the Highlands and is the southernmost division of the Appalachian Province. South of the Highlands is the Piedmont Plateau.

In the northern part of Somerset County, and making up about 6 percent of the total area, is an area in the Appalachian Mountains that is part of the Highlands. This area consists of gently sloping to steep uplands that are underlain by gneiss, quartzite, and limestone rock (*3*). It consists of broad, rounded or flat-topped ridges that rise 400 to 600 feet above the lowlands to the south.

The Highlands are dissected by Peapack and Gladstone Brooks, the North Branch of the Raritan River, and the Lamington River. These streams flow in a southerly direction through the Piedmont Plateau.

About 94 percent of Somerset County lies in the Piedmont Plateau. It is mainly a lowland consisting of gently rounded hills separated by wide valleys, but some ridges and isolated hills rise conspicuously above the general surface. The Passaic Basin, partly in the northeastern part of

TABLE 17.—*Temperature and precipitation data*

[All data from Somerville, New Jersey]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average monthly total	One year in 10 will have—		Days that have snow cover of 1 inch or more	Average depth of snow on days that have snow cover
			Maximum temperature higher than—	Minimum temperature lower than—		Less than—	More than—		
	°F	°F	°F	°F	Inches	Inches	Inches		Inches
January	39	21	55	2	3.3	0.9	4.8	9	5
February	40	21	57	6	2.7	1.8	4.2	8	6
March	50	29	64	15	4.0	2.0	5.9	3	5
April	62	38	77	27	3.7	1.5	5.9	(1)	2
May	73	48	87	35	3.8	1.4	6.3	----------	----------
June	82	57	95	46	3.9	1.2	5.5	----------	----------
July	86	62	98	52	4.7	1.4	8.5	----------	----------
August	84	61	95	50	5.0	1.5	8.4	----------	----------
September	78	54	89	39	3.8	1.2	6.9	----------	----------
October	67	43	83	29	3.3	1.0	6.1	----------	----------
November	54	33	70	20	3.7	1.8	6.1	1	2
December	42	24	60	7	3.3	.9	6.2	7	5
Year	63	41	[2] 99	[3] −3	45.2	33.1	53.1	28	6

[1] Less than 0.5 day.
[2] Average annual maximum temperature.
[3] Average annual minimum temperature.

the county, was the site of the largest glacial lake in New Jersey. Deposits of sediment ranging from several to many feet thick cover the floor of the basin. The underlying bedrock is Brunswick shale or basalt. The Passaic Basin is dissected by the Passaic and Dead Rivers, which flow northeast into Morris County.

Three basalt sheets or lava flows formed the Watchung Mountains in the northeastern part of the county. The second Watchung Mountains formed the boundary of glacial Lake Passaic. Only part of the Watchung Mountains, which extend into Union, Morris, and Passaic Counties, is in Somerset County. In places between the individual lava flows of the Watchung Mountains is as much as 100 feet of shale. Other intruded strata formed the Sourland Mountains and the diabase intrusion at Rocky Hill.

During the most recent period of glaciation, large amounts of meltwater poured onto the Piedmont lowlands south of the Watchung Mountains in the vicinity of North Plainfield, Green Brook, Bound Brook, Manville, and Millstone. Considerable amounts of glacial outwash material were deposited along Green Brook and the Raritan and Millstone Rivers. These glacial deposits are mainly granitic material.

Brunswick shale, the dominant formation in the Piedmont lowlands, is a soft red shale, sandstone, argillite, or siltstone that covers the remaining part of the county. The elevation ranges from about 50 feet to 400 feet above sea level. Where the Brunswick shale is adjacent to an intrusion of basalt or diabase, the shale is baked or meta-

Piedmont lowland is dissected by the lower reaches of the Lamington River, the North and South Branches of the Raritan River, the Millstone River, and several smaller tributaries.

Climate[4]

Somerset County, while humid and temperate, has a continental climate that is influenced only slightly by the ocean. The data given in tables 17 and 18 are from the cooperative weather station at Somerville.

Summer temperatures occasionally exceed 100°F., but temperatures in the middle or upper 90's occur frequently. Winter temperatures generally are not below 10° for long periods, but drainage tile must be placed below a depth of 30 inches for protection against freezing.

The average annual precipitation is about 45 inches, and the monthly averages show the precipitation is well distributed over the year. Nearly every year, however, there are periods when there is not enough rainfall to supply moisture for high-value crops. Consequently, the irrigated acreage has increased considerably in recent years, especially during the drought of 1961–66. Rainfall is heaviest in July and August. Much of the summer rainfall comes as thunderstorms, and about 30 occur annually. Summer rainfall amounts and intensities are greatly affected by the Watchung Mountains. Most summer

TABLE 18.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data from Somerville, New Jersey]

Probability	Dates for given probability and temperatures of—				
	16° F or lower	20° F or lower	24° F or lower	28° F or lower	32° F or lower
Spring:					
1 year in 10 later than	March 25	March 31	April 13	April 28	May 7
2 years in 10 later than	March 19	March 25	April 6	April 22	May 3
5 years in 10 later than	March 10	March 16	March 30	April 15	April 27
Fall:					
1 year in 10 earlier than	November 21	November 17	October 20	October 9	October 2
2 years in 10 earlier than	November 26	November 13	October 28	October 17	October 7
5 years in 10 earlier than	December 5	November 22	November 7	October 28	October 13

showers come from the west, and sometimes the heavily

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Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard and brittle; little affected by moistening.

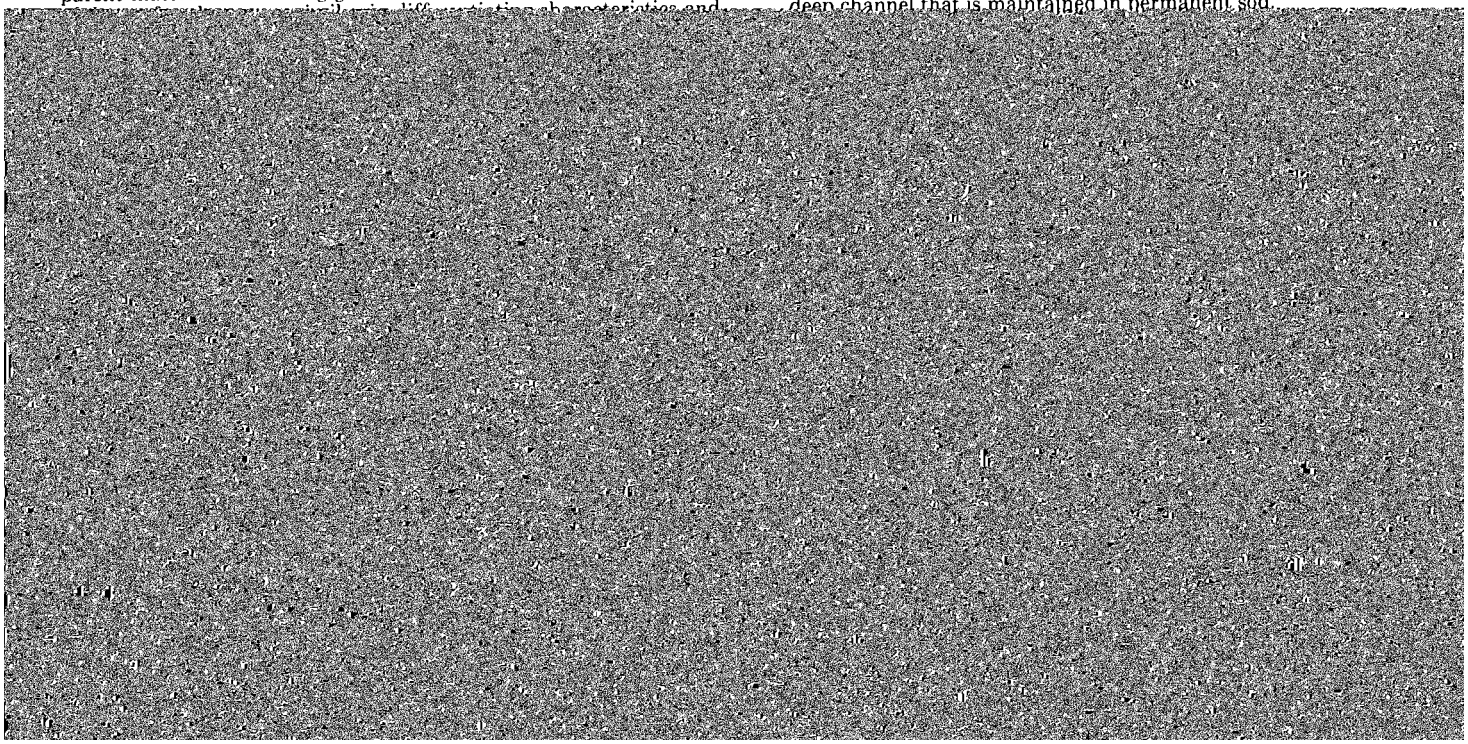
Contour stripcropping. Growing crops in strips that follow the contour or are parallel to terraces or diversions. Strips of grass or

(1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture

prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.



GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. The suitability of the soils for use as cropland is discussed in the soil descriptions. Other information is given in tables as follows:

Acreage and extent, table 1, page 9.
Estimated yields, tables 2 and 3, pages 54 through 55.
Woodland, table 4, page 56, and table 5, page 58.
Wildlife, table 6, page 60.
Engineering uses of the soils, tables 7, 8, and 9, pages 64 through 87.
Community development, table 10, page 90.

Map symbol	Mapping unit	Described on page	Capability unit	Woodland suitability group	Landscape planting group
AbA	Abbottstown silt loam, 0 to 2 percent slopes	10	IIIw-71	3w1	2
AbB	Abbottstown silt loam, 2 to 6 percent slopes	10	IIIw-71	3w1	2
AmB	Amwell gravelly loam, 2 to 6 percent slopes	11	IIIw-70	2w1	2
AmC	Amwell gravelly loam, 6 to 12 percent slopes	11	IIIe-70	2w1	2
AnB	Amwell gravelly silt loam, rock substratum, 2 to 6 percent slopes	11	IIIw-70	2w1	2
AnC	Amwell gravelly silt loam, rock substratum, 6 to 12 percent slopes	11	IIIe-70	2w1	2
ArB	Arendtsville gravelly loam, 2 to 6 percent slopes	12	IIe-55	2o1	3
ArC	Arendtsville gravelly loam, 6 to 12 percent slopes	12	IIIe-53	2o1	3
BaC	Bartley loam, 3 to 15 percent slopes	13	IIIe-71	2w1	3
BdA	Bindsboro silt loam, 0 to 2 percent slopes	[illegible]	[illegible]	[illegible]	[illegible]

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Described on page	Capability unit	Woodland suitability group	Landscape planting group
MeB	Meckesville gravelly loam, 2 to 6 percent slopes	30	IIe-51	2o1	3
MeC	Meckesville gravelly loam, 6 to 12 percent slopes	30	IIIe-51	2o1	3
MoB	Mount Lucas silt loam, 2 to 6 percent slopes	31	IIe-71	2w1	2
MpC	Mount Lucas gravelly silt loam, 6 to 12 percent slopes	31	IIIe-71	2w1	2
MuB	Mount Lucas-Watchung very stony silt loams, 2 to 12 percent slopes	32	VIIs-77	2w1	2
NeB	Neshaminy silt loam, 2 to 6 percent slopes	33	IIe-55	2o1	3
NeC	Neshaminy silt loam, 6 to 12 percent slopes	33	IIIe-55	2o1	3
NhE	Neshaminy very stony silt loam, 18 to 35 percent slopes	33	VIIs-61	2o1	3
NkC	Neshaminy-Mount Lucas very stony silt loams, 2 to 12 percent slopes	34	VIs-61	2o1	3
NkD	Neshaminy-Mount Lucas very stony silt loams, 12 to 18 percent slopes	34	VIs-61	2o1	3
NmB	Neshaminy silt loam, fragipan variant, 2 to 6 percent slopes	35	IIe-55	2o1	3
NmC	Neshaminy silt loam, fragipan variant, 6 to 12 percent slopes	35	IIIe-55	2o1	3
NoA	Norton loam, 0 to 2 percent slopes	36	I-51	3o1	3
NoB	Norton loam, 2 to 6 percent slopes	36	IIe-51	3o1	3
NoC	Norton loam, 6 to 12 percent slopes	36	IIIe-51	3o1	3
NoC2	Norton loam, 6 to 12 percent slopes, eroded	36	IIIe-51	3o1	3
PbC	Parker very gravelly sandy loam, 3 to 15 percent slopes	37	IVs-58	3f1	3
PcE	Parker rocky sandy loam, 25 to 35 percent slopes	37	VIIs-60	3x1	3
PeD	Parker-Edneyville very stony soils, 15 to 25 percent slopes	37	VIs-22	3x1	1
Ph	Parsippany silt loam	38	IVw-80	3w1	1
Pk	Parsippany silt loam, very poorly drained variant	39	VIw-80	3w1	1
PlC	Pattenburg gravelly loam, 6 to 12 percent slopes	40	IIIe-58	2o1	3
PlD	Pattenburg gravelly loam, 12 to 18 percent slopes	40	IVe-58	2o1	3
PmA	Penn silt loam, 0 to 2 percent slopes	40	IIs-65	3o1	3
PmB	Penn silt loam, 2 to 6 percent slopes	41	IIe-65	3o1	3
PmC	Penn silt loam, 6 to 12 percent slopes	41	IIIe-65	3o1	3
PnB	Penn shaly silt loam, 2 to 6 percent slopes	41	IIe-65	3o1	3
PnC	Penn shaly silt loam, 6 to 12 percent slopes	42	IIIe-65	3o1	3
QkC	Quakertown silt loam, 2 to 12 percent slopes	42	IIIe-55	2o1	3
QkD	Quakertown silt loam, 12 to 18 percent slopes	43	IVe-55	2o1	3
RbA	Raritan silt loam, 0 to 4 percent slopes	43	IIw-71	3w1	2
RcB	Readington silt loam, 2 to 6 percent slopes	44	IIe-71	3w1	3
ReA	Reaville silt loam, 0 to 2 percent slopes	45	IIIw-76	4w1	2
ReB	Reaville silt loam, 2 to 6 percent slopes	45	IIIw-76	4w1	2
RhC	Riverhead sandy loam, 3 to 15 percent slopes	46	IIIe-58	3o1	3
Ro	Rowland silt loam	47	Vw-78	2w2	2
RyB	Royce silt loam, 2 to 6 percent slopes	47	IIe-55	2o1	3
UD	Udifluvents and Ochrepts	48	IIw-79	2w2	2
Um	Urban land	48	-------	---	---
Wc	Watchung silt loam	49	Vw-80	1w1	1
WhA	Whippany silt loam, 0 to 4 percent slopes	50	IIw-70	2w1	2

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