SOIL SURVEY OF

Madison County, Virginia

United States Department of Agriculture
Soil Conservation Service
In cooperation with
Virginia Polytechnic Institute and State University

Major fieldwork for this soil survey was done in the period 1960-65. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1967. This survey was made cooperatively by the Soil Conservation Service and Virginia Polytechnic Institute and State University. The Madison County Extension Office and Farm Bureau also contributed. The survey is part of the technical assistance furnished to the Culpeper Soil and Water Conservation District.

Copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability classification of each. It also shows the page where each soil is described and the woodland group to which the soil has been assigned.

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

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

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

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

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

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

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

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

Cover: Congaree and Chewacla soils on first bottoms and moderately steep Brandywine and Eubanks soils on uplands. Corn can be grown year after year on Congaree and Chewacla soils. Brandywine and Eubanks soils are better suited to hay, pasture, and forest.

Contents

Issued July 1975

SOIL SURVEY OF MADISON COUNTY, VIRGINIA

BY J. H. ELDER, JR. AND D. E. PETTRY, VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

FIELDWORK BY J. H. ELDER, JR., W. J. EDMONDS, ROBERT L. HODGES, HOOVER H. THOMAS, VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

MADISON COUNTY is in the northern part of Virginia (fig. 1). It is bordered by Rappahannock County on the north, Culpeper County on the east, Orange and Greene Counties on the south, and Page County on the west. The total land area is 327 square miles, or 209,280 acres. The total population, according to the 1970 census, was 8,638. Madison, the county seat, is near the center of the county. It is the only incorporated town in the county. The population is about 300.

Agriculture is the principal enterprise. Livestock production, chiefly beef cattle, and dairying are the greatest sources of farm income. Hogs, calves, eggs, broilers, and turkeys also contribute to total farm income. Apples, peaches, and other fruit are important cash crops in the northern and western part of the county. Corn, small grain, and hay are the main field crops.[1]

Lumber, grain mill products, and the manufacture of furniture, chicken coops, oak flooring, fenceposts, and work clothing have added to the economic well-being of the county.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Madison County, where they are located, and how they can be used. They 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.

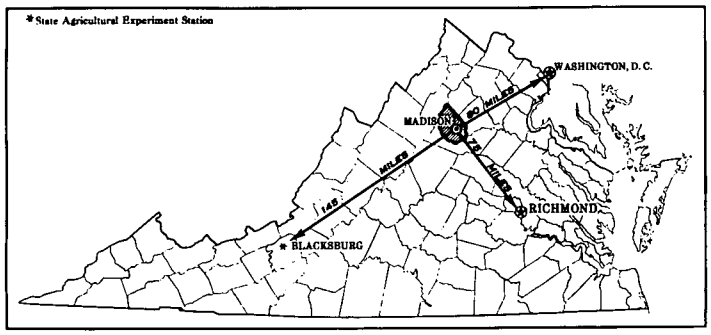

Figure 1.—Location of Madison County in Virginia.

[1]From U.S. Census of Agriculture.

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. Cecil and Elioak, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Cecil fine sandy loam, 2 to 7 percent slopes, eroded, is one of several phases within the Cecil series.

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

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

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

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

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of

the group consists of the names of the dominant soils, joined by "and." An example is Braddock and Thurmont loams.

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it cannot be classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Alluvial land, cobbly, is a land type in Madison County.

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

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

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their study and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area, or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field, or for selecting the exact location of a road, building, or similar structure because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect their management.

Delineations and names on the general soil map of Madison County do not exactly coincide with those shown on the published maps for adjoining Orange County, Rappahannock County, and Culpeper County. Such differences result from technical changes in naming and mapping soils and from changes in the concept of soil classification that have occurred since publication.

The 14 soil associations in Madison County are described on the following pages.

Soils of the Blue Ridge Mountains

The soils in these associations are in the Blue Ridge Mountains and on adjacent ridges and colluvial foot slopes. They are mostly wooded and steep. A large acreage is in the Shenandoah National Park.

1. Rock land-Myersville-Catoctin association

Rock land and moderately deep and deep, well drained and somewhat excessively drained soils on mountain uplands

The landscape of this association is one of broad mountain ridgetops and steep-walled valleys. Outcrop of greenstone schist is common. Elevations range from about 1,500 to more than 4,000 feet.

This association makes up about 6 percent of the county. It is about 58 percent Rock land, 33 percent the Myersville-Catoctin complex, and 9 percent less extensive soils.

Rock land is on the tops and the very steep sides of ridges. The areas mapped are Rock land, basic, and Rock land, Myersville and Catoctin materials. Greenstone rock outcrop covers 25 to 90 percent of the surface area. In most places the soil material between the outcrop resembles a thin Myersville or Catoctin soil.

The Myersville-Catoctin complex is on the smoother ridgetops and the steep side slopes. The Myersville part of this complex is a deep, well-drained soil that has a very stony silt loam surface layer and a stony silty clay loam subsoil. The Catoctin part is a moderately deep, well-drained to somewhat excessively drained soil that has a very stony silt loam surface layer and a thin silt loam subsoil.

Of lesser extent in this association are the deep, well-drained Unison and Tusquitee soils; the deep, moderately well drained Trego soils; the deep, poorly drained Baile soils; Colluvial land, very stony; and Colluvial land, extremely stony. The soils are in valleys, at the base of slopes, and along streams and drainageways. All are colluvial soils. The areas of Colluvial land are along drainageways at the base of steep rocky slopes.

This association is largely mixed forest of oak, hemlock, poplar, pine, and similar species. Only a few small areas are cleared, and they are used for recreational purposes. The rough mountainous terrain is poorly suited to general farming. It is better suited to forest and recreational use. About 80 percent of this association is in the Shenandoah National Park.

In all of this association but a few small areas of Tusquitee and Unison soils, the steep slopes, the rock outcrop, and, in a few places, a seasonal high water table are limitations for homesites.

2. Porters-Rock land association

Moderately deep and deep, well-drained soils and Rock land on mountain uplands

The landscape of this association is one of narrow mountain ridgetops and steep-walled valleys. Outcrop of granite, granite gneiss, and granodiorite is common. Elevations range from about 1,000 to more than 4,000 feet.

This association makes up about 19 percent of the county. It is about 44 percent Porters soils; 30 percent Rock land, Porters and Hazel materials; 15 percent Rock land, acidic; and 11 percent less extensive soils.

The moderately deep to deep, well-drained Porters soils are on the smoother ridgetops and the steep mountainsides. They have a very stony loam surface layer and a stony clay loam subsoil.

Rock land is on ridgetops and steep valley walls. The areas mapped are Rock land, Porters and Hazel materials, and Rock land, acidic. Outcrop of granite, granite gneiss, and granodiorite

covers 25 to 90 percent of the surface area. In most places the soil material between the outcrop resembles a thin Porters or Hazel soil.

Of lesser extent in this association are the well-drained Tusquitee soils; the somewhat excessively drained to excessively drained Brandywine soils; the moderately well drained Trego soils; Colluvial land, very stony; Colluvial land, extremely stony; and Rock outcrop. Trego and Tusquitee soils, which are colluvial soils, Colluvial land, very stony, and Colluvial land, extremely stony, are at the base of slopes and along streams and drainageways. Rock outcrop is on rough mountain crests and nearly precipitous valley walls where the surface area is 90 to 100 percent rock. Brandywine soils are at lower elevations on ridgetops and side slopes.

This association is largely mixed forest (fig. 2) of oak, hemlock, pine, and similar species. Only a few small areas are cleared, and they are used for recreational purposes and apple orchards. The rough mountainous terrain is poorly suited to general farming. It is better suited to forest and recreational use. About 50 percent of this association is in the Shenandoah National Park. Slope and depth to bedrock are limitations for homesites.

3. Tusquitee-Colluvial land-Unison association

Deep, well drained and somewhat excessively drained colluvial soils in mountain valleys and on colluvial fans

The landscape of this association is one of broad mountain valleys and colluvial fans at the base of steep mountain slopes. Coarse stones and rock fragments range from common to many on the surface. Elevations are dominantly 800 to 2,000 feet.

This association makes up about 8 percent of the county. It is about 40 percent Tusquitee soils, 40 percent Colluvial land, 11 percent Unison soils, and 9 percent less extensive soils.

The deep, well-drained Tusquitee soils are on colluvial fans at the base of steep mountainsides. They have a stony loam surface layer and a stony clay loam subsoil.

Colluvial land is on colluvial fans. It is brown loamy soil material that is 25 to 90 percent stones. The areas mapped are Colluvial land, very stony, and Colluvial land, extremely stony.

The deep, well-drained Unison soils are on toe slopes at the base of steep mountainsides and on saddles in the low mountain foothills. Their surface layer is loam or very stony silt loam.

Of lesser extent in this association are the deep, well-drained Dyke, Braddock, and Thurmont soils; the deep, moderately well drained Trego soils; and Alluvial land, cobbly. Dyke, Braddock, and Thurmont soils are farther from the mountains than the major soils. Trego soils are in saddles and along streams and drainageways. Alluvial land, cobbly, is on flood plains. It is brown sandy soil material that is 30 to 50 percent gravel and cobbles.

About 30 percent of this association is cleared and used for general crops and orchards. The rest is mixed forest of poplar, oak, hemlock, pine, and related species. The association is good for farming, but in places slope and stoniness interfere with management. Slippage is a hazard in disturbed areas. Stoniness and slope are limitations for homesites.

Figure 2.—Looking north from Old Rag Mountain in association 2. The steep Porters soils and Rock land on mountainsides are best suited to forest.

Soils on Uplands of the Piedmont Plateau

The soils in these associations are on the Piedmont Plateau. They formed mainly in a wide variety of metamorphic and igneous rocks. They have a wide range of slope, but are mostly gently sloping and sloping. Some are well suited to crops, orchards, and pasture. A large acreage is wooded.

4. Brandywine-Eubanks-Lloyd association

Deep, well drained to excessively drained soils on dissected uplands

This association is east of and adjacent to the Blue Ridge Mountains. The landscape is one of hills and low mountains. Outcrop of biotite gneiss and granodiorite is common in places. Elevations range from about 600 to more than 1,000 feet.

This association makes up about 17 percent of the county. It is about 25 percent Brandywine soils, 6 percent Eubanks soils, very deep, 27 percent Eubanks-Lloyd complex, and 42 percent less extensive soils.

The somewhat excessively drained to excessively drained Brandywine soils have a stony loam surface layer; a thin, weakly expressed subsoil; and a deep substratum of strongly weathered granitic rock. They are sloping to steep.

The well-drained Eubanks soils, very deep, are on ridgetops and the smoother side slopes. They have a loam surface layer and a red clay loam subsoil that is underlain by deep, strongly weathered, granite gneiss saprolite.

The Eubanks-Lloyd complex is on ridgetops and the sloping to moderately steep side slopes. The Eubanks part of this complex has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. The Lloyd part is a deep, well-drained soil that has a loam surface layer and a red to dark-red clay subsoil.

Of lesser extent in this association are the deep, well drained to moderately well drained Meadowville soils; the deep, well drained to excessively drained Chester-Brandywine complex; the deep, well drained Lloyd thin solum variant; and the deep, moderately well drained Trego soils. Meadowville soils are in depressions and along small drainageways. The Chester-Brandywine complex and the Lloyd variant are on upland ridges and side slopes. The Lloyd variant has a thin subsoil over a substratum of strongly weathered biotite gneiss. Trego soils are on toe slopes and along drainageways.

Approximately 50 percent of this association has been cleared for general farming. The rest is mixed hardwood and pine woodland. The association is fairly well suited to general farming and is good grassland (fig. 3). Bluegrass is native to most of the association. In places steep slopes are limitations for pasture and woodland.

Steepness is one of the main limiting factors for homesites. A seasonal high water table is the dominant limitation in Meadowville and Trego soils.

5. Elioak-Hazel-Meadowville association

Moderately deep to deep, moderately well drained to excessively drained soils on the tops and sides of ridges, along drainageways, and in deep depressions

Figure 3.—Brandywine-Eubanks-Lloyd association near Wolftown.

This association is characterized by moderately wide, gently sloping ridgetops; narrow, sloping to steep side slopes; and narrow, gently sloping bands along drainageways and in depressions. It occurs as two strips that extend in a northeast-southwest direction across the county. One strip, about one-half mile wide, extends from Banco to Wolftown. The other, about 5 miles wide, includes the communities of Oakpark, Radiant, and Uno.

This association makes up about 22 percent of the county. It is about 40 percent Elioak soils, 22 percent Hazel soils, 22 percent Meadowville soils, and 16 percent less extensive soils.

The deep, well-drained Elioak soils are on the tops and smooth sides of ridges. They have a fine sandy loam surface layer, a red clay loam subsoil, and a highly micaceous loamy substratum of highly weathered mica schist and graywacke sandstone.

The moderately deep, excessively drained Hazel soils are steeper than Elioak soils. They have a loam surface layer, a thin loam subsoil, and a substratum of highly weathered mica schist and graywacke sandstone.

The deep, well drained to moderately well drained Meadowville soils formed in colluvial material in depressions and along drainageways. They are underlain by residual mica schist or graywacke sandstone.

Of lesser extent in this association are the deep, well-drained Glenelg soils; the deep, well-drained to somewhat excessively drained Manor soils; the deep, poorly drained Worsham soils; and Rock land, acidic. Glenelg soils are on ridgetops and smooth slopes. Manor soils are sloping to moderately steep. Worsham soils are along drainageways and in depressions. Rock land, acidic, is rough and steep.

Approximately 45 percent of this association has been cleared for general farming. Elioak and Meadowville soils are suited to crops. Hazel soils are poorly suited because they are coarse textured and tend to be droughty.

Some of the association is limited for homesites by steep slopes, a seasonal high water table, or shallowness over hard rock. In places Elioak soils and the included Glenelg soils have few limitations.

6. Brandywine-Eubanks association

Deep, excessively drained to well drained soils on the tops and sides of ridges

This association is west of Novum, in the northern part of the county. The landscape is one of moderately narrow, gently sloping to sloping ridgetops and moderately steep to steep side slopes.

This association makes up about 2 percent of the county. It is about 31 percent Brandywine soils, 22 percent Eubanks soils, and 47 percent less extensive soils.

The deep, somewhat excessively drained to excessively drained Brandywine soils are on the rougher ridgetops and steeper side slopes. They have a fine gravelly loam surface layer and a thin subsoil and are underlain by coarse-grained, highly weathered granitic rock.

The deep, well-drained Eubanks soils are commonly on the smoother ridgetops. They have a fine gravelly loam surface layer and a red fine gravelly clay loam subsoil and are underlain by coarse-grained, highly weathered granitic rock.

Of lesser extent in this association are the deep, well drained to moderately well drained Meadowville soils; the deep, poorly drained to moderately well drained Alluvial land, mixed; and Rock land, acidic. Meadowville soils and Alluvial land, mixed, are along drainageways and in depressions.

Approximately 20 percent of this association has been cleared for general farming, but much of it has been abandoned because the soils are gravelly and generally droughty. Because the association is characteristically droughty, it is locally known as "The Desert."

Except in areas where the soils are too shallow over bedrock or slope is excessive, the association has few limitations for homesites. Contamination of ground water is a hazard in some areas if septic tanks are used.

7. Brandywine-Chester-Meadowville association

Deep, excessively drained to moderately well drained soils on the broad tops and the sides of ridges, along drainageways, and in depressions

This association is south of Novum, in the northern part of the county. The landscape is one of fairly broad, low ridges and sharp, steep slopes near drainageways and narrow colluvial strips along the drainageways.

This association makes up about 3 percent of the county. It is about 57 percent Brandywine soils, 13 percent Chester soils, 15 percent Meadowville soils, and 15 percent less extensive soils.

The deep, somewhat excessively drained to excessively drained Brandywine soils, Brandywine loam and the Brandywine part of the Chester-Brandywine complex, are rough and moderately steep. They have a loam surface layer, a thin subsoil, and a thick loamy substratum of highly weathered biotite gneiss or biotite granite. The deep, well-drained Chester part of the complex has a loam surface layer, a clay loam subsoil, and a substratum of highly weathered biotite granite.

The deep, well drained to moderately well drained Meadowville soils are in narrow bands along drainageways and in depressions. They have a loam surface layer, a light silty clay loam subsoil that formed in local colluvium, and a substratum of residual, highly weathered biotite gneiss and biotite granite.

Of lesser extent in this association are the deep, well-drained Eubanks and Lloyd soils and the Lloyd thin solum variant. All are on ridgetops and, in places, on smooth side slopes.

This association (fig. 4) is one of the better farming areas in the county. Approximately 60 percent of it has been cleared.

Except for slope, Chester soils have few limitations for homesites. If septic tanks are used, contamination of ground water is a hazard in Brandywine soils because they are coarse textured. A seasonal high water table is a limitation in Meadowville soils. Steep slopes are limitations for homesites in some other areas.

8. Cecil-Lloyd-Louisburg association

Deep and moderately deep, well-drained to excessively drained soils on the broad tops and the sides of ridges

This association occurs as a strip, about 3 miles wide, that parallels U.S. Route 29. The landscape is one of broad, gently sloping to sloping ridges and narrow, sloping to steep side slopes. The dominant soils formed in material weathered from granite and gneiss.

This association makes up about 10 percent of the county. It is about 30 percent Cecil soils, 25 percent Lloyd soils, 20 percent Louisburg soils, and 25 percent less extensive soils.

The deep, well-drained Cecil soils are on ridgetops and smooth side slopes. They have a fine sandy loam surface layer and a red clay subsoil.

The deep, well-drained Lloyd soils are on ridges and smooth side slopes. They have a loam surface layer and a red to dark-red clay subsoil.

The well-drained to excessively drained Louisburg soils are steeper than Cecil and Lloyd soils. They have a sandy loam surface layer and a thin subsoil.

Figure 4.—Brandywine-Chester-Meadowville association along Route 231, north of Madison. Droughty knoll at upper left is Brandywine soil.

Of lesser extent in this association are the deep, moderately well drained to somewhat poorly drained Colfax soils; the deep, poorly drained Worsham soils; the deep, well drained Starr soils; and the deep, well drained to moderately well drained Meadowville soils. Colfax soils are in saddles and on toe slopes adjacent to drainageways. The rest are in narrow strips along drainageways.

This association is one of the better farming areas in the county. Approximately 70 percent of it has been cleared.

Slope, a seasonal high water table, or shallowness over hard rock are the main limitations for homesites in this association.

9. Lloyd-Hazel-Elioak association

Deep and moderately deep, well-drained to excessively drained soils on the tops and sides of ridges

This association is southeast of Madison, in two northeast-southwest strips. The landscape is one of broad, gently sloping to sloping ridges and narrow, sloping to steep side slopes. The dominant soils formed in material weathered from schist and graywacke sandstone.

This association makes up 2 percent of the county. It is about 67 percent Lloyd soils, 15 percent Hazel soils, 12 percent Elioak soils, and 6 percent less extensive soils.

The deep, well-drained Lloyd and Elioak soils are on the tops and smooth sides of ridges. Lloyd soils have a fine sandy loam surface layer and a red to dark-red clay subsoil. Elioak soils have a fine sandy loam surface layer and a micaceous, red clay loam subsoil.

The moderately deep, excessively drained Hazel soils are on the rougher ridges and the steeper slopes. They have a loam surface layer and a thin subsoil.

Of lesser extent in this association are the deep, well drained to moderately well drained Meadowville soils; the deep, poorly drained Worsham soils; and the deep, well drained Glenelg, Cecil, and Appling soils. Meadowville and Worsham soils are along drainageways and in depressions. Glenelg, Cecil, and Appling soils are on the tops and smooth sides of ridges.

Approximately 60 percent of this association has been cleared. It is a good farming area, particularly in areas of Elioak and Lloyd soils. Hazel soils tend to be droughty.

Shallowness over hard rock and steep slopes are limitations for homesites on Hazel soils. A seasonal high water table is the main limitation in Worsham and Meadowville soils. A clayey subsoil is the main limitation in the other soils. Elioak soils are difficult to compact because the subsoil is micaceous.

10. Fauquier-Catoctin association

Deep and moderately deep, well drained and somewhat excessively drained soils on the tops and sides of ridges

The association is in the eastern part of the county, in a northeast-southwest strip about 1 mile wide. It extends from an area east of Uno to the intersection of U.S. Route 15 and County Route 614 near the Culpeper County line. The landscape is one of broad, rolling ridges and steep, narrow slopes. The dominant soils formed in material weathered from greenstone schist.

This association makes up about 2 percent of the county. It is about 56 percent Fauquier soils, 30 percent Catoctin soils, and 14 percent less extensive soils.

The deep, well-drained Fauquier soils are on the broader ridges and the smoother side slopes. They have a silt loam surface layer and a silty clay loam to silty clay subsoil.

The moderately deep, somewhat excessively drained Catoctin soils are on the narrow ridges and the rough, steep side slopes. They have a silt loam surface layer and a thin silty clay loam subsoil.

Of lesser extent in this association are the deep, well drained to moderately well drained Meadowville soils and the deep, poorly drained Worsham soils. Both are in narrow bands along drainageways and in depressions.

Approximately 65 percent of this association has been cleared. It is a good farming area, particularly for pasture and hay.

Except for slope, Fauquier soils have few limitations for homesites. Catoctin soils are limited by steep slopes and shallowness over hard rock. The other soils have a seasonal high water table.

11. Davidson-Bremo-Zion association

Deep and moderately deep, moderately well drained to somewhat excessively drained soils on the narrow tops and the sides of ridges

This rolling to hilly association occurs as three areas in the southeastern part of the county. The dominant soils formed in material weathered from basic rocks, such as greenstone, diabase, and hornblende gabbro.

The association makes up about 1 percent of the county. It is about 48 percent Davidson soils, 29 percent Bremo soils, 19 percent Zion soils, and 4 percent less extensive soils.

The deep, well-drained Davidson soils are on the smoother ridgetops and side slopes. They have a clay loam surface layer and a dark-red clay subsoil.

The moderately deep, somewhat excessively drained Bremo soils are in the steeper, rougher areas. They have a silt loam surface layer and a thin silt loam subsoil.

The moderately deep, well-drained Zion soils are on the broadest, flattest ridgetops. They have a silt loam surface layer and an extremely plastic subsoil that in a few places is mottled with gray in the lower part. They are underlain mainly by hornblende and gabbro.

Of lesser extent in this association are the deep, moderately well drained Iredell soils; the deep, poorly drained Elbert soils; the deep, well drained Starr soils; and the moderately deep, somewhat excessively drained Catoctin soils. Elbert and Iredell soils are on upland flats and in depressions. Starr soils are in narrow strips along drainageways. Catoctin soils are on side slopes.

Approximately 50 percent of this association has been cleared. The rest is mixed pine and hardwood forest. Davidson and Starr soils are suited to general farming. Zion, Bremo, Iredell, Elbert, and Catoctin soils are better suited to pasture.

The dominant soils are limited as homesites mainly by slope and shallowness over rock. Iredell, Elbert, and Zion soils have high shrink-swell clays that are poorly suited as building sites.

12. Rapidan-Penn-Bucks association

Deep and moderately deep, well-drained soils on the broad tops and the sides of ridges

This association is in the extreme eastern part of the county, in a northeast-southwest strip about 2 miles wide. The landscape is one of broad, low, gently sloping ridgetops and narrow, moderately steep slopes along the larger drainageways. The dominant soils formed in material weathered from red shale, sandstone, and conglomerate of the Triassic Basin.

This association makes up about 2 percent of the county. It is about 29 percent Rapidan soils, 13 percent Penn soils, 13 percent Bucks soils, and 45 percent less extensive soils.

The deep, well-drained Rapidan and Bucks soils are smooth and gently sloping to sloping. Rapidan soils have a loam surface layer and a red to dark-red clay subsoil. Bucks soils have a loam surface layer and a clay loam subsoil.

The moderately deep, well-drained Penn soils are on the steeper slopes. They have a silt loam surface layer and a light silty clay loam subsoil.

Of lesser extent in this association are the deep, moderately well drained Calverton and Creedmoor soils; the deep, well drained Mayodan soils; the well drained Lewisberry soils; and the well drained to moderately well drained Manassas soils. Calverton and Creedmoor soils are in saddles and on flats. Mayodan soils are on the tops and smooth sides of ridges. Lewisberry soils are on rough side slopes. They have a thin solum. Manassas soils are in narrow strips along drainageways. They have a moderately thick solum.

This association is one of the better farming areas in the county. Approximately 75 percent of it has been cleared.

Slope is a limitation for homesites on Bucks, Rapidan, and Mayodan soils. Shallowness over hard rock and, in many places, steep slopes are limitations in Penn and Lewisberry soils. A seasonal high water table is the dominant limitation in Calverton, Creedmoor, and Manassas soils.

Soils of the Flood Plains and River Terraces of the Piedmont Plateau

The soils in these associations are on flood plains and river terraces of the Piedmont Plateau. They formed in old and recent alluvium. Most areas in the associations are used for farming.

13. Hiwassee-Wickham-Roanoke association

Deep, well-drained and poorly drained soils on river terraces

This association is along the eastern side of the Robinson River, between Brightwood and Criglersville. The landscape is one of broad, nearly level to sloping river terraces that are broken by streams and valleys. The dominant soils formed in old alluvium that washed from other soils of the Piedmont Plateau and the Blue Ridge Mountains.

This association makes up about 1 percent of the county. It is about 67 percent Hiwassee soils, 18 percent Wickham clayey subsoil variant, 9 percent Roanoke soils, and 6 percent less extensive soils.

The deep, well-drained Hiwassee soils are at the higher elevations. They are generally more rolling than the other soils. They have a loam surface layer and a dark-red clay subsoil.

The deep, well-drained, nearly level to gently sloping Wickham clayey subsoil variant is on intermediate terraces. It has a loam surface layer and a clay subsoil.

The deep, poorly drained Roanoke soils are on low terraces and in depressions on the higher terraces. They have a silt loam surface layer and a silty clay loam to clay subsoil.

Of lesser extent in this association are the deep, moderately well drained Altavista soils; the deep, somewhat poorly drained Augusta soils; the deep, well drained Starr and Eubanks soils; and the deep, somewhat excessively drained to excessively drained Brandywine soils. Altavista and Augusta soils are on low stream terraces and in depressions in the higher terraces. Starr soils are in colluvial strips along drainageways. Eubanks and Brandywine

soils are in small areas on steeper slopes. They formed in material weathered from granite and gneiss.

Approximately 85 percent of this association has been cleared. Except for poor drainage in Roanoke and Augusta soils, it is one of the better upland farming areas in the county.

Except for slope, Hiwassee and Wickham soils have few limitations for homesites. The other soils are limited by slope or a seasonal high water table.

14. Chewacla-Congaree-Codorus association

Deep, well drained to somewhat poorly drained soils on flood plains

This association is on the flood plain along the larger creeks and rivers. The largest areas are along the Robinson and Rapidan Rivers. All the soils formed in recent alluvium.

This association makes up about 5 percent of the county. It is about 58 percent Chewacla soils, 20 percent Congaree soils, 12 percent Codorus cobbly subsoil variant, and 10 percent less extensive soils.

In most places the deep, well-drained Congaree soils are along the rivers. They are loamy throughout.

The deep, somewhat poorly drained Chewacla soils are adjacent to Congaree soils. They have a silt loam surface layer and subsoil and a loamy substratum.

The deep, moderately well drained to somewhat poorly drained Codorus cobbly subsoil variant also is on flood plains, along with Congaree and Chewacla soils. It has a loam surface layer and subsoil and a cobbly, sandy, and loamy substratum.

Of lesser extent in this association are the excessively drained Buncombe soils; the well drained to moderately well drained Meadowville soils; the deep, poorly drained Wehadkee soils; Alluvial land, cobbly; and Riverwash. Buncombe soils are on natural levees along riverbanks. Meadowville soils are on colluvial fans at the base of steep slopes. Wehadkee soils are in the lowest areas on the flood plain.

About 55 percent of this association has been cleared for general farming. Congaree soils and the drained Chewacla and Codorus soils are some of the best corn-producing soils in the county.

Flooding is a hazard and occurs at least once every 5 years. It is the dominant limitation for homesites and septic tank absorption fields.

Descriptions of the Soils

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

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

As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock land, acidic, and Alluvial land, mixed, for example, do not belong to a soil series, but nevertheless, are 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 is the capability unit and woodland group in which the mapping unit has been placed. The page for the description of each capability unit can be found 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 at the end of this survey, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*9*).[2]

Delineations and names on the detailed soil maps of Madison County do not exactly coincide with those shown on the published maps for adjoining Orange County, Rappahannock County, and Culpeper County. Such differences result from technical changes in naming and mapping soils and from changes in the concept of soil classification that have occurred since publication.

Albano Series

Soils in the Albano series are deep, nearly level, and poorly drained. They formed in residuum that weathered from Triassic sandstone and shale and in some local alluvial material.

In a representative profile the surface layer is grayish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 32 inches. The upper 5 inches is gray silty clay loam mottled with yellowish brown. The lower 19 inches is gray silty clay mottled with yellowish brown and olive yellow. The substratum is weathered shale about 16 inches thick. Hard shale bedrock is at a depth of 48 inches.

Unless limed, Albano soils are strongly acid or very strongly acid throughout. They have low available water capacity, but they tend to accumulate seepage from surrounding or adjacent areas. Permeability is slow. Organic-matter content is generally low, and natural fertility is medium. Runoff is generally slow.

The plant cover in most areas is water-tolerant grasses and trees. Some areas are used for pasture. Only a few areas are cultivated.

Representative profile of Albano silt loam about 2½ miles east of Locust Dale on the south side of State Road 614:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; moderate, fine and very fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

B1tg—8 to 13 inches, gray (10YR 6/1) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; friable; common fine roots; few thin clay films; few, fine, black concretions; strongly acid; clear, smooth boundary.

B2tg—13 to 32 inches, gray (N 5/0) silty clay; few to common, medium, distinct, yellowish-brown (10YR 5/6) and olive-yellow (2.5Y 6/8) mottles; moderate, medium and coarse, subangular blocky structure; firm, sticky, and plastic; few fine roots; common thin clay films; approximately 5 percent weathered shale fragments; strongly acid; clear, smooth boundary.

C—32 to 48 inches, weathered shale; gray (N 5/0) silty clay loam in cracks and crevices; shale is firm in place, but cuts easily with a spade; strongly acid; clear, wavy boundary.

R—48 inches, hard reddish-gray (10R 5/1) shale.

[2]Italic numbers in parentheses refer to Literature Cited, p. 142.

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

Soils	Acres	Percent
Albano silt loam	186	(1)
Alluvial land, mixed	359	.2
Alluvial land, cobbly	1,557	.7
Altavista loam, clayey subsoil variant, 0 to 2 percent slopes	292	.1
Altavista loam, clayey subsoil variant, 2 to 7 percent slopes	273	.1
Appling fine sandy loam, 2 to 7 percent slopes	280	.1
Appling fine sandy loam, 7 to 15 percent slopes	316	.2
Appling fine sandy loam, 7 to 20 percent slopes, eroded	415	.2
Appling fine sandy loam, very deep, 2 to 7 percent slopes	223	.1
Augusta silt loam, clayey subsoil variant	329	.2
Baile stony silt loam, 2 to 7 percent slopes	370	.2
Braddock and Thurmont loams, 2 to 7 percent slopes	560	.3
Braddock and Thurmont loams, 7 to 15 percent slopes	593	.3
Braddock and Thurmont loams, 15 to 25 percent slopes, eroded	198	(1)
Brandywine fine gravelly loam, 7 to 15 percent slopes	316	.2
Brandywine fine gravelly loam, 15 to 25 percent slopes	912	.4
Brandywine loam, very deep, 5 to 15 percent slopes	1,451	.7
Brandywine loam, very deep, 15 to 25 percent slopes	2,721	1.3
Brandywine loam, very deep, 25 to 45 percent slopes	2,029	1.0
Brandywine stony loam, very deep, 7 to 25 percent slopes	2,340	1.1
Brandywine stony loam, very deep, 25 to 50 percent slopes	8,386	4.0
Bremo silt loam, 7 to 15 percent slopes	310	.2
Bremo silt loam, 15 to 35 percent slopes	702	.3
Bucks loam, permeable substratum, 2 to 7 percent slopes, eroded	387	.2
Bucks loam, permeable substratum, 7 to 15 percent slopes eroded	148	(1)
Buncombe loamy fine sand	184	(1)
Calverton and Creedmoor silt loams, 0 to 7 percent slopes	414	.2
Catoctin silt loam, 7 to 15 percent slopes	402	.2
Catoctin silt loam, 15 to 45 percent slopes	861	.4
Cecil fine sandy loam, 2 to 7 percent slopes	2,232	1.1
Cecil fine sandy loam, 2 to 7 percent slopes, eroded	900	.4
Cecil fine sandy loam, 7 to 15 percent slopes	982	.5
Cecil fine sandy loam, 7 to 15 percent slopes, eroded	2,670	1.3
Cecil fine sandy loam, 15 to 25 percent slopes, eroded	350	.2
Cecil fine sandy loam, very deep, 2 to 7 percent slopes	1,270	.6
Cecil clay loam, 7 to 15 percent slopes, severely eroded	121	(1)
Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes	299	.1
Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes, eroded	169	(1)
Chester-Brandywine loams, very deep, 2 to 7 percent slopes	660	.3
Chester-Brandywine loams, very deep, 7 to 15 percent slopes	749	.4
Chester-Brandywine loams, very deep, 7 to 15 percent slopes, eroded	578	.3
Chester-Brandywine loams, very deep, 15 to 25 percent slopes	368	.2
Chewacla silt loam	6,709	3.2
Codorus loam, cobbly subsoil variant	1,480	.7
Colfax fine sandy loam, 2 to 10 percent slopes	430	.2
Colluvial land, very stony	821	.4
Colluvial land, extremely stony	7,050	3.4
Congaree fine sandy loam	1,231	.6
Congaree loam	1,091	.5
Davidson clay loam, 2 to 7 percent slopes, eroded	380	.2
Davidson clay loam, 7 to 15 percent slopes, eroded	733	.4
Davidson clay loam, 15 to 25 percent slopes, eroded	172	(1)
Dyke loam, 2 to 7 percent slopes	299	.1
Dyke loam, 7 to 15 percent slopes, eroded	517	.3
Dyke loam, 15 to 35 percent slopes, eroded	335	.2
Elbert silt loam	146	(1)
Elioak fine sandy loam, 2 to 7 percent slopes	2,850	1.4
Elioak fine sandy loam, 2 to 7 percent slopes, eroded	789	.4
Elioak fine sandy loam, 7 to 15 percent slopes	1,730	.8
Elioak fine sandy loam, 7 to 15 percent slopes, eroded	5,984	2.9
Elioak fine sandy loam, 15 to 25 percent slopes, eroded	1,150	.6
Elioak loam, 2 to 7 percent slopes	974	.5
Elioak loam, 2 to 7 percent slopes, eroded	689	.3
Elioak loam, 7 to 15 percent slopes, eroded	3,800	1.8
Elioak loam, 15 to 25 percent slopes, eroded	651	.3
Elioak silty clay loam, 7 to 15 percent slopes, severely eroded	613	.3
Elioak silty clay loam, 15 to 25 percent slopes, severely eroded	355	.2
Eubanks fine gravelly loam, 2 to 7 percent slopes	375	.2
Eubanks fine gravelly loam, 7 to 15 percent slopes	315	.2
Eubanks fine gravelly loam, 7 to 15 percent slopes, eroded	280	.1
Eubanks loam, very deep, 2 to 7 percent slopes	371	.2
Eubanks loam, very deep, 7 to 15 percent slopes, eroded	1,330	.6
Eubanks loam, very deep, 15 to 25 percent slopes, eroded	748	.4
Eubanks-Lloyd clay loams, 7 to 15 slopes, severely eroded	360	.2
Eubanks-Lloyd clay loams, 15 to 25 percent slopes, severely eroded	808	.4
Eubanks-Lloyd clay loams, 25 to 45 percent slopes, severely eroded	415	.2
Eubanks-Lloyd loams, 2 to 7 percent slopes	1,517	.7

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

Soils	Acres	Percent
Eubanks-Lloyd loams, 2 to 7 percent slopes, eroded	970	.5
Eubanks-Lloyd loams, 7 to 15 percent slopes	730	.4
Eubanks-Lloyd loams, 7 to 15 percent slopes, eroded	4,510	2.2
Eubanks-Lloyd loams, 15 to 25 percent slopes, eroded	2,250	1.1
Fauquier silt loam, 2 to 7 percent slopes	399	.2
Fauquier silty clay loam, 2 to 7 percent slopes, eroded	326	.2
Fauquier silty clay loam, 7 to 15 percent slopes, eroded	1,648	.9
Fauquier silty clay loam, 15 to 25 percent slopes, eroded	288	.1
Glenelg loam, 5 to 15 percent slopes, eroded	1,487	.7
Glenelg loam, 15 to 25 percent slopes, eroded	780	.4
Hazel loam, 7 to 15 percent slopes	1,280	.6
Hazel loam, 15 to 25 percent slopes	6,540	3.1
Hazel loam, 25 to 55 percent slopes	3,240	1.6
Hiwassee loam, 2 to 7 percent slopes	988	.5
Hiwassee loam, 2 to 7 percent slopes, eroded	416	.2
Hiwassee loam, 7 to 15 percent slopes, eroded	900	.4
Hiwassee loam, 15 to 25 percent slopes, eroded	153	[1]
Iredell silt loam, 2 to 7 percent slopes	143	[1]
Lewisberry sandy loam, 10 to 25 percent slopes	201	[1]
Lloyd fine sandy loam, 2 to 7 percent slopes	997	.5
Lloyd fine sandy loam, 7 to 15 percent slopes, eroded	1,899	.9
Lloyd fine sandy loam, 15 to 25 percent slopes, eroded	566	.3
Lloyd loam, 2 to 7 percent slopes	681	.3
Lloyd loam, 2 to 7 percent slopes, eroded	1,252	.6
Lloyd loam, 7 to 15 percent slopes, eroded	1,774	.9
Lloyd loam, thin solum variant, 2 to 7 percent slopes, eroded	241	.1
Lloyd loam, thin solum variant, 7 to 15 percent slopes, eroded	665	.3
Lloyd loam, thin solum variant, 15 to 25 percent slopes, eroded	227	[1]
Lloyd clay loam, 7 to 15 percent slopes, severely eroded	436	.2
Lloyd clay loam, 15 to 25 percent slopes, severely eroded	247	.1
Louisburg sandy loam, 5 to 15 percent slopes	1,492	.7
Louisburg sandy loam, 15 to 25 percent slopes	2,215	1.1
Louisburg sandy loam, 25 to 55 percent slopes	581	.3
Made land	81	[1]
Manassas silt loam, 2 to 7 percent slopes	307	.2
Manor silt loam, 7 to 20 percent slopes	226	[1]
Mayodan fine sandy loam, 2 to 7 percent slopes	406	.2
Mayodan fine sandy loam, 7 to 15 percent slopes, eroded	270	.1
Meadowville loam, 2 to 7 percent slopes	11,327	5.4
Meadowville loam, 7 to 15 percent slopes	962	.5
Myersville-Catoctin very stony silt loams, 7 to 15 percent slopes	1,895	.9
Myersville-Catoctin very stony silt loams, 15 to 25 percent slopes	1,392	.7
Myersville-Catoctin very stony silt loams, 25 to 45 percent slopes	1,337	.6
Penn loam, 5 to 15 percent slopes	314	.2
Penn loam, 15 to 25 percent slopes	236	.1
Porters very stony loam, 7 to 15 percent slopes	591	.3
Porters very stony loam, 15 to 25 percent slopes	2,234	1.1
Porters very stony loam, 25 to 50 percent slopes	14,753	7.1
Rapidan silt loam, 2 to 7 percent slopes	629	.3
Rapidan silty clay loam, 7 to 15 percent slopes, eroded	572	.3
Riverwash	603	.3
Roanoke silt loam	251	.1
Rock land, acidic	6,467	3.1
Rock land, basic	1,780	.9
Rock land, Myersville and Catoctin materials, moderately steep	3,172	1.5
Rock land, Myersville and Catoctin materials, steep	3,085	1.5
Rock land, Porters and Hazel materials, moderately steep	1,494	.7
Rock land, Porters and Hazel materials, steep	12,346	5.9
Rock outcrop	331	.2
Starr silt loam, 2 to 10 percent slopes	2,609	1.3
Trego loam, 2 to 10 percent slopes	534	.3
Tusquitee stony loam, 2 to 7 percent slopes	503	.2
Tusquitee stony loam, 7 to 15 percent slopes	1,496	.7
Tusquitee stony loam, 15 to 25 percent slopes	3,969	1.9
Tusquitee stony loam, 25 to 45 percent slopes	937	.5
Unison loam, 2 to 7 percent slopes	402	.2
Unison loam, 7 to 15 percent slopes	563	.3
Unison loam, 15 to 25 percent slopes	308	.2
Unison very stony silt loam, 7 to 15 percent slopes	225	.1
Unison very stony silt loam, 15 to 25 percent slopes	457	.2
Watt channery silt loam, 5 to 15 percent slopes	266	.1
Watt channery silt loam, 15 to 35 percent slopes	216	[1]
Wehadkee silt loam	408	.2
Wickham loam, clayey subsoil variant, 2 to 7 percent slopes	418	.2
Wickham loam, clayey subsoil variant, 7 to 15 percent slopes, eroded	131	[1]
Worsham loam, 2 to 7 percent slopes	1,212	.6
Zion silt loam, 2 to 7 percent slopes	305	.2
Zion silt loam, 7 to 15 percent slopes	148	[1]
Water	230	[1]
Total	209,280	100.0

[1] Less than 0.05 percent.

The solum ranges from 20 to 40 inches in thickness. Depth to hard bedrock ranges from 40 to 60 inches. The content of coarse fragments ranges from 0 to 10 percent in the solum.

The Ap horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 or 3. The B2t horizon has hue of 10YR or 2.5Y or neutral, value of 5 to 7, and chroma of 0 to 3. The Bt horizon is silty clay loam, silty clay, or clay. It has an average clay content of 35 to 50 percent in the upper 20 inches.

Albano soils are near or adjacent to Penn, Bucks, Lewisberry, Mayodan, Calverton, and Creedmoor soils. They are grayer throughout and more poorly drained than any of those soils.

Albano silt loam (Ab).—This soil is in small areas along drainageways, in depressions, and on flats at the heads of drainageways. Slopes are concave and range from 1 to about 4 percent.

Included with this soil in mapping were some areas where the surface layer is loam, a few areas where up to 8 inches of reddish-brown overwash material is on the surface, and a few areas where hard rock is within a depth of 40 inches. Also included were some areas where the soil is slightly better drained than is typical.

Runoff is slow, and the erosion hazard is slight. A seasonal high water table and slow permeability cause excessive wetness in winter and spring. Droughtiness is likely during extended dry periods in summer.

Drainage adequate for cultivated crops is difficult, and few areas are cultivated. The soil is suited to pasture if drained and fertilized. Seasonal wetness and slow permeability limit many nonfarm uses of this soil. Capability unit Vw-1; woodland group 4w.

Alluvial Land, Mixed

Alluvial land, mixed (Ac) is transported soil material deposited on flood plains along fairly large streams. It consists of varying amounts of stratified sand, silt, and clay. Locally, it has a high content of gravel below the plow layer. It is dominantly moderately well drained to somewhat poorly drained, but in some small areas it is excessively drained or poorly drained.

Flooding and a seasonal high water table are limitations. Most of the acreage is in woodland. Capability unit IIIw-1; woodland group 5.

Alluvial Land, Cobbly

Alluvial land, cobbly (Ad) is along fairly large streams in nearly level areas that are subject to frequent flooding. It consists of coarse sediments that are 30 to more than 50 percent cobbles and gravel. Soil material between the gravel and cobbles is mainly brown to strong brown in color and sandy to loamy in texture. This land is generally excessively drained to moderately well drained, but in some small areas it is somewhat poorly drained to poorly drained.

The high content of cobbles and gravel and the flood hazard make this land poorly suited to cultivated crops and to many other uses. About 60 percent of the acreage is mixed hardwood, hemlock, and pine forest. The rest is used mainly for pasture. Capability unit VIs-1; woodland group 5.

Altavista Series, Clayey Subsoil Variant

Soils recognized as the Altavista, clayey subsoil variant are deep, moderately well drained soils on stream terraces. They formed in mixed alluvial sediments of sand, silt, clay, and gravel that washed from other soils and rocks in the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is dark yellowish-brown loam about 11 inches thick. The subsoil is yellowish-brown clay to a depth of 26 inches. Below this, to a depth of 48 inches, it is brownish-yellow clay or clay loam that has common to many strong-brown, grayish-brown, light brownish-gray, and gray mottles. The substratum is strong-brown fine sandy loam that becomes coarser and more gravelly and cobbly with increasing depth.

The Altavista soils in Madison County have a finer textured subsoil than is typical for Altavista soils, and the subsoil is strongly acid to medium acid. Organic-matter content is low, and natural fertility is medium. Permeability is moderate, and available water capacity is medium.

About 90 percent of the acreage is used for general farm crops and pasture. The rest is wooded.

Representative profile of Altavista loam, clayey subsoil variant, 0 to 2 percent slopes, about 1 mile north of Hebron Church and about one-fourth mile east of the Robinson River:

Ap—0 to 11 inches, dark yellowish-brown (10YR 4/4) loam; moderate, fine and very fine, granular structure; friable; many fine roots; few fine mica flakes; medium acid; clear, smooth boundary.

B21t—11 to 26 inches, yellowish-brown (10YR 5/6) clay; moderate, fine and medium, subangular blocky structure; firm, slightly plastic and slightly sticky; many thin clay films; few fine roots; few fine mica flakes; medium acid; clear, smooth boundary.

B22t—26 to 36 inches, brownish-yellow (10YR 6/6) light clay; common, fine, distinct, strong-brown (7.5YR 5/6) and grayish-brown (2.5Y 5/2) mottles; moderate, medium, subangular blocky structure; firm, plastic and sticky; many thin clay films; few fine roots; common fine mica flakes; strongly acid; clear, smooth boundary.

B3t—36 to 48 inches, brownish-yellow (10YR 6/8) clay loam; many, medium, distinct, light brownish-gray (2.5Y 6/2), strong-brown (7.5YR 5/6), and gray (10YR 5/1) mottles; weak, coarse, subangular blocky structure; firm, sticky; few medium clay films; few fine pebbles; common fine mica flakes; strongly acid; clear, smooth boundary.

C1—48 to 54 inches, strong-brown (7.5YR 5/8) fine sandy loam; light brownish-gray (2.5Y 6/2) and gray (10YR 5/1) mottles; single grained; very friable; 15 percent rounded gravel; common fine mica flakes; strongly acid; clear, smooth boundary.

C2—54 to 72 inches, very gravelly and cobbly sandy loam, mottled with gray (10YR 5/1), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/6); 50 percent coarse fragments; common fine mica flakes; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to hard bedrock ranges from 4 to more than 15 feet. The content of coarse fragments ranges from 0 to 10 percent in the solum and from 5 to more than 50 percent in the underlying strata. Few to common mica flakes are throughout the profile.

The Ap horizon has hue of 7.5YR, 10YR, and 2.5Y; value of 4 to 7; and chroma of 1 to 6. It is dominantly loam, but ranges from fine sandy loam to silt loam. The Bt horizon is dominantly yellowish brown or brownish yellow and has hue of 7.5YR, 10YR, and 2.5Y; value of 4 to 8; and chroma of 3 or more. In the upper 24 inches it has mottles in chroma of 2 or less. It ranges from clay loam to clay and is 35 to 45 percent clay. The B3 horizon is sandy clay loam to clay loam typically mottled with gray. The C horizon is generally stratified with coarse-textured to fine-textured material.

Altavista soils, clayey subsoil variant, are commonly near the Wickham, clayey subsoil variant; the Augusta, clayey subsoil variant; the Hiwassee and Roanoke soils of stream terraces; and to a lesser extent the Congaree, Chewacla, and Wehadkee soils of the bottom land. They are more poorly drained than Wickham and Hiwassee soils and are better drained than Augusta and Roanoke soils. They are at higher elevations on the landscape and have a thicker and more clayey subsoil than Congaree, Chewacla, and Wehadkee soils.

Altavista loam, clayey subsoil variant, 0 to 2 percent slopes (A1A).—This soil has the profile described as representative of the series. Included in mapping were a few small areas where the surface layer is silt loam or fine sandy loam, a few small areas where a weak fragipan is at a depth of 20 to 30 inches, and some areas where gravel is on the surface and throughout the solum.

Runoff is slow, and the erosion hazard is slight. A water table is commonly at a depth of about 20 inches in winter and early in spring. A few low areas are subject to occasional flooding. The surface layer is friable and is easily tilled. Seasonal wetness is the dominant limitation for farming or other uses. Flooding

is a hazard in low areas. Capability unit IIw-2; woodland group 2o.

Altavista loam, clayey subsoil variant, 2 to 7 percent slopes (A1B).—This soil has a profile similar to the one described as representative of the series, but it has a slightly thinner surface layer. Included in mapping were a few small areas where the surface layer is yellowish-brown light clay loam, a few small areas where slopes are as much as 12 percent, small areas where a fragipan is in the subsoil, and a few places where gravel is on the surface and throughout the solum.

Runoff is slow to medium. The erosion hazard is moderate in cultivated areas. A water table is commonly at a depth of about 20 inches in winter and spring. The surface layer is friable and is easily tilled. Seasonal wetness, slope, and the erosion hazard limit some uses of this soil. Capability unit IIe-1; woodland group 2o.

Appling Series

The Appling series consists of deep and very deep, well-drained soils on uplands. The deep Appling soils formed in residuum derived from weathered granite and gneiss. The very deep soils formed in material weathered from graywacke sandstone.

In a representative profile the surface layer is dominantly light yellowish-brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 48 inches. The upper 4 inches is brownish-yellow sandy clay loam, the next 23 inches is yellowish-red clay, and the lower 12 inches is yellowish-red clay loam. The substratum to a depth of 74 inches is mottled saprolite of fine sandy loam texture. Depth to hard rock is greater than 5 feet.

Appling soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. Permeability is moderate, and available water capacity is medium.

About 50 to 65 percent of the acreage is woodland. The rest is used for general farm crops, mainly small grain, hay, and pasture.

Representative profile of Appling fine sandy loam, 2 to 7 percent slopes, in a wooded area on the west side of State Road 704, 1½ miles north of Brightwood:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; 2 to 5 percent angular quartz pebbles; strongly acid; clear, smooth boundary.

A2—2 to 9 inches, light yellowish-brown (10YR 6/4) fine sandy loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; 2 to 5 percent angular quartz pebbles; strongly acid; clear, smooth boundary.

B1t—9 to 13 inches, brownish-yellow (10YR 6/6) sandy clay loam; weak, fine, subangular blocky structure; friable; many fine roots; few thin clay films; few fine mica flakes; strongly acid; clear, smooth boundary.

B2t—13 to 36 inches, yellowish-red (5YR 5/8) clay; few, medium, faint, strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, subangular blocky structure; firm, slightly sticky and plastic; few fine roots; thin and medium continuous clay films; few fine mica flakes; strongly acid; clear, smooth boundary.

B3t—36 to 48 inches, yellowish-red (5YR 5/8) clay loam; many, medium, distinct, strong-brown (7.5YR 5/6), brownish-yellow (10YR 6/8), and red (2.5YR 4/6) mottles; weak, medium, subangular blocky structure; firm; few fine roots; many medium clay films; few fine mica flakes; strongly acid; clear, smooth boundary.

C—48 to 74 inches, yellowish-brown (10YR 5/6) fine sandy loam; yellow (10YR 7/6), white (10YR 8/1), and red (2.5YR 5/6) mottles; massive; friable; strongly weathered granite-gneiss saprolite.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock ranges from 5 to as much as 50 feet in places. In some areas a few angular quartz pebbles are on the surface and in the profile. Few to common mica flakes are throughout the B and C horizons.

The A horizon has hue of 2.5Y and 10YR, value of 5 to 7, and chroma of 3 to 8. The A1 horizon has value of 2 to 5 and chroma of 1 or 2. It is dominantly fine sandy loam, but in places ranges to coarse sandy loam. The B2t horizon ranges from yellowish red to yellowish brown in hue of 5YR to 10YR, value of 5 or 6, and chroma of 6 to 8. The Bt horizon is 35 to 55 percent clay. The lower part has common mottles high in value and chroma. The C horizon is multicolored, strongly weathered granitic rock that breaks easily to very friable sandy soil material.

Appling soils are commonly near Cecil, Lloyd, Louisburg, Elioak, Glenelg, Colfax, Worsham, and Hazel soils. They have a browner subsoil than Cecil and Lloyd soils. They have a thicker solum and a much higher clay content in the subsoil than Louisburg, Glenelg, and Hazel soils. They have less mica and a redder subsoil than Elioak soils. They are better drained than the nearby Colfax and Worsham soils.

Appling fine sandy loam, 2 to 7 percent slopes (ApB)—This soil is on narrow to moderately wide ridgetops. It has the profile described as representative of the series. The surface layer is about 9 inches thick, is very friable, and is easy to till.

Included with this soil in mapping were small areas where the surface layer is sandy clay loam, small areas where the solum is thinner than is typical, and small areas in depressions where the soil is more poorly drained. Also included were a few small areas where bedrock is at a depth of about 3 feet.

Runoff is slow to medium. The erosion hazard is moderate in cultivated areas. Permeability and slope limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 3o.

Appling fine sandy loam, 7 to 15 percent slopes (ApC).—This soil is similar to the one described as representative of the series, but the surface layer is only about 7 inches thick. Included in mapping were a few small areas where the surface layer is sandy clay loam.

Runoff is medium to rapid. The erosion hazard is severe in cultivated areas. Slope and permeability limit many nonfarm uses of this soil. Capability unit IIIe-1; woodland group 3o.

Appling fine sandy loam, 7 to 20 percent slopes, eroded (ApD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 6 inches thick. The plow layer is a mixture of the original surface layer and material from the subsoil. It is dominantly sandy loam, but ranges to fine sandy clay loam or clay loam in some small areas. A few shallow gullies have formed.

Runoff is medium to rapid. This soil is highly susceptible to erosion if used for cultivated crops. Slope and permeability limit many nonfarm uses of this soil. Capability unit IIIe-1; woodland group 3o.

Appling fine sandy loam, very deep, 2 to 7 percent slopes (ArB).—This soil has a profile similar to the one described as representative of the series, but it formed in material weathered from graywacke sandstone and is about 12 feet deep over bedrock. The surface layer is about 12 inches thick, is very friable, and is easily tilled. Angular quartz gravel is common in some areas.

Included with this soil in mapping were a few small areas where bedrock is at a depth of 4 to 8 feet and a few small areas where the surface layer is sandy clay loam or clay loam.

Runoff is slow to medium, and the soil is moderately susceptible to erosion if used for cultivated crops. Slope and permeability limit some nonfarm uses of this soil. About 75 percent of the acreage is wooded. Capability unit IIe-1; woodland group 3o.

Augusta Series, Clayey Subsoil Variant

The Augusta series, clayey subsoil variant, consists of deep, somewhat poorly drained soils on river terraces. These soils formed in alluvial deposits of sand, silt, clay, and gravel that washed from other soils and rocks of the Piedmont Plateau and the Blue Ridge Mountains. They differ from Augusta soils elsewhere in having a clayey subsoil.

In a profile representative of this variant, the surface layer is dark grayish-brown silt loam about 9 inches thick. The subsoil

extends to a depth of 47 inches. The upper 4 inches is yellowish-brown silty clay loam mottled with olive brown and grayish brown. The next 15 inches is light olive-brown clay that has many gray and yellowish-brown mottles. The lower 19 inches is gray clay mottled with yellowish brown. The substratum to a depth of 64 inches is gray to light-gray clay loam, generally high in content of fine to coarse gravel.

Augusta soils have a strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. The water table is within a depth of about 1 foot in winter and spring. Available water capacity is high.

Most of the acreage is used for pasture and hay. About 30 percent of the acreage is wooded.

Representative profile of Augusta silt loam, clayey subsoil variant, about 1¼ miles north of Hebron Church and ¼ mile east of the Robinson River:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, very fine and fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—9 to 13 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct mottles of olive brown (2.5Y 4/4) and grayish brown (10YR 5/2); weak, medium and fine, subangular blocky structure; friable to firm; few fine roots; few thin clay films; strongly acid; clear, smooth boundary.

B21tg—13 to 28 inches, light olive-brown (2.5Y 5/4) clay; common, fine, medium, distinct mottles of yellowish brown (10YR 5/6) and gray to light gray (5Y 6/1); moderate, medium and fine, subangular blocky structure; firm, sticky and plastic; few fine roots; many thin clay films; few fine mica flakes; few, fine, dark-brown concretions; strongly acid; clear, smooth boundary.

B22tg—28 to 47 inches, gray (N 5/0) clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, coarse, subangular blocky structure; firm, sticky and plastic; common thin clay films; few fine mica flakes; many, fine, brown concretions; strongly acid; clear, smooth boundary.

Cg—47 to 64 inches, gray to light-gray (5Y 6/1) clay loam streaked with dark gray and brownish yellow; massive; common fine mica; up to 40 percent fine to coarse gravel; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock ranges from about 4 to more than 15 feet. The content of fine to coarse gravel ranges from 0 to 10 percent in the solum and from 5 to more than 50 percent in the underlying strata. Few to common mica flakes are throughout the profile.

The Ap horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It is dominantly silt loam, but in a few places is loam and fine sandy loam. The B1t and B21t horizons are dominantly yellowish brown, light olive brown, grayish brown, pale yellow, or light brownish gray and have distinct mottles of light gray to dark gray. The B22tg horizon is dominantly gray to light gray and has high chroma mottles. The Bt horizon ranges from silty clay loam to clay and is 35 to 50 percent clay. The C horizon is stratified with coarse-textured to fine-textured material.

Augusta soils, clayey subsoil variant, are commonly near the Wickham clayey variant; the Altavista clayey variant; the Hiwassee and Roanoke soils; and to a lesser extent the Congaree, Chewacla, and Wehadkee soils of the bottom land. Augusta soils are grayer and more poorly drained than Hiwassee, Wickham, and Altavista soils. They are browner and better drained than Roanoke soils. They are at higher elevations and have a thicker and more clayey subsoil than Congaree, Chewacla, and Wehadkee soils.

Augusta silt loam, clayey subsoil variant (Au).—This nearly level soil is in narrow to broad areas on river terraces. Included in mapping were a few small areas where the surface layer is loam or fine sandy loam, some areas where a few pebbles are on the surface and throughout the solum, and a few small areas where the solum is as thin as 30 inches.

Runoff is slow, and the erosion hazard is slight. The water table is commonly at a depth of 8 to 12 inches in winter and early in spring. A few of the lowest areas are subject to occasional flooding. The surface layer is friable, but prolonged wetness often interferes with tillage.

Seasonal wetness is the dominant limitation for many nonfarm uses. Capability unit IIIw-2; woodland group 2w.

Baile Series

Soils in the Baile series are deep and poorly drained. They formed in material weathered from greenstone schist and granodiorite rock and in some local alluvium. They are in low wet areas on the Piedmont Plateau and the Blue Ridge Mountains. Reeds and mosses are common in undrained, cleared areas.

In a representative profile the surface layer is dominantly dark-gray stony silt loam about 9 inches thick. The subsoil extends to a depth of 36 inches. The upper 21 inches is gray silty clay loam that has many yellowish-brown and strong-brown mottles. The lower 6 inches is brown silt loam mottled with gray and strong brown. The substratum to a depth of 72 inches is mottled brown and gray loam and strongly weathered greenstone rock.

Baile soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. Permeability is moderately slow to slow in the subsoil. Available water capacity is medium to high.

Most of the acreage is wooded. A few areas have been cleared for pasture. The soils are poorly suited to cultivated crops because the water table is high.

Representative profile of Baile stony silt loam, 2 to 7 percent slopes, west of Skyline Drive, one-half mile east of Big Meadows Lodge:

A1g—0 to 1 inch, very dark gray (10YR 3/1) stony silt loam; weak, fine and very fine, granular structure; friable; many fine roots; 10 to 25 percent stone fragments; strongly acid; clear, smooth boundary.

A2g—1 to 9 inches, dark-gray (10YR 4/1) stony silt loam; moderate, fine, granular structure; friable; many fine and medium roots; 20 percent greenstone fragments; strongly acid; clear, smooth boundary.

B21tg—9 to 23 inches, gray (10YR 5/1) light silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure; friable, slightly plastic; many fine and medium roots; thin patchy clay films; 20 percent stone fragments; very strongly acid; clear, smooth boundary.

B22tg—23 to 30 inches, gray (10YR 5/1) light silty clay loam; many, coarse, distinct, brown (10YR 5/3) and strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; many thin clay films; many, fine, dark-brown concretions; 20 percent stone fragments; very strongly acid; clear, smooth boundary.

B3tg—30 to 36 inches, brown to dark-brown (7.5YR 4/4) heavy silt loam; many, medium, distinct, gray (10YR 5/1) and strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable, slightly sticky and slightly plastic; many, fine, dark-brown concretions; 25 percent greenstone fragments; strongly acid; clear, smooth boundary.

IIC—36 to 72 inches, mottled brown (7.5YR 5/4) and gray (10YR 5/1) loam and strongly weathered greenstone rock.

The solum ranges from 30 to 40 inches in thickness. Depth to hard bedrock is generally between 5 and 10 feet. The content of coarse fragments on the surface and throughout the solum ranges from 15 to 25 percent.

The A horizon is dominantly stony silt loam, but in places is stony loam. In cultivated areas the Ap horizon is gray to dark gray in hue of 10YR and 2.5Y, value of 4 to 6, and chroma of 0 or 1. A thin, very dark gray to black A1 horizon is common in forested areas. The B2t horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 0 or 1 and commonly has high-chroma mottling. It ranges from heavy silt loam to silty clay loam.The clay content is 20 to 35 percent.

Baile soils are commonly near Catoctin, Myersville, Unison, and Trego soils. They are grayer throughout and are more poorly drained than those soils.

Baile stony silt loam, 2 to 7 percent slopes (BaB).—This soil is along drainageways, in depressions, and on flats at the heads of drainageways.

Included with this soil in mapping were a few small areas where slopes are 0 to 2 percent, small areas where a weak fragipan is in the lower part of the subsoil, and small areas where the surface layer is browner than is typical. Also included were a few areas where the solum is about 24 to 48 inches thick.

Runoff is slow, and the erosion hazard is slight. Because the water table is high and permeability is moderately slow to slow,

this soil is poorly suited to cultivated crops. If adequately drained and fertilized, it is suited to pasture.

Seasonal wetness and moderately slow to slow permeability limit many nonfarm uses. Capability unit IVw-1; woodland group 1w.

Braddock Series

Soils in the Braddock series are deep and well drained. They are on foothills of the Blue Ridge Mountains and on uplands in the Piedmont. They formed in old colluvial deposits of soil and rock material that washed and rolled from higher areas.

In a representative profile the surface layer is yellowish-brown loam about 9 inches thick. The subsoil extends to a depth of 48 inches. It is dominantly red clay loam to clay. The substratum to a depth of 85 inches is mottled yellowish-red, strong-brown, white, black, and red loam saprolite.

Braddock soils have a strongly acid subsoil and are low in organic-matter content. They are low to medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

In the less sloping areas these soils are well suited to general farm crops. Steep areas are commonly wooded.

Representative profile of Braddock loam in an area of Braddock and Thurmont loams, 2 to 7 percent slopes, about 2 miles east of Wolftown on south side of State Road 662 at its junction with State Road 663:

Ap—0 to 9 inches, yellowish-brown (10YR 5/6) loam; moderate, fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary. 6 to 11 inches thick.

B1—9 to 13 inches, yellowish-red (5YR 5/6) light clay loam; weak, fine and very fine, subangular blocky structure; friable, slightly sticky and slightly plastic; thin patchy clay films; few fine roots; less than 2 percent weathered granitic and greenstone rock fragments; strongly acid; clear, smooth boundary. 4 to 6 inches thick.

B21t—13 to 38 inches, red (2.5YR 4/8) clay; moderate, fine and medium, subangular blocky structure; firm, sticky and slightly plastic; thin patchy clay films; 10 percent weathered greenstone and granitic rock fragments; strongly acid; gradual, smooth boundary. 11 to 15 inches thick.

B22t—38 to 48 inches, red (2.5YR 4/8) heavy clay loam; moderate, fine, subangular blocky structure; firm, sticky and slightly plastic; thin continuous clay films; 25 percent weathered greenstone and granitic rock fragments; strongly acid; clear, smooth boundary. 10 to 12 inches thick.

IIC—48 to 85 inches, mottled yellowish-red, strong-brown, white, red, and black granitic saprolite that crushes easily to loam; rock structure evident; friable; many mica flakes; strongly acid.

The solum ranges from 30 to 60 inches in thickness. Depth to hard bedrock ranges from about 5 to as much as 50 feet. Thickness of the colluvium ranges from about 3 to more than 20 feet. The content of coarse fragments ranges from 0 to about 25 percent in the A, B1, and B2 horizons and increases with increasing depth. Coarse fragments are subangular, rounded, or angular pebbles or cobbles of granite, quartzite, gneiss, greenstone, granodiorite, and similar rocks. In unlimed areas reaction is very strongly acid or strongly acid.

The Ap and A2 horizons have hue of 7.5YR or 10YR; value of 4, 5, or 6; and chroma of 3 to 8. In eroded areas the Ap horizon is commonly yellowish red (5YR 5/6). The A horizon is loam, fine sandy loam, or sandy loam and is gravelly, cobbly, stony, or very stony. The B2t horizon is dominantly red in hue of 2.5YR or 10R, value of 4 or 5, and chroma of 6 to 8. It is heavy clay loam, sandy clay, or clay and is cobbly or gravelly. The clay content is 35 to 50 percent. The B3t horizon has about the same range in color as the B2t horizon and is mottled or streaked in shades of red, yellow, or brown. It is generally coarser textured than the B2t horizon and commonly has a higher content of coarse fragments. In places the B horizon is underlain by what appears to be the surface layer of a buried soil. The IIC horizon is variegated yellowish-red, red, and reddish-yellow loamy soil material high in content of cobbles, stones, or gravel.

Braddock soils are commonly near Dyke, Trego, Thurmont, and Unison soils. They do not have the dark-red subsoil that is typical of Dyke soils. They have a redder subsoil than Thurmont and Unison soils and are better drained than Trego soils.

Braddock and Thurmont loams, 2 to 7 percent slopes (BcB).—About 55 percent of the total acreage of this mapping unit is Braddock soil and 45 percent is Thurmont soil. These soils are on uplands. Some areas are entirely Braddock soil, some are Thurmont soil, and some are both. The Braddock soil has the profile described as representative of the Braddock series. The Thurmont soil is described under the heading "Thurmont Series."

Included with these soils in mapping were small areas where a weak fragipan is at the contact of the colluvial and residual material. Also included were a few small areas where erosion has removed part of the original surface layer and the present surface layer is reddish-brown clay loam.

The surface layer of both soils is friable and easily tilled. Runoff is slow to medium. The erosion hazard is moderate if the soils are used for cultivated crops. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 2o.

Braddock and Thurmont loams, 7 to 15 percent slopes (BcC).—About 65 percent of the total acreage of this mapping unit is Braddock soil and 35 percent is Thurmont soil. These soils are on uplands. Some areas are entirely Braddock soil, some are Thurmont soil, and some are both.

Included with these soils in mapping were small eroded areas where the plow layer is a mixture of the original surface layer and material from the subsoil and is only about 6 inches thick. Also included were a few shallow gullies and a few small areas where the surface layer is reddish-brown clay loam.

Runoff is medium to rapid. The erosion hazard is severe if the soils are used for cultivated crops. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Braddock and Thurmont loams, 15 to 25 percent slopes, eroded (BcD2).—About 60 percent of the total acreage of this mapping unit is Braddock soil and 40 percent is Thurmont soil. These soils are on uplands. Some areas are entirely Braddock soil, some are Thurmont soil, and some are both.

Included with these soils in mapping were small severely eroded areas where the surface layer is red to reddish-brown clay loam. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if the soils are used for cultivated crops. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland group 2r.

Brandywine Series

The Brandywine series consists of deep, somewhat excessively drained to excessively drained soils that formed in material weathered from granite and granite gneiss. These soils are on uplands on the Piedmont Plateau.

In a representative profile the surface layer is dominantly brown fine gravelly loam about 11 inches thick. The subsoil, about 5 inches thick, is yellowish-brown fine gravelly loam mottled with strong brown. The substratum is multicolored fine gravelly loamy sand and strongly weathered granite about 38 inches thick. Hard granite bedrock is at a depth of about 54 inches.

Brandywine soils are strongly acid to very strongly acid and are low in organic-matter content. They are low to medium in natural fertility. Permeability is moderately rapid, and available water capacity is very low.

Most of the acreage is wooded. Some areas are used for pasture, and a few are cultivated.

Representative profile of Brandywine fine gravelly loam, 7 to 15 percent slopes, about 4 miles northwest of Haywood on

the west side of State Road 604 near the junction with State Road 606:

A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) fine gravelly loam; moderate, fine and very fine, granular structure; very friable; many fine and medium roots; 25 percent coarse fragments; strongly acid; clear, smooth boundary.

A2—2 to 11 inches, brown (7.5YR 5/4) fine gravelly loam; moderate, fine and very fine, granular structure; very friable; many fine and medium roots; 25 percent coarse fragments; strongly acid; clear, smooth boundary.

B2—11 to 16 inches, yellowish-brown (10YR 5/6) fine gravelly loam; many strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; many fine roots; 35 percent coarse fragments; strongly acid; clear, smooth boundary.

C1—16 to 28 inches, mixed yellowish-brown (10YR 5/6) and yellowish-red (5YR 4/6) fine gravelly loamy sand; rock-controlled structure; very friable; few fine roots; 40 percent coarse fragments; very strongly acid; gradual, smooth boundary.

C2—28 to 54 inches, mixed yellowish-brown (20YR 5/6), yellow (10YR 7/6), white (10YR 8/2), and black, (10YR 2/1) strongly weathered granite that easily crushes to fine gravelly loamy sand; about 50 percent coarse fragments; very strongly acid; clear, wavy boundary.

R—54 inches, hard coarse-grained granite; many blue and white quartz grains.

The solum ranges from 10 to 30 inches in thickness. Depth to bedrock ranges from 4 to 10 feet. The content of coarse fragments generally exceeds 30 percent throughout the profile.

The A2 horizon has hue of 10YR and 7.5 YR, value of 3 to 5, and chroma of 1 to 4. It is fine gravelly loam, loam, and stony loam. The B horizon ranges from about 4 to 12 inches in thickness and is fine gravelly loam, loam, and stony loam. It has value of 5 or 6 and chroma of 4 to 6.

Brandywine soils are near or adjacent to Chester, Eubanks, and Meadowville soils. They have a more gravelly profile and a thinner solum than those soils. They also differ in not having a Bt horizon.

Brandywine fine gravelly loam, 7 to 15 percent slopes (BdC).—This soil is on rolling uplands and on side slopes. It has the profile described as representative of the series.

Included with this soil in mapping were a few small areas where slopes are 2 to 7 percent, small areas where the soil is shallower over hard bedrock than is typical, and small areas where the subsoil is thin clay loam. Also included were a few areas of Rock outcrop.

Runoff is fairly slow, but the erosion hazard is severe if this soil is cultivated. Because the soil is droughty and has a high content of gravel, it is poorly suited to row crops. It is better suited to small grain, pasture, or trees. Droughtiness, moderately rapid permeability, and slope are the chief limitations. Capability unit IVe-2; woodland group 3f.

Brandywine fine gravelly loam, 15 to 25 percent slopes (BdD).—This soil has a profile similar to the one described as representative of the series, but it is slightly thinner. Included in mapping were a few small areas where hard rock is at a depth of less than 12 inches, a few areas where the subsoil is thin light clay loam, and a few areas of Rock outcrop.

Runoff is medium. The erosion hazard is very severe if this soil is cultivated. Because the soil is droughty, it is poorly suited to cultivated crops. It is better suited to pasture or trees. Slope is the dominant limitation. Capability unit VIe-2; woodland group 3f.

Brandywine loam, very deep, 5 to 15 percent slopes (BeC).—The profile of this soil differs from the one described as representative of the series in having a friable substratum 7 to 40 feet deep or more over hard bedrock and in not having a gravelly surface layer. Included in mapping were a few areas of Rock outcrop and a few areas where the subsoil is thin light clay loam.

Runoff is slow to medium. The erosion hazard is severe if this soil is cultivated. The soil is droughty and is poorly suited to most row crops. It is better suited to small grain, pasture, or trees. Droughtiness, moderately rapid permeability, and slope are the main limitations. Capability unit IVe-2; woodland group 3f.

Brandywine loam, very deep, 15 to 25 percent slopes (BeD).—The profile of this soil differs from the one described as representative of the series in having a friable substratum 7 to 40 feet deep or more over hard rock and in not having the high content of fine gravel in the surface layer. Included in mapping were a few areas of Rock outcrop and a few areas where the subsoil is light clay loam up to 6 inches thick.

Runoff is medium. The erosion hazard is very severe if this soil is cultivated. The soil is droughty and is poorly suited to most cultivated crops. It is better suited to small grain, pasture, or trees. Slope is the dominant limitation. Capability unit VIe-2; woodland group 3f.

Brandywine loam, very deep, 25 to 45 percent slopes (BeF).—The profile of this soil differs from the one described as representative of the series in having a friable substratum 7 to 40 feet deep or more over bedrock and in not having the high content of fine gravel in the surface layer. Included in mapping were a few small areas where the subsoil is light clay loam up to 6 inches thick, a few areas of Rock outcrop, and some small areas where the surface layer is high in content of very fine gravel.

Runoff is medium. The erosion hazard is severe if this soil is disturbed or exposed. Because the soil is steep and droughty, it is better suited to permanent grass or trees than to other crops. Slope is a major limitation. Capability unit VIIe-1; woodland group 3f.

Brandywine stony loam, very deep, 7 to 25 percent slopes (BnD).—The profile of this soil is similar to the one described as representative of the series, but the substratum is 7 to 30 feet thick or more and the surface layer is stony instead of gravelly. Coarse fragments in the surface layer are as much as 12 inches in diameter. Slopes are mainly 15 to 25 percent, but in some small areas they are 7 to 15 percent. Rock outcrop is common in a few areas. It is identified by a spot symbol on the soil map.

Included with this soil in mapping were a few small areas where the subsoil is strong-brown to red light clay loam up to 12 inches thick.

Runoff is medium. The erosion hazard is severe if the plant cover is disturbed. Because this soil is stony, sloping, and droughty, it is poorly suited to cultivated crops. It is suited to pasture or trees. Slopes and moderately rapid permeability are the chief limitations. Capability unit VIe-2; woodland group 3f.

Brandywine stony loam, very deep, 25 to 50 percent slopes (BnF).—The profile of this soil differs from the one described as representative of the series. The substratum is 7 to 30 feet deep or more over bedrock, and the surface layer is stony instead of gravelly. Coarse fragments in the surface layer are as much as 12 inches in diameter. Rock outcrop is common in a few areas. It is identified by a spot symbol on the soil map.

Included with this soil in mapping were a few small areas where the subsoil is strong-brown to red light clay loam up to 12 inches thick and small areas where slopes are greater than 50 percent.

Runoff is medium. The erosion hazard is severe if this soil is disturbed or exposed. Stoniness, steep slopes, and droughtiness limit the use of this soil for cultivated crops and also limit nonfarm uses. Only a few small areas are cleared and used for pasture. The rest is wooded. Capability unit VIIe-1; woodland group 3f.

Bremo Series

Soils in the Bremo series are moderately deep and somewhat excessively drained. They are on the Piedmont Uplands. They

549-665 O - 75 - 2

formed in material weathered from hornblende gabbro and similar dark-colored rocks.

In a representative profile the surface layer is yellowish-brown silt loam about 7 inches thick. The subsoil is mottled strong-brown gravelly silt loam about 5 inches thick. The substratum is about 14 inches thick. It is mottled reddish-yellow, yellowish-red, black, and strong-brown silt loam mixed with strongly weathered hornblende gabbro. Hard bedrock is at a depth of 26 inches.

Bremo soils have a strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. They have low available water capacity and moderately rapid to rapid permeability.

These soils are mainly used for wood production. A few acres are used for pasture.

Representative profile of Bremo silt loam, 7 to 15 percent slopes, about 1½ miles east of Radiant and three-fourths of a mile north of State Road 684:

Ap—0 to 7 inches, yellowish-brown (10YR 5/4) silt loam; moderate, very fine, granular structure; friable; many fine roots; 10 percent fine gravel; strongly acid; clear, smooth boundary.

B—7 to 12 inches, strong-brown (7.5YR 5/6) gravelly silt loam; many, medium, brownish-yellow (10YR 6/6) mottles; weak, fine, subangular blocky structure; friable; common, fine, black concretions; many fine roots; 20 percent coarse fragments; strongly acid; clear, smooth boundary.

C—12 to 26 inches, variegated reddish-yellow (7.5YR 6/8), strong-brown (7.5YR 5/6), black (N 2/0), and yellowish-red (5YR 4/6) silt loam in rock structure; mixed with strongly weathered hornblende gabbro; crevices in rock material; strongly acid; diffuse, irregular boundary.

R—26 inches, dark-colored hornblende gabbro bedrock.

The solum ranges from about 12 to 20 inches in thickness. Depth to bedrock ranges from 20 to 40 inches. The content of coarse fragments ranges from 10 to 30 percent in the upper horizons and increases with increasing depth to 60 percent or more in the C horizon. Coarse fragments are weathered fragments of parent rock and quartz.

The Ap horizon has value of 4 to 5 and chroma of 4 to 8. It is dominantly silt loam, but in places is loam, gravelly silt loam, and gravelly loam. The A1 horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 2 to 4. The B horizon ranges from gravelly silt loam to gravelly heavy silt loam. It has value of 4 to 5 and chroma of 4 to 8. In places it contains thin discontinuous lenses of silty clay loam.

Bremo soils are near or adjacent to Iredell, Zion, Lloyd, and Davidson soils. They are not so deep over rock as those soils, and they do not have a Bt horizon of clay accumulation.

Bremo silt loam, 7 to 15 percent slopes (BrC).—This soil is on the tops and sides of narrow ridges. It has the profile described as representative of the series.

Included with this soil in mapping were a few small areas where slopes are 2 to 7 percent, a few small areas where the subsoil is thin and clayey, and a few areas where bedrock is at a depth of less than 20 inches. Also included were a few areas of Rock outcrop and some areas where coarse fragments are common on the surface.

Runoff is medium. The erosion hazard is very severe if this soil is farmed. Because the soil is droughty and shallow over rock, it is poorly suited to row crops. It is better suited to small grain, grass, and trees. Slope and shallowness over bedrock limit many nonfarm uses of this soil. Capability unit IVe-2; woodland group 3d.

Bremo silt loam, 15 to 35 percent slopes (BrE).—This soil has a profile similar to the one described as representative of the series, but it is only about 24 inches deep over bedrock. Areas are medium to small in size.

Included with this soil in mapping were a few small areas where the subsoil is thin and clayey, a few small areas where bedrock is at a depth of less than 20 inches, and some areas where coarse fragments are common on the surface. Also included were a few areas of bedrock outcrop. A few shallow and moderately deep gullies have formed.

Runoff is rapid, and the erosion hazard is very severe. Because this soil is droughty, steep, and shallow over bedrock, it is poorly suited to cultivated crops. It is suited to pasture or trees. Slope and shallowness over rock limit many nonfarm uses of this soil. Capability unit VIe-2; woodland group 3d.

Bucks Series

The Bucks series consists of deep, well-drained soils on the Triassic uplands. These soils formed in material weathered from trap conglomerate, red shale, and sandstone. They differ from Bucks soils elsewhere in having a more permeable substratum.

In a representative profile the surface layer is dark-brown loam about 9 inches thick. The subsoil extends to a depth of 36 inches. The upper 23 inches is dark reddish-brown clay loam. The lower 4 inches is yellowish-red clay loam mottled with strong brown, red, and reddish brown. The substratum to a depth of 70 inches is a mixture of loamy soil material and strongly weathered shale and conglomerate rock.

Bucks soils are mostly strongly acid and are low in organic-matter content and natural fertility. They have a moderately permeable subsoil and a rapidly permeable substratum. Available water capacity is mostly medium.

The acreage is about equally divided between crops or pasture and woodland.

Representative profile of Bucks loam, permeable substratum, 2 to 7 percent slopes, near Locust Dale about one-half mile east of Route 15 on the south side of State Road 671:

Ap—0 to 9 inches, dark-brown (7.5YR 4/2) loam; moderate, fine and very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—9 to 14 inches, dark reddish-brown (5YR 3/3) light clay loam; dark-brown (7.5YR 3/2) mottles; weak, fine, subangular blocky structure; friable; many fine roots; few thin clay films; few fine pebbles; strongly acid; clear, smooth boundary.

B2t—14 to 32 inches, dark reddish-brown (5YR 3/4) clay loam; moderate, fine and medium, subangular blocky structure; firm; many fine roots; thin continuous clay films; few fine pebbles; strongly acid; gradual, smooth boundary.

B3t—32 to 36 inches, yellowish-red (5YR 4/6) clay loam; many, medium, reddish-brown (2.5YR 4/4), strong-brown (7.5YR 5/6), and red (2.5YR 4/6) mottles; weak, medium, subangular blocky structure; friable; few thin clay films; strongly acid; gradual, smooth boundary.

C—36 to 70 inches, mottled dark reddish-brown (5YR 3/4), brown (7.5YR 4/4), and brownish-yellow (10YR 6/6) loamy soil material mixed with strongly weathered shale and sandstone trap conglomerate; friable; strongly acid.

The solum ranges from 20 to 40 inches in thickness and from 0 to 10 percent in content of coarse fragments. Depth to hard bedrock ranges from about 5 to 15 feet. The Ap horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 2 to 4. It is typically loam, but ranges to sandy loam. The B2t horizon has hue of 2.5YR to 7.5YR, value of 3 to 6, and chroma of 2 to 6. It ranges from clay loam to silty clay loam and has a clay content of 25 to 35 percent.

Bucks soils are near or adjacent to Rapidan, Penn, and Mayodan soils. They have a less clayey subsoil than Rapidan soils. They have a thicker solum than Penn soils. They are redder throughout than Mayodan soils.

Bucks loam, permeable substratum, 2 to 7 percent slopes (BsB).—This soil is on low ridgetops and gentle side slopes. It has the profile described as representative of the series.

Included with this soil in mapping were a few small areas where the solum is thicker than is typical and other small areas where it is thinner. Also included were a few small areas where the soil formed in material weathered from baked shale and the soil is grayer throughout, the subsoil is more sticky and plastic, and depth to bedrock is about 4 feet. Also included were a few small areas where some surface soil has been lost through erosion and the plow layer is slightly more clayey.

Runoff is slow to medium. The erosion hazard is moderate if this soil is farmed. The soil is well suited to cultivated crops, and crops respond well to management. Slope limits many nonfarm uses. Capability unit IIe-1; woodland group 3o.

Bucks loam, permeable substratum, 7 to 15 percent slopes, eroded (BsC2).—This soil has a profile similar to the one described as representative of the series, but is generally thinner throughout. The surface layer is only about 6 inches thick.

Included with this soil in mapping were a few small areas where the solum is either thinner or thicker than is typical. A few shallow gullies have formed.

Runoff is medium. The erosion hazard is severe if this soil is farmed. The soil is fairly well suited to all cultivated crops commonly grown in the county. Slope is the dominant limitation for many nonfarm uses of this soil. Capability unit IIIe-1; woodland group 3o.

Buncombe Series

The Buncombe series consists of deep, excessively drained soils on flood plains. These soils formed in sandy alluvial sediments that washed from other soils of the Piedmont and Blue Ridge Mountains.

In a representative profile the surface layer is brown loamy fine sand about 12 inches thick. The next layer is 21 inches of strong-brown loamy fine sand. Below this is 11 inches of strong-brown fine sandy loam. At a depth of 54 inches is stratified sand and gravel.

Buncombe soils are strongly acid to medium acid. They are low in organic-matter content and in natural fertility. Permeability is rapid, and the available water capacity is low.

These soils are used about equally for woodland and for crops or pasture.

Representative profile of Buncombe loamy fine sand near the Rapidan River, one-half mile west of Madison Mills:

Ap—0 to 12 inches, brown (10YR 5/3) loamy fine sand; weak, very fine, granular structure; loose; many fine roots; few fine mica flakes; medium acid; clear, smooth boundary.

C1—12 to 43 inches, strong-brown (7.5YR 5/6) loamy fine sand; single grained; loose; common fine roots; lenses of medium and coarse sand up to 3 inches thick; common fine mica flakes; medium acid; abrupt, smooth boundary.

C2—43 to 54 inches, strong-brown (7.5YR 5/6) fine sandy loam; single grained; very friable; few fine roots; common fine mica flakes; medium acid; clear, smooth boundary.

C3—54 to 66 inches, stratified gravel and coarse sand; medium acid.

Depth to hard bedrock is generally more than 10 feet. Stratified layers of variably sized pebbles are common below a depth of 40 inches. Mica flakes are few to many throughout the profile.

The A horizon has hue of 2.5Y or 10YR, value of 3 to 5, and chroma of 2 to 6. The C horizon has hue of 2.5Y to 7.5YR, value of 2 to 8, and chroma of 2 to 6. The A and C horizons to a depth of about 40 inches are dominantly loamy fine sand or sand. The clay content is less than 10 percent.

Buncombe soils commonly are near or adjacent to Congaree, Chewacla, and Wehadkee soils. They are coarser textured throughout than those soils. They have a paler surface layer than Congaree soils, and they lack the gray colors of Chewacla and Wehadkee soils.

Buncombe loamy fine sand (Bu).—This soil is in narrow strips on flood plains along the larger streams. Slopes are mainly 0 to 2 percent, but range to 4 percent in a few places.

Included with this soil in mapping are a few small areas where as little as 16 inches of loamy fine sand overlies loamy sediments and a few small areas where some gravel is on the surface and throughout the profile.

Flooding is frequent to very frequent, and new sediments are generally added during each flood. Internal drainage is excessive, and runoff is slow. Drought is likely in summer unless rains are timely. Flooding is a serious limitation. This soil is poorly suited to corn because available water capacity is low. Capability unit IIIs-1; woodland group 2o.

Calverton Series

Soils in the Calverton series are deep, moderately well drained to somewhat poorly drained soils of the Triassic uplands. The Calverton soils in Madison County are dominantly moderately well drained. They formed in material weathered from shale and sandstone and in some places in local alluvium.

In a representative profile the surface layer is dominantly yellowish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 44 inches. The upper 16 inches is brownish-yellow silty clay loam mottled with yellowish brown, strong brown, and pinkish gray. The lower 20 inches is a firm fragipan of strong-brown silt loam mottled with yellowish red and pinkish gray. The substratum to a depth of 62 inches is weathered shale mixed with silty clay loam.

Calverton soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. The fragipan is slowly permeable. Available water capacity is medium.

The acreage is divided about equally between woodland and pasture or hay. A few areas are cultivated.

The Calverton soils in Madison County are mapped only with Creedmoor soils.

Representative profile of Calverton silt loam in an area of Calverton and Creedmoor silt loams, 0 to 7 percent slopes, about 2 miles east of U.S. Highway 15 on the north side of State Road 671:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

A2—1 to 8 inches, yellowish-brown (10YR 5/6) silt loam; moderate, fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

B2t—8 to 24 inches, brownish-yellow (10YR 6/6) silty clay loam; few, fine, faint mottles of yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6); few, medium and coarse, distinct, pinkish-gray (7.5YR 6/2) mottles in lower part; moderate, medium and fine, subangular blocky structure; friable, slightly sticky; many fine roots; few thin clay films; strongly acid; clear, smooth boundary.

Bx—24 to 44 inches, strong-brown (7.5YR 5/6) heavy silt loam mottled with yellowish red (5YR 5/6) and pinkish gray (7.5YR 6/2); moderate, medium, platy structure; hard, firm, and brittle; strongly acid; gradual, smooth boundary.

C—44 to 62 inches, mottled reddish-brown (5YR 4/3) and reddish-gray (5YR 5/2) weathered Triassic shale mixed with gray (10YR 5/1) and white (10YR 8/2) silty clay loam in crevices.

The solum ranges from 35 to 50 inches in thickness. Depth to hard bedrock ranges from 40 to 60 inches or more. The A2 horizon has hue of 5Y to 10YR, value of 5 to 7, and chroma of 3 to 6. The A horizon is commonly silt loam, but in a few places is loam. The Bt horizon has hue of 2.5Y to 10YR, value of 5 to 7, and chroma of 6 or 8. It ranges from heavy silt loam to silty clay loam. The Bx horizon is weakly to strongly expressed and ranges from 6 to 30 inches in thickness. The lower part of the Bt horizon and the Bx horizon commonly have mottles of chroma 2 or less.

Calverton soils are near or adjacent to Bucks, Creedmoor, Mayodan, and Penn soils. In contrast with Bucks, Mayodan, and Penn soils, they have a fragipan and are more poorly drained. They do not have the plastic clay subsoil that is typical of Creedmoor soils.

Calverton and Creedmoor silt loams, 0 to 7 percent slopes (CbB).—About 55 percent of the total acreage of this mapping unit is Calverton soil and 45 percent is Creedmoor soil. These soils are on the Triassic uplands. Some areas are entirely Calverton soil, some are Creedmoor soil, and some are both. The Calverton soil has the profile described as representative of the Calverton series. The Creedmoor soil is described under the heading "Creedmoor Series."

Included with these soils in mapping were a few small areas where the surface layer is loam, a few areas where hard bedrock is within a depth of 20 inches, and a few small areas where the soils formed in residuum weathered from baked shale. In these included areas the profile is gray throughout. Also included were a few small areas where slopes are as much as 10 percent.

Runoff is slow to medium, and the erosion hazard is slight to moderate. Because the water table is perched in winter and spring, these soils are wet. They are suited to cultivated crops. Artificial drainage is needed for optimum crop production. Slow permeability, a seasonal high water table, and shallowness over bedrock are the dominant limitations. Capability unit IIIw-2; woodland group 3w.

Catoctin Series

The Catoctin series consists of moderately deep, well drained to somewhat excessively drained soils on the Piedmont Uplands. These soils formed in material weathered from greenstone schist.

In a representative profile the surface layer is brown silt loam about 6 inches thick. The subsoil is yellowish-red silty clay loam 6 inches thick. The substratum is yellowish-brown silt loam mixed with strongly weathered greenstone schist. Hard greenstone schist is at a depth of 27 inches.

Unless limed, Catoctin soils are mainly medium acid throughout. They are low in organic-matter content and medium in natural fertility. Available water capacity is medium to low, and permeability is moderately rapid.

The rolling soils are used largely for pasture. The steep soils are used largely for woodland.

Representative profile of Catoctin silt loam, 7 to 15 percent slopes, approximately 1 mile north of Liberty Mill on the west side of State Route 641 at the junction of State Route 620:

Ap—0 to 6 inches, brown (7.5YR 4/4) silt loam; weak, fine, granular structure; friable; many fine roots; few to common, fine, greenstone fragments; medium acid; clear, smooth boundary.

B&Bt—6 to 12 inches, yellowish-red (5YR 4/6) silty clay loam; weak, fine and medium, subangular blocky structure; friable; discontinuous areas have common thin clay films; many fine roots; common to many greenstone fragments; slightly acid; clear, smooth boundary.

C—12 to 27 inches, yellowish-brown (10YR 5/4) silt loam and highly weathered greenstone schist fragments streaked with strong brown and black; many fine rock fragments; slightly acid; diffuse, irregular boundary.

R—27 inches, hard greenstone schist rock.

The solum ranges from 12 to about 20 inches in thickness. Depth to hard bedrock is 20 to 38 inches. The content of coarse fragments in the B and C horizons is more than 35 percent. The Ap horizon has hue of 7.5YR and 10YR, value of 3 to 5, and chroma of 2 to 4. It is largely silt loam, but ranges to loam and light silty clay loam. The B horizon has hue of 7.5YR and 5YR, value of 4 and 5, and chroma of 4 to 8. It ranges from silt loam to silty clay loam.

Catoctin soils are near or adjacent to Fauquier, Rapidan, Myersville, and Meadowville soils. They have a thinner solum and are shallower over bedrock than those soils.

Catoctin silt loam, 7 to 15 percent slopes (CcC).—This soil is on the tops and sides of narrow ridges. It has the profile described as representative of the series.

Included with this soil in mapping were a few small areas where the surface layer is loam or light silty clay loam, and a few areas of Rock outcrop. A few shallow gullies have formed.

Runoff is medium. The erosion hazard is very severe in cultivated areas. Shallowness over hard rock and droughtiness make this soil poorly suited to row crops. The soil is better suited to small grain or pasture. The shallowness over rock and the slope limit many nonfarm uses. Capability unit IVe-2; woodland group 4d.

Catoctin silt loam, 15 to 45 percent slopes (CcE).—This soil has a profile similar to the one described as representative of the series, but the solum is only about 8 inches thick. The many rock outcrops are identified by spot symbols on the soil map. A few shallow gullies have formed.

Runoff is rapid, and the erosion hazard is very severe. The soil is better suited to permanent grass or trees than to other crops. Slope is the dominant limitation for most nonfarm uses. Capability unit VIIe-1; woodland group 4d.

Cecil Series

Soils in the Cecil series are deep and very deep and well drained. The deep soils formed in material weathered from gneiss and granite. The very deep soils formed in material weathered from graywacke sandstone. All are on the Piedmont Uplands.

In a representative profile the surface layer is dominantly yellowish-brown fine sandy loam about 10 inches thick. The subsoil extends to a depth of 51 inches. In sequence downward it is 4 inches of yellowish-red sandy clay loam; 26 inches of red, firm clay; and 11 inches of red sandy clay loam mottled with reddish yellow. The substratum is red fine sandy loam that is mottled with yellowish red and white and is mixed with strongly weathered granitic rock. Hard granite bedrock is at a depth of 92 inches.

Cecil soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is moderately permeable. Available water capacity is moderate.

A large acreage is woodland. The rest is used for general crops, mainly hay and pasture.

Representative profile of Cecil fine sandy loam, 2 to 7 percent slopes, about 2 miles northwest of Brightwood on the west side of State Road 639:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, fine and very fine, granular structure; very friable; matted with fine roots; strongly acid; clear, smooth boundary.

A2—1 to 10 inches, yellowish-brown (10YR 5/4) fine sandy loam; moderate, fine and very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—10 to 14 inches, yellowish-red (5YR 5/6) sandy clay loam; weak, fine, subangular blocky structure; friable; common fine roots; few thin clay films; strongly acid; clear, smooth boundary.

B21t—14 to 29 inches, red (2.5YR 4/6) clay; moderate, fine, subangular blocky structure; firm; few fine mica flakes; few fine roots; many thin clay films; strongly acid; clear, smooth boundary.

B22t—29 to 40 inches, red (2.5YR 4/6) clay; moderate, fine, angular blocky structure; firm; few fine mica flakes; few fine roots; many thin and medium clay films; strongly acid; clear, smooth boundary.

B3—40 to 51 inches, red (2.5YR 4/6) sandy clay loam mottled with reddish yellow (5YR 6/8); weak, medium, subangular blocky structure; friable; few fine mica flakes; strongly acid; gradual, smooth boundary.

C—51 to 92 inches, red (2.5YR 4/6) fine sandy loam; many, medium, distinct, yellowish-red (5YR 5/8) and white (10YR 8/2) mottles; rock structure evident; common rock fragments; common fine mica; strongly acid; diffuse, irregular boundary.

R—92 inches, hard, partially weathered, light-colored granite rock.

The solum ranges from 40 to 60 inches in thickness, but averages 51 inches. Depth to bedrock ranges from 5 to more than 10 feet. A few angular quartz pebbles are on the surface and in the solum. Few to common mica flakes occur throughout the subsoil and substratum.

The Ap horizon has hue of 10YR and 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is commonly fine sandy loam, but ranges to sandy loam and loam. In severely eroded areas it is clay loam or sandy clay loam. The B2t horizon has hue of 2.5YR or 10R, value of 4 or 5, and chroma of 6 to 8. The Bt horizon is 35 to 60 percent clay. The lower part of the B horizon and the C horizon commonly have high chroma mottles.

Cecil soils are near or adjacent to Appling, Lloyd, Colfax, Worsham, and Louisburg soils. They are redder than Appling soils, but are not so dark red as Lloyd soils. They are redder and have a much thicker and finer textured subsoil than Louisburg and Hazel soils. They are better drained than Colfax and Worsham soils. The very deep Cecil soils are near Elioak and Hazel soils. They are similar in color to Elioak soils, but in contrast have a thicker solum, a higher clay content in the subsoil, and less mica throughout their profile.

Cecil fine sandy loam, 2 to 7 percent slopes (CeB).—This soil is on narrow to moderately wide ridgetops. It has the profile described as representative of the series. The surface layer is about 10 inches thick, is very friable, and is easily tilled. In some areas a few angular quartz pebbles are on the surface and throughout the profile.

Included with this soil in mapping were small areas where the surface layer is fine sandy clay loam, small areas where the solum is thinner than typical, and small areas that are slightly less well drained.

Runoff is slow to medium. The erosion hazard is moderate in cultivated areas. Slope and moderate permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 3o.

Cecil fine sandy loam, 2 to 7 percent slopes, eroded (CeB2).—This soil has a profile similar to the one described as representative of the series, but in most places the surface layer is less than 8 inches thick. In plowed fields the surface layer is yellowish brown or yellowish red as a result of soil loss through erosion and the mixing of material from the subsoil with the surface layer. The surface layer is ordinarily friable and easy to till. In severely eroded spots it is firm.

Included with this soil in mapping were some small severely eroded areas where the plow layer is mainly red fine sandy clay loam to clay.

Runoff is medium. The erosion hazard is moderate in cultivated areas. Slope and moderate permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 3o.

Cecil fine sandy loam, 7 to 15 percent slopes (CeC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is slightly thinner, generally no more than 8 inches thick. The surface layer is friable and easy to till.

Runoff is medium to rapid. The erosion hazard is severe in cultivated areas. Slope and moderate permeability limit some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 3o.

Cecil fine sandy loam, 7 to 15 percent slopes, eroded (CeC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 6 inches thick and is not so friable as that of the uneroded Cecil soils. The plow layer is a mixture of the surface layer and material from the subsoil and in places ranges from yellowish brown to yellowish red or red. A few shallow gullies have formed. Included in mapping were some areas where the surface layer is fine sandy clay loam to clay.

Runoff is medium to rapid. This soil is highly susceptible to erosion in cultivated areas. Slope and moderate permeability limit some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 3o.

Cecil fine sandy loam, 15 to 25 percent slopes, eroded (CeD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 6 inches thick. The solum is about 42 inches thick. The plow layer is a mixture of the surface soil and material from the subsoil and ranges from yellowish brown to yellowish red. A few shallow gullies have formed.

Included with this soil in mapping were small areas where the solum is less than 40 inches thick and a few small areas where the surface layer ranges from fine sandy clay loam to clay.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. Slope is the dominant limitation to many nonfarm uses. Capability unit IVe-1; woodland group 3r.

Cecil fine sandy loam, very deep, 2 to 7 percent slopes (CfB).—This soil has a profile similar to the one described as representative of the series, but it formed in material weathered from graywacke sandstone and the substratum is about 12 feet deep over bedrock. The surface layer is about 12 inches thick. The lower part of the subsoil and the substratum have a moderately high mica content. Quartz gravel is common in places on the surface and throughout the profile. Included in mapping were a few small areas where hard rock is at a depth of 4 to 8 feet.

Runoff is slow to medium. The soil is slightly to moderately susceptible to erosion if it is cultivated. The thick saprolite substratum can be easily excavated. Slope and moderate permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Cecil clay loam, 7 to 15 percent slopes, severely eroded (CgC3).—This soil has a profile similar to the one described as representative of the series, but the surface layer is largely subsoil material exposed through erosion. The surface layer ranges from clay loam to clay and from yellowish red to red. The solum is about 42 inches thick. A few shallow and moderately deep gullies have formed. The surface layer tends to be cloddy if plowed when wet.

Runoff is rapid. The erosion hazard is very severe if this soil is used for cultivated crops. The slope, the texture of the surface layer, and moderate permeability limit some nonfarm uses. Capability unit IVe-3; woodland group 3c.

Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes (ChC).—About 60 percent of the total acreage of this mapping unit is Cecil soil and 40 percent is Appling soil. Some areas are entirely Cecil soil, some are Appling soil, and some are both. The Cecil soil has a profile similar to the one described as representative of the Cecil series, but the substratum is thick and friable. Appling fine sandy loam is described under the heading "Appling Series."

Included with these soils in mapping were a few small areas where slopes are moderately steep. Also included were a few areas where hard rock is at a depth of 4 to 8 feet.

Runoff is medium to rapid. The erosion hazard is severe if these soils are used for cultivated crops. Slope and moderate permeability limit many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes, eroded (ChC2).—About 55 percent of the total acreage of this mapping unit is Cecil soil and 45 percent is Appling soil. Some areas are Cecil soil, some are Appling soil, and some are both. The Cecil soil has a profile similar to the one described as representative of the Cecil series, but the substratum is thick and friable. The Appling soil is described under the heading "Appling Series." The surface layer in this unit is about 6 inches thick and is yellowish brown to yellowish red. A few shallow gullies have formed.

Included with these soils in mapping were a few small areas where slopes are moderately steep, a few small areas where hard rock is at a depth of 4 to 8 feet, and a few small areas where the surface layer is sandy clay loam or clay.

Runoff is medium to rapid. The erosion hazard is severe if these soils are used for cultivated crops. Slope and moderate permeability limit many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Chester Series

The Chester series consists of deep, well-drained soils on the Piedmont Uplands. These soils formed in material weathered from dark-colored granite and granite gneiss. The Chester soils

in Madison County have a thicker substratum and are deeper over hard rock than is typical.

In a representative profile the surface layer is brown to dark-brown loam about 7 inches thick. The subsoil extends to a depth of 30 inches. The upper 19 inches is strong-brown light clay loam. The lower 4 inches is yellowish-red light clay loam mottled with strong brown. The substratum to a depth of 65 inches is a mixture of strong-brown loam and highly weathered granite gneiss.

Chester soils have a strongly acid to medium acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable, and the surface layer and substratum are rapidly permeable. Available water capacity is medium to high.

Most areas are cleared and farmed. Steep areas are largely wooded.

Representative profile of Chester loam, very deep, in an area of Chester-Brandywine loams, very deep, 2 to 7 percent slopes, about 1½ miles southwest of Novum on the north side of Route 607:

A1—0 to 1 inch, dark-brown (7.5YR 3/2) loam; moderate, fine and very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

A2—1 to 7 inches, brown to dark-brown (7.5YR 4/4) loam; moderate, fine and very fine, granular structure; very friable; many fine and medium roots; strongly acid; clear, smooth boundary.

B2t—7 to 26 inches, strong-brown (7.5YR 5/6) light clay loam; weak, fine, subangular blocky structure; friable; many fine roots; few fine mica flakes; few, thin, patchy clay films; strongly acid; clear, smooth boundary.

B3t—26 to 30 inches, yellowish-red (5YR 5/6) light clay loam mottled with strong brown (7.5YR 5/6); very weak fine and medium, subangular blocky structure; very friable; common fine roots; few, thin, patchy clay films; few fine mica flakes; strongly acid; clear, smooth boundary.

C—30 to 65 inches, strong-brown (7.5YR 5/6) loam mottled with white (10YR 8/2), black (10YR 2/1), and dark brown (10YR 4/3); highly weathered granite gneiss crushes easily to very friable soil material; common, fine, black mica flakes; strongly acid.

The solum ranges from about 30 to 45 inches in thickness. Depth to hard bedrock ranges from 10 to more than 40 feet, but is commonly about 15 feet. The A2 horizon has hue of 10YR, 7.5YR, and 5YR; value of 3 to 5; and chroma of 3 to 6. The A horizon is commonly loam but ranges from silt loam to fine sandy loam. The B2t horizon has hue of 7.5YR and 5YR, value of 4 to 5, and chroma of 3 to 8. It ranges from loam to clay loam and has a clay content of 18 to 35 percent.

Chester soils are near or adjacent to Brandywine, Eubanks, Lloyd, and Meadowville soils. They have a thicker and finer textured subsoil than Brandywine soils. They have a browner and coarser textured subsoil than Eubanks and Lloyd soils. They have a thinner solum and are better drained than Meadowville soils.

Chester-Brandywine loams, very deep, 2 to 7 percent slopes (CkB).—This mapping unit is about 65 percent Chester soil and 35 percent Brandywine soil. The Chester soil has the profile described as representative of the Chester series. The Brandywine soil is described under the heading "Brandywine Series."

Included with these soils in mapping were a few small eroded areas where the surface layer is slightly finer textured than is typical, a few small areas where bedrock is at a depth of 2 feet, and some areas where a few quartz fragments are on the surface.

Runoff is slow to medium, and the erosion hazard is moderate. Both soils are suited to cultivated crops, but the Brandywine soil is droughty. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 2o.

Chester-Brandywine loams, very deep, 7 to 15 percent slopes (CkC).—This mapping unit is about 65 percent Chester soil and 35 percent Brandywine soil. The Chester soil has a profile similar to the one described as representative of the Chester series, but the solum is thinner. The Brandywine soil is described under the heading "Brandywine Series."

Included with these soils in mapping were a few small areas where bedrock is at a depth of 2 feet; a few areas, identified by spot symbols on the soil map, where bedrock crops out; and some areas where a few angular quartz fragments are on the surface and throughout the profile.

Runoff is medium. The erosion hazard is severe if these soils are cultivated. Both soils are suited to general crops, but the Brandywine soil is droughty. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Chester-Brandywine loams, very deep, 7 to 15 percent slopes, eroded (CkC2).—This mapping unit is about 65 percent Chester soil and 35 percent Brandywine soil. The Chester soil has a profile similar to the one described as representative of the Chester series, but the solum and the surface layer are thinner. The Brandywine soil is described under the heading "Brandywine Series."

Included with these soils in mapping were a few small areas where bedrock is at a depth of 2 feet; a few areas, identified by spot symbols on the soil map, where bedrock crops out; and some areas where a few angular quartz fragments are on the surface and in the profile. A few shallow gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe if these soils are cultivated. Both soils are suited to general crops, but the Brandywine soil is droughty. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Chester-Brandywine loams, very deep, 15 to 25 percent slopes (CkD).—This mapping unit is about 65 percent Chester soil and 35 percent Brandywine soil. The Chester soil has a profile similar to the one described as representative of the Chester series, but the solum is only about 26 inches thick. The Brandywine soil is described under the heading "Brandywine Series."

Included with these soils in mapping were a few areas where bedrock is at a depth of 2 feet; some areas, identified by spot symbols on the soil map, where bedrock crops out; and some areas where a few angular quartz fragments are on the surface and in the profile. Also included were small areas where the surface layer is about 4 inches thick. A few shallow gullies have formed.

Runoff is medium to rapid, and the erosion hazard is very severe. Because these soils are steep and droughty, they are better suited to pasture, small grain, permanent sod, or woodland than to row crops. Slope is the dominant limitation. Capability unit IVe-1; woodland group 2r.

Chewacla Series

Soils in the Chewacla series are deep, somewhat poorly drained soils on flood plains. They formed in alluvial sediments washed from other soils of the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is dark yellowish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 49 inches. The upper 11 inches is mottled yellowish-brown silt loam. The lower 29 inches is brownish-yellow silt loam mottled with strong brown and brownish gray. The substratum to a depth of 80 inches is mottled light brownish-gray and light-gray fine sandy loam.

Chewacla soils have a medium acid to strongly acid subsoil and are medium to low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is high.

Representative profile of Chewacla silt loam about 3 miles east of Uno and 1 mile northeast of the end of State Road 616:

Ap—0 to 9 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, very fine and fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

B1—9 to 20 inches, yellowish-brown (10YR 5/4) silt loam; strong-brown (7.5YR 5/6) and brownish-yellow (10YR 6/6) mottles; weak, fine, granular

structure; friable; many fine roots; common fine mica flakes; medium acid; gradual, smooth boundary.

B2—20 to 49 inches, brownish-yellow (10YR 6/6) silt loam; common, fine, strong-brown (7.5YR 5/6) and light brownish-gray (2.5Y 6/2) mottles; weak, fine, subangular blocky structure; friable; common fine mica flakes; few fine roots; strongly acid; clear, smooth boundary.

C1g—49 to 69 inches, light brownish-gray (2.5Y 6/2) fine sandy loam; many, medium, distinct, yellowish-brown (10YR 5/8) mottles; single grained; very friable; many mica flakes; black coatings in root channels; strongly acid; clear, smooth boundary.

C2g—69 to 80 inches, light-gray (10YR 6/1) fine sandy loam; many, medium, prominent, strong-brown (7.5YR 5/6) mottles; single grained; very friable; many fine mica flakes; strongly acid.

The solum ranges from 36 to 70 inches in thickness. It has few to many mica flakes. Depth to hard bedrock ranges from 4 to more than 20 feet. Mottles of chroma 2 or less are within a depth of 24 inches, and the amount of gray increases with increasing depth.

The Ap horizon has hue of 10YR and 7.5YR, value of 3 to 6, and chroma of 1 to 4. The A horizon is commonly silt loam, but in places ranges to fine sandy loam or loam. The upper part of the B horizon has hue of 10YR, 7.5YR, and 5YR; value of 4 to 6; and chroma of 2 to 4. The B horizon ranges from silt loam or heavy sandy loam to silty clay loam. In places the C horizon is stratified with sand, silt, and gravel.

Chewacla soils are near or adjacent to Congaree, Wehadkee, and Buncombe soils. They are more poorly drained than Congaree and Buncombe soils. They are better drained than Wehadkee soils.

Chewacla silt loam (Cm).—This soil is on narrow to moderately wide flood plains along the larger streams and rivers. Slopes are 0 to 2 percent.

Included with this soil in mapping were small areas where the surface layer is fine sandy loam and a few small areas where up to 8 inches of loamy sand overwash is on the surface.

Flooding is frequent, and new sediments are deposited during each flood. Internal drainage and runoff are slow. If adequately drained, this soil is well suited to corn and other general crops of the area. Flooding and seasonal wetness are the dominant limitations for nonfarm uses. Capability unit IIIw-1; woodland group 1w.

Codorus Series, Cobbly Subsoil Variant

The soils in this variant of the Codorus series are deep, moderately well drained to somewhat poorly drained soils on flood plains. They formed in alluvial sediments that washed from other soils on the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is dark yellowish-brown loam about 11 inches thick. The subsoil, about 10 inches thick, is yellowish-brown loam that has many, fine and medium, strong-brown mottles. The substratum to a depth of 50 inches is mottled light brownish-gray, strong-brown, and brownish-yellow very cobbly sandy loam.

Codorus soils have a strongly acid subsoil and are medium to low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

About 60 percent of the acreage is cleared and farmed. The rest is wooded.

Representative profile of Codorus loam, cobbly subsoil variant, on the north side of State Road 670, one-eighth mile west of its junction with State Road 231:

Ap—0 to 11 inches, dark yellowish-brown (10YR 4/4) loam; moderate, very fine and fine, granular structure; very friable; few small fragments of gneiss, granodiorite, and greenstone rock; common fine mica flakes; strongly acid; clear, smooth boundary.

B2—11 to 21 inches, yellowish-brown (10YR 5/4) loam; many, fine and medium, faint, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; common mica flakes; few cobbles and pebbles of granodiorite, greenstone, and gneiss; strongly acid; clear, smooth boundary.

Cg—21 to 50 inches, mottled, light brownish-gray (10YR 6/2), brownish-yellow (10YR 6/6), and strong-brown (7.5YR 5/6) very cobbly sandy loam that becomes grayer with increasing depth; 50 to 60 percent cobbles and gravel; common fine mica flakes; strongly acid.

Depth to stratified very cobbly sandy loam ranges from about 12 to 30 inches. Depth to hard bedrock ranges from about 3 to more than 10 feet. Rounded pebbles make up 2 to 15 percent of the A and B horizons. Mica flakes are few to common throughout the profile. Low chroma mottles are within a depth of 24 inches.

The Ap horizon is dominantly loam, but in places ranges to silt loam or fine sandy loam. It has hue of 10YR and 7.5YR, value of 3 to 6, and chroma of 1 to 4. The B horizon has hue of 7.5YR, 10YR, and 2.5Y; value of 4 to 6; and chroma of 3 to 6. The C horizon is stratified very gravelly and very cobbly sandy loam that is 45 to 60 percent coarse fragments.

Codorus soils are near or adjacent to Congaree, Chewacla, and Wehadkee soils and Alluvial land, cobbly. They are more poorly drained than Congaree soils. They are better drained than Wehadkee soils. They have fewer coarse fragments in the upper horizons than Alluvial land, cobbly. They have more cobbles and are shallower than Chewacla soils.

Codorus loam, cobbly subsoil variant (Cn).—This soil is in narrow to moderately wide areas on flood plains along the larger streams and rivers. Included in mapping were a few small areas where the surface layer is fine sandy loam, a few small areas where the soil is well drained and has a browner surface layer and subsoil, and a few small gravelly areas.

Flooding is frequent, and new sediments are deposited during each flood. Runoff is slow. The soil is suited to corn and other general crops. Flooding and a seasonal high water table limit most nonfarm uses. Capability unit IIIw-1; woodland group 1w.

Colfax Series

The Colfax series consists of deep, somewhat poorly drained to moderately well drained soils on uplands. These soils formed partly in colluvial material that washed from higher lying soils and partly in material that weathered from granite, granite gneiss, and graywacke sandstone.

In a representative profile the surface layer is dominantly light yellowish-brown fine sandy loam about 9 inches thick. The subsoil extends to a depth of 49 inches. The upper 5 inches is light yellowish-brown sandy clay loam. The next 12 inches is brownish-yellow light sandy clay loam that has many strong-brown and few light brownish-gray mottles in the lower part. Below this is a compact and brittle fragipan, about 16 inches thick, of brownish-yellow fine sandy loam mottled with strong brown and gray. The lower 7 inches of the subsoil is mottled strong-brown light sandy clay loam. The substratum to a depth of 60 inches is multicolored fine sandy loam mixed with strongly weathered graywacke sandstone.

Colfax soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is slowly permeable. Available water capacity is medium to low.

Most areas are wooded. Some are pastured, and a few are cultivated.

Representative profile of Colfax fine sandy loam, 2 to 10 percent slopes, about 1 mile northeast of Rochelle at the end of State Road 682:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, very fine and fine, granular structure; very friable; many fine roots; 2 to 3 percent fine quartz fragments; very strongly acid; clear, smooth boundary.

A2—1 to 9 inches, light yellowish-brown (10YR 6/4) fine sandy loam; moderate, very fine and fine, granular structure; very friable; many fine roots; 1 percent fine quartz fragments; very strongly acid; clear, smooth boundary.

B1t—9 to 14 inches, light yellowish-brown (10YR 6/4) light sandy clay loam; many, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, fine, subangular blocky structure; very friable; few fine roots; few thin clay films; very strongly acid; gradual, smooth boundary.

B2t—14 to 26 inches, brownish-yellow (10YR 6/6) light sandy clay loam; many, fine, faint, strong-brown (7.5YR 5/6) mottles; few, fine, distinct,

light brownish-gray (10YR 6/2) mottles in lower 8 inches; weak, fine and medium, subangular blocky structure; friable; few fine roots; few thin clay films; few fine quartz pebbles; very strongly acid; clear, smooth boundary.

Bx—26 to 42 inches, brownish-yellow (10YR 6/6) fine sandy loam; many, fine, faint, strong-brown (7.5YR 5/6) and distinct gray to light-gray (10YR 6/1) mottles; moderate, thick, platy structure; compact, brittle, and hard; common fine quartz pebbles; very strongly acid; gradual, smooth boundary.

IIB3t—42 to 49 inches, strong-brown (7.5YR 5/6) light sandy clay loam; many, medium, faint, brownish-yellow (10YR 6/6) and distinct gray (10YR 5/1) mottles; weak, medium, subangular blocky structure; friable; common medium clay films; common fine mica flakes; very strongly acid; gradual, smooth boundary.

IIC—49 to 60 inches, mottled gray (10YR 5/1), black (10YR 2/1), strong-brown (7.5YR 5/6), and white (10YR 8/2) weathered graywacke sandstone crushes easily to fine sandy loam; massive; very friable; very strongly acid.

The solum ranges from 40 to 60 inches in thickness and from 0 to 10 percent in content of coarse fragments. Depth to the fragipan is about 27 inches. Depth to hard bedrock ranges from 4 to more than 10 feet.

The A2 horizon has hue of 10YR, 2.5Y, and 5Y; value of 5 to 7; and chroma of 3 to 6. The A horizon ranges from fine sandy loam to sandy loam. The B2t horizon has hue of 7.5YR, 10YR, and 2.5Y; value of 5 and 6; and chroma of 4 to 8. The upper 10 inches of the Bt horizon has mottles of chroma 2. This horizon ranges from heavy fine sandy loam to clay loam and is 18 to 35 percent clay. The Bx horizon is mottled in hue of 7.5YR to 2.5Y and is weakly to strongly developed. It ranges from fine sandy loam to sandy clay loam. Stone lines are common in the Bt and C horizons.

Colfax soils are near or adjacent to Appling, Cecil, Louisburg, Elioak, and Worsham soils. In contrast with Appling, Cecil, Louisburg, and Elioak soils, they have a fragipan and are more poorly drained. They are better drained and less clayey than Worsham soils.

Colfax fine sandy loam, 2 to 10 percent slopes (CoC).—This soil is on toe slopes, in saddles, and at the heads of drainageways. Slopes are mainly 2 to 7 percent, but in places range from 2 to 10 percent. Areas are small to medium in size.

Included with this soil in mapping were a few areas where the subsoil is clay and there is no fragipan, small areas where no Bt horizon is above the fragipan, and a few small gravelly areas.

Runoff is medium, and the erosion hazard is moderate. A seasonal high water table and slow permeability are the major limitations for crop production. The soil is suited to pasture. Seasonal wetness and slow permeability are the major limitations for most nonfarm uses. Capability unit IIIw-2; woodland group 2w.

Colluvial Land, Very Stony

Colluvial land, very stony (Cr) (fig. 5) is in mountain valleys. It consists of soil and rock material rolled from adjacent mountainsides. It is well drained to somewhat excessively drained. Slopes range from 5 to 20 percent. Coarse fragments of granodiorite and greenstone, ranging from fine gravel to huge boulders 10

Figure 5.—Colluvial land, very stony, on colluvial fans and at the base of mountain foot slopes. This land type is best suited to forest and pasture.

feet or more in diameter, make up 25 to 75 percent of the total mass. The soil between the coarse fragments is commonly loam, but in places ranges to fine sandy loam and silt loam.

Colluvial land, very stony, is poorly suited to general crops. Only a few small areas are cleared, and they are used for pasture. The rest is mixed forest of oak, poplar, hemlock, and pine. Capability unit VIs-1; woodland group 5.

Colluvial Land, Extremely Stony

Colluvial land, extremely stony (Cu) is in mountain valleys. It consists of soil and rock material rolled from adjacent mountainsides. It is well drained to somewhat excessively drained. Slopes range from 15 to 45 percent. Coarse fragments of granodiorite and greenstone, ranging from fine gravel to huge boulders 10 feet or more in diameter, make up 40 to 90 percent of the total mass. The soil between the coarse fragments is largely loam, but in places ranges to fine sandy loam and silt loam.

Colluvial land, extremely stony, is poorly suited to general crops. All the acreage is in mixed woodland of oak, poplar, hemlock, and pine. Capability unit VIIs-1; woodland group 5.

Congaree Series

The Congaree series consists of deep, well-drained soils on flood plains. These soils formed in alluvial sediments washed from other soils on the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is dark-brown loam about 11 inches thick. The underlying layer to a depth of 72 inches is dark-brown or very dark brown loam. Fine mica flakes are common throughout the profile.

From the plow layer down to a depth of about 40 inches, Congaree soils are slightly acid to strongly acid. They are medium in organic-matter content and natural fertility. They are moderately permeable throughout and have high available water capacity.

Most of the acreage is farmed. The rest is mainly wooded.

Representative profile of Congaree loam about 3 miles east of Uno along the Rapidan River, 1 mile northeast of the end of State Route 616:

Ap—0 to 11 inches, dark-brown (7.5YR 4/4) loam; moderate, fine and very fine, granular structure; friable; many fine roots; common fine mica flakes; medium acid; clear, smooth boundary.

C1—11 to 29 inches, dark-brown (7.5YR 4/4) loam; weak, very fine and fine, granular structure; friable; common fine roots; common fine mica flakes; medium acid; clear, smooth boundary.

C2—29 to 41 inches, very dark brown (7.5YR 3/2) loam; single grained; very friable; common fine roots; common fine mica flakes; medium acid; clear, smooth boundary.

C3—41 to 72 inches, dark-brown (10YR 3/3) loam; single grained; friable; few fine roots; common fine mica flakes; medium acid; clear, smooth boundary.

The clay content between depths of 10 and 40 inches is 18 to 35 percent. In places the profile contains thin lenses of sand to silty clay. Depth to bedrock is generally more than 6 feet.

The Ap horizon has hue of 10YR, 7.5YR, and 5YR; value of 3 to 5; and chroma of 2 to 6. It ranges from loam to silt loam and fine sandy loam. The C horizon, to a depth of 30 inches, has hue of 10YR and 7.5YR, value of 3 to 5, and chroma of 3 to 6. In the upper part it ranges from fine sandy loam to silt loam. Below a depth of 30 inches in places, it has mottles of chroma 2 or less.

Congaree soils are on flood plains near Chewacla, Wehadkee, Codorus, Buncombe, and Meadowville soils. They are better drained than Chewacla, Wehadkee, and Codorus soils. They are finer textured than Buncombe soils. They differ from Meadowville soils in not having a Bt horizon.

Congaree fine sandy loam (Cv).—This soil has a profile similar to the one described as representative of the series, but the surface layer is sandier and the underlying material is also coarser textured. The underlying material is dominantly fine sandy loam, but ranges to loam and silt loam.

Included with this soil in mapping were a few small gravelly areas, a few small areas where as much as 8 inches of sandy overwash is on the surface, and small areas where the subsoil is thin and weakly expressed.

Flooding is frequent, and new sediments are deposited during each flood. Internal drainage is moderately rapid, and runoff is slow. The soil is well suited to corn and similar crops. Flooding is a major limitation for most nonfarm uses. Capability unit IIw-1; woodland group 1o.

Congaree loam (Cw).—This soil is in narrow to moderately wide areas on flood plains along the larger streams and rivers. It has the profile described as representative of the series.

Included with this soil in mapping were small areas of soils on low terraces, a few small areas where as much as 8 inches of sandy overwash is on the surface, and some areas where gravel is on the surface.

Flooding is frequent, and new sediments are deposited during each flood. Internal drainage is moderate, and runoff is slow. The soil is well suited to corn and similar crops. Flooding is the major limitation. Capability unit IIw-1; woodland group 1o.

Creedmoor Series

Soils in the Creedmoor series are deep and moderately well drained. They formed in material weathered from Triassic shale and sandstone.

In a representative profile the surface layer is dominantly light yellowish-brown silt loam about 8 inches thick. The subsoil extends to a depth of 46 inches. The upper 15 inches is yellowish-brown silty clay loam. The lower 23 inches is yellowish-brown, very plastic clay mottled with gray, strong brown, and reddish yellow. The substratum is weak-red silt loam mottled with strong brown, brownish yellow, and gray. Hard red shale is at a depth of 62 inches.

Creedmoor soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The lower part of the subsoil is very slowly permeable. Available water capacity is medium.

The Creedmoor soils in Madison County are mapped only with Calverton soils.

Representative profile of Creedmoor silt loam in an area of Calverton and Creedmoor silt loams, 0 to 7 percent slopes, about one-half mile east of Route 15 on north side of Woodberry Forest Road:

A1—0 to 2 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, fine and very fine, granular structure; friable; many fine roots; very strongly acid; clear, smooth boundary.

A2—2 to 8 inches, light yellowish-brown (10YR 6/4) silt loam; moderate, fine, granular structure; friable; many fine roots; very strongly acid; clear, smooth boundary.

B21—8 to 23 inches, yellowish-brown (10YR 5/8) silty clay loam; moderate, fine and very fine, subangular blocky structure; friable to firm; many fine roots; thin continuous clay films; very strongly acid; clear, smooth boundary.

B22t—23 to 46 inches, yellowish-brown (10YR 5/8) clay; many, medium, distinct, gray (10YR 6/1), strong-brown (7.5YR 5/6), and reddish-yellow (7.5YR 6/8) mottles; weak, coarse, subangular blocky structure; firm, very sticky and very plastic; few fine roots; thin continuous clay films; very strongly acid; clear, smooth boundary.

C—46 to 62 inches, weak-red (2.5YR 4/2) silt loam; strong-brown (7.5YR 5/6), brownish-yellow (10YR 6/6), and gray (10YR 6/1) mottles; rock-controlled structure; clay plugs in crevices and root channels; very strongly acid; abrupt, irregular boundary.

R—62 inches, hard, red Triassic shale.

The solum ranges from 36 to 60 inches in thickness, but averages 46 inches. Depth to bedrock is 5 feet or more. The A2 horizon has hue of 10YR or 2.5Y, value of 6 or 7, and chroma of 2 to 5. The A horizon is largely

silt loam, but in places is loam and sandy loam. The B21t horizon has hue of 2.5Y to 10YR, value of 5 to 7, and chroma of 4 to 8. The B22t horizon has some mottles with chroma of 2 or less. The upper part of the B horizon ranges from silty clay loam to light silty clay and the lower part from silty clay to clay.

Creedmoor soils are near or adjacent to Bucks, Calverton, Mayodan, and Penn soils. They are more poorly drained and have a more plastic and clayey subsoil than Bucks, Mayodan, and Penn soils. They differ from Calverton soils in not having a fragipan.

Davidson Series

Soils of the Davidson series are deep, well-drained soils of the Piedmont Uplands. These soils formed in material weathered from greenstone, diabase, and similar rocks.

In a representative profile the surface layer is dark reddish-brown clay loam about 7 inches thick. The subsoil, which extends to a depth of about 62 inches, is dark-red clay. The underlying material is multicolored reddish-yellow, red, dark-red, olive-yellow, and strong-brown silty clay loam mixed with strongly weathered rock. Hard bedrock is at a depth of 74 inches.

Davidson soils have a medium acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is high.

These soils are suited to the commonly grown cultivated crops and to pasture crops. The steeper areas are commonly used for pasture or woodland.

Representative profile of Davidson clay loam, 2 to 7 percent slopes, eroded, on the west side of State Road 231 about one-half mile south of Pratts:

Ap—0 to 7 inches, dark reddish-brown (2.5YR 3/4) clay loam; moderate, fine, granular structure; friable, slightly sticky; many fine roots; few, fine, weathered rock fragments; medium acid; abrupt, smooth boundary.

B21t—7 to 26 inches, dark-red (10R 3/6) clay; moderate, fine and medium, subangular blocky structure; firm, plastic and sticky; continuous moderately thick clay films; many fine roots; few, fine, weathered rock fragments; medium acid; gradual, smooth boundary.

B22t—26 to 62 inches, dark-red (10R 3/6) clay; weak, fine, subangular blocky structure; firm, plastic and sticky; many moderately thick clay films on vertical ped surfaces; few, fine, dark-brown concretions; many, fine, olive-yellow and yellowish-brown, soft weathered rock fragments; medium acid; gradual, smooth boundary.

C—62 to 74 inches, reddish-yellow (5YR 6/8) silty clay loam mottled and streaked with red (2.5YR 4/6), dark red (2.5YR 3/6), olive yellow (2/5Y 6/6), and strong brown (7.5YR 5/6); massive; friable, slightly sticky, weathered rock material; medium acid; abrupt, wavy boundary.

R—74 inches, hard, massive, dark-colored amphibolite or hornblende-gabbro rock.

The solum ranges from 60 to 100 inches in thickness. Depth to bedrock is more than 6 feet. The Ap horizon has hue of 5YR or redder, value of less than 4, and chroma of 2 to 6. It ranges from clay loam to loam. The upper 24 inches of the Bt horizon has hue redder than 5YR and value of 3 or less. It is clay, and the clay content is generally greater than 50 percent.

Davidson soils are near or adjacent to Catoctin, Iredell, Zion, Bremo, and Lloyd soils. They are much deeper, have a redder hue, and have a much higher clay content in the subsoil than Catoctin and Bremo soils. They are redder and better drained than Iredell and Zion soils. They are darker red throughout than Lloyd soils, which formed in material derived from mixed acid and basic rock.

Davidson clay loam, 2 to 7 percent slopes, eroded (DaB2).—This soil is on narrow to moderately wide ridgetops. It has the profile described as representative of the series.

Included with this soil in mapping were small areas where the surface layer is clay, a few small areas where few to many angular quartz fragments are on the surface and throughout the profile, and some areas where the solum is less than 60 inches thick.

Runoff is slow to medium. The erosion hazard is moderate if this soil is used for cultivated crops. The surface layer is friable to firm and sticky and is somewhat difficult to till. Slope and the clayey subsoil limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 1c.

Davidson clay loam, 7 to 15 percent slopes, eroded (DaC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 5 inches thick. Included in mapping were small areas where the soil is severely eroded and the surface layer is clay, a few areas where few to common angular quartz pebbles are on the surface and in the profile, and some areas where the solum is less than 60 inches thick. A few shallow gullies have formed.

Runoff is moderately rapid. The erosion hazard is severe if this soil is used for cultivated crops. Slope and the clayey subsoil limit some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 1c.

Davidson clay loam, 15 to 25 percent slopes, eroded (DaD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 5 inches thick. Included in mapping were small areas where the soil is severely eroded and the plow layer is clay, a few areas where few to common quartz pebbles are on the surface and throughout the profile, and some areas where the solum is less than 60 inches thick. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is used for cultivated crops. Slope is the dominant limitation for many nonfarm uses. Capability unit IVe-1; woodland group 1c.

Dyke Series

Soils in the Dyke series are deep and well drained. They are on mountain foot slopes. They formed in colluvium moved from higher lying soils and from partly weathered greenstone and granodiorite rocks of the Blue Ridge Mountains.

In a representative profile the surface layer is dark reddish-brown loam about 8 inches thick. The subsoil extends to a depth of about 48 inches. It is dark-red clay, mottled with red and has common to many weathered greenstone and granodiorite fragments in the lower 12 inches. The underlying material to a depth of 84 inches is a mixture of dark-red to strong-brown clay loam and weathered greenstone and granodiorite rock fragments. It is 50 to 60 percent rock fragments.

Dyke soils have a strongly acid to medium acid subsoil. They are low in organic-matter content and medium in natural fertility. The subsoil is moderately permeable. Available water capacity is high.

Approximately 50 percent of the acreage is used for crops or pasture. Steeper areas are pastured or wooded.

Representative profile of Dyke loam, 2 to 7 percent slopes, about three-fourths of a mile northeast of State Route 670 at Syria:

Ap—0 to 8 inches, dark reddish-brown (5YR 3/4) loam; moderate, fine and very fine, granular structure; friable; many fine roots; few fine quartz fragments; strongly acid; abrupt, smooth boundary.

B21t—8 to 14 inches, dark-red (10R 3/6) clay; weak to moderate, fine and medium, subangular blocky structure; firm, sticky and plastic; thin patchy clay films; 5 percent weathered granodiorite gravel; few fine roots; strongly acid; gradual, smooth boundary.

B22t—14 to 36 inches, dark-red (10R 3/6) clay; moderate, fine and medium, subangular blocky structure; firm, sticky and plastic; thin patchy clay films; 5 percent weathered granodiorite rock fragments; few fine roots; strongly acid; gradual, smooth boundary.

B3t—36 to 48 inches, dark-red (10R 3/6) clay; many, medium, faint, red (10R 4/6) mottles; weak, medium, subangular blocky structure; friable; few thin clay films; 20 percent weathered granodiorite and greenstone rock fragments; medium acid; gradual, smooth boundary.

IIC—48 to 84 inches, partly weathered granodiorite and greenstone rock fragments; dark-red (10R 3/6), yellowish-red (5YR 4/6), red (2.5YR 4/6), and strong-brown (7.5YR 5/6) friable clay loam between rock fragments; about 50 to 60 percent rock fragments.

The solum ranges from 36 to 60 inches in thickness, but averages about 48 inches. Depth to bedrock ranges from 4 to more than 20 feet. The content of coarse fragments is 2 to 10 percent in the A horizon and increases with increasing depth to more than 50 percent in the C horizon. The boulders of granite-gneiss or granodiorite rock on the surface in a few areas are identified by spot symbols on the soil map.

The Ap horizon has hue of 5YR, 7.5YR, and 2.5YR; value of less than 4; and chroma of 2 to 6. It ranges from loam to clay loam. The B2t horizon has hue of 2.5YR and 10R, value of 3 when moist and less than 5 when dry, and chroma of 4 to 8. It is clay, and the clay content is generally greater than 40 percent.

Dyke soils are near or adjacent to Unison, Tusquitee, Trego, and Braddock soils. They are darker red throughout than Unison and Tusquitee soils. They are better drained than Trego soils. They have a darker red surface layer and subsoil than Braddock soils.

Dyke loam, 2 to 7 percent slopes (DkB).—This soil is on ridgetops and toe slopes that flank the Blue Ridge Mountains. It has the profile described as representative of the series. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the soil is eroded and the surface layer is clay loam to clay, some areas where few to common greenstone and granodiorite rock fragments are on the surface, and some areas, identified by spot symbols on the soil map, where a few boulders are on the surface.

Runoff is medium, and the erosion hazard is moderate. The surface layer is friable and easy to till. If eroded, it is sticky and harder to till. The soil is well suited to general farm crops. The sticky clayey subsoil and the slope limit some nonfarm uses. Capability unit IIe-1; woodland group 1c.

Dyke loam, 7 to 15 percent slopes, eroded (DkC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only 5 inches thick. Included in mapping were a few areas where the soil is severely eroded and the plow layer is dominantly subsoil material that ranges from clay loam to clay. A few shallow and moderately deep gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe if this soil is used for cultivated crops. Tillage is difficult in the eroded areas where the surface layer is clayey. Slope is the major limitation. Capability unit IIIe-1; woodland group 1c.

Dyke loam, 15 to 35 percent slopes, eroded (DkE2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 5 inches thick. Included in mapping were a few small areas where the soil is severely eroded and the plow layer is dominantly subsoil material that ranges from loam to clay. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is used for cultivated crops. The slope and clayey texture make tillage difficult. Slope is the major limitation for many nonfarm uses of this soil. Capability unit IVe-1; woodland group 1c.

Elbert Series

The Elbert series consists of deep, poorly drained soils on uplands. These soils formed in material weathered from dark-colored basic rocks, such as diabase.

In a representative profile the surface layer is dominantly gray silt loam about 11 inches thick. The subsoil extends to a depth of 42 inches. The upper 20 inches is olive-gray, extremely plastic clay mottled with strong brown and dark gray. The lower 11 inches is olive-gray heavy silty clay loam mottled with strong brown. The substratum is light olive-gray silty clay loam and highly weathered diabase rock. Hard diabase rock is at a depth of 80 inches.

Elbert soils are extremely acid to strongly acid in the upper part of the solum and medium acid to neutral in the lower part. They are low in organic-matter content and medium in natural fertility. The subsoil is slowly permeable. Available water capacity is medium.

Most areas are wooded. A few areas are used for pasture.

Representative profile of Elbert silt loam on the south side of State Road 614 about 1 1/4 miles east of Locust Dale:

A1—0 to 1 inch, very dark gray (10YR 3/1) silt loam; moderate, very fine and fine, granular structure; friable; matted with fine roots; very strongly acid; clear, smooth boundary.

A2—1 to 11 inches, gray (10YR 5/2) silt loam; moderate, fine and very fine, granular structure; friable; many fine and medium roots; few, fine, black concretions; common, prominent, medium, strong-brown (7.5YR 5/6) mottles in lower 3 inches; strongly acid; clear, smooth boundary.

B2tg—11 to 31 inches, olive-gray (5Y 5/2) clay; few, prominent, fine and medium, strong-brown (7.5YR 5/6) and dark-gray (N4/0) mottles; moderate, medium and coarse, subangular blocky structure; extremely plastic and sticky; few fine roots; few, fine, dark-brown and black concretions; strongly acid; clear, smooth boundary.

B3tg—31 to 42 inches, olive-gray (5Y 5/2) heavy silty clay loam; few, fine, prominent, strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; plastic and sticky; common, fine, black, brownish-gray, and green mineral flecks; medium acid; clear, smooth boundary.

C1g—42 to 56 inches, light olive-gray (5Y 6/2) silty clay loam mottled with greenish, white, and black flecks; massive; friable; medium acid; gradual, smooth boundary.

C2—56 to 80 inches, highly weathered, greenish-white, brown, and black diabase rock that rubs easily to silty clay loam material; medium acid; diffuse, wavy boundary.

R—80 inches, hard diabase rock.

The solum ranges from 40 to 60 inches in thickness, but averages 42 inches. Depth to hard bedrock ranges from 3 1/2 to more than 8 feet. In some areas a few coarse fragments and some rounded, hard diabase boulders are on the surface.

The A horizon has hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 0 or 1. It ranges from silt loam to loam. The A and B horizons commonly have high chroma mottling. The B2 horizon has hue of 5Y, 2.5Y, or 10YR; value of 4 or 5; and chroma of 1 or 2. It is clay, and the clay content is commonly greater than 50 percent.

Elbert soils are near or adjacent to Iredell, Bremo, Bucks, and Penn soils. They are more poorly drained than Iredell soils. They are more poorly drained and have a thicker, more plastic subsoil than Bremo, Bucks, and Penn soils.

Elbert silt loam (Eb).—This nearly level soil is on drainage divides and at the heads of drainageways. Slopes are mainly 0 to 2 percent, but range up to 4 percent. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the solum is only 20 inches deep over hard rock and a few areas where rounded diabase boulders up to 2 feet in diameter are on the surface.

Runoff is slow, and the erosion hazard is slight. This soil is poorly suited to cultivated crops because it has a seasonal high water table and slow permeability. Artificial drainage is difficult. Excessive wetness and slow permeability limit many nonfarm uses. Capability group Vw-1; woodland group 4w.

Elioak Series

The Elioak series consists of deep, well-drained soils on uplands of the Piedmont Plateau. These soils formed in material weathered from mica schist, phyllite, and graywacke sandstone.

In a representative profile the surface layer is dominantly yellowish-brown fine sandy loam about 8 inches thick. The subsoil extends to a depth of 40 inches. The upper 3 inches is yellowish-red sandy clay loam. The next 19 inches is red clay loam. The lower 10 inches is red clay loam mottled with yellowish red. The substratum to a depth of 85 inches is yellowish-red, highly micaceous fine sandy loam that weathered from graywacke sandstone. It is mottled with red and strong brown.

Elioak soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

A large acreage is used for general crops and pasture. A large acreage, which is most extensive on the steeper slopes, is woodland.

Representative profile of Elioak fine sandy loam, 2 to 7 percent slopes, on the west side of State Road 616, 1 mile north of Aroda:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, fine and very fine, granular structure; very friable; matted with fine and medium roots; strongly acid; gradual, smooth boundary.

A2—1 to 8 inches, yellowish-brown (10YR 5/4) fine sandy loam; moderate, fine, granular structure; very friable; many fine and medium roots; common fine mica; strongly acid; clear, smooth boundary.

B1t—8 to 11 inches, yellowish-red (5YR 4/8) sandy clay loam; weak, fine, subangular blocky structure; friable; common fine roots; many fine mica flakes; few thin clay films; strongly acid; clear, smooth boundary.

B2t—11 to 30 inches, red (2.5YR 4/8) clay loam; moderate, fine and medium, subangular blocky structure; friable; thin to moderately thick continuous clay films; many finely divided mica flakes; few fine and medium roots; strongly acid; clear, smooth boundary.

B3t—30 to 40 inches, red (2.5YR 4/8) clay loam mottled with yellowish red (5YR 4/6); weak to moderate, medium, subangular blocky structure; friable; moderately thick continuous clay films; many mica flakes; strongly acid; clear, smooth boundary.

C—40 to 85 inches, yellowish-red (5YR 4/6) fine sandy loam mottled with red (2.5YR 4/8) and strong brown (7.5YR 5/6); rock-controlled structure; friable; few thin clay films in crevices and root channels in the upper part; highly micaceous; strongly acid.

The solum ranges from 30 to 45 inches in thickness, but averages 40 inches. Depth to bedrock ranges from 10 to more than 40 feet. In some areas a few angular quartz fragments are on the surface and throughout the profile. Also, many fine mica flakes are throughout the profile.

The A horizon has hue of 7.5YR and 10YR, value of 3 to 5, and chroma of 2 to 4. The A1 horizon has value of 3 to 5 and chroma of 0 to 2. The B2t horizon is red in hue of 2.5YR and 10R, value of 4 to 5, and chroma of 6 to 8. The lower 10 inches of the Bt horizon commonly has high chroma mottling. The lower part of the B horizon and the C horizon are highly micaceous.

Elioak soils are near or adjacent to Glenelg, Hazel, Manor, Meadowville, Cecil, Worsham, Appling, and Lloyd soils. They have a redder subsoil than Glenelg soils and a thicker solum than Hazel and Manor soils. They have a thinner solum and are more micaceous throughout than Cecil and Appling soils. They are not so dark red as Lloyd soils. They are better drained than Meadowville and Worsham soils.

Elioak fine sandy loam, 2 to 7 percent slopes (E1B).—This soil has the profile described as representative of the series. The surface layer is very friable and easy to till.

Included with this soil in mapping were small areas where the profile is thinner than is typical, some areas where few to common angular quartz pebbles are on the surface and throughout the profile, and a few areas where bedrock crops out.

Runoff is medium. The erosion hazard is moderate in cultivated areas. The soil is well suited to general farm crops. Moderate permeability and the slope limit some nonfarm uses. Capability unit IIe-1; woodland group 2c.

Elioak fine sandy loam, 2 to 7 percent slopes, eroded (E1B2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 5 inches thick. The plow layer is a mixture of the original surface layer and material from the subsoil. It is reddish brown in places. It is dominantly fine sandy loam, but is clay loam in a few small areas. It is friable and easy to till.

Runoff is medium. The erosion hazard is moderate in cultivated areas. Slope and permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2c.

Elioak fine sandy loam, 7 to 15 percent slopes (E1C).—This soil has a profile similar to the one described as representative of the series, but it has a thinner solum. Included in mapping were small areas where the surface layer is sandy clay loam and a few small areas where bedrock is at a depth of 4 to 10 feet.

Runoff is medium to rapid. The erosion hazard is severe in cultivated areas. Slope and permeability limit some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 2c.

Elioak fine sandy loam, 7 to 15 percent slopes, eroded (E1C2).—This soil has a profile similar to the one described as representative of the series, but it has a thinner solum. Included in mapping were a few small areas where the surface layer is sandy clay loam or clay loam and a few small areas where bedrock is at a depth of 4 to 10 feet. Also included were a few areas where the soil formed in material weathered from arkosic sandstone. In these areas the soil contains very little mica and is about 30 inches deep over hard bedrock. A few shallow gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe in cultivated areas. Slope and permeability limit many nonfarm uses of this soil. Capability unit IIIe-1; woodland group 2c.

Elioak fine sandy loam, 15 to 25 percent slopes, eroded (E1D2).—This soil has a profile similar to the one described as representative of the series, but it has a thinner solum. Included in mapping were a few small areas where the surface layer is sandy clay loam or clay loam and a few small areas where bedrock is at a depth of 4 to 10 feet. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe in cultivated areas. Slope is the dominant limitation for many nonfarm uses of this soil. Capability unit IVe-1; woodland group 2c.

Elioak loam, 2 to 7 percent slopes (EmB).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the surface layer is loam and is slightly browner. The surface layer is friable and is easily tilled. The surface is slick because mica flakes are common.

Included with this soil in mapping were a few small areas where the surface layer is silty clay loam, a few small areas where hard schist rock is at a depth of 2 to 6 feet, and some areas where a few angular quartz pebbles are on the surface.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2c.

Elioak loam, 2 to 7 percent slopes, eroded (EmB2).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the surface layer is loam and is brown.

Included with this soil in mapping were a few spots where the surface layer is more severely eroded and is reddish-brown or red clay loam, some areas where a few angular quartz pebbles are on the surface and throughout the profile, and a few small areas where hard bedrock is at a depth of 2 to 6 feet.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2c.

Elioak loam, 7 to 15 percent slopes, eroded (EmC2).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the surface layer is browner and is only about 5 inches thick. In all but the more severely eroded areas, the surface layer is friable and easy to till. The solum is about 36 inches thick.

Included with this soil in mapping were a few small areas where bedrock is at a depth of 2 to 6 feet, some areas where a few quartz pebbles are on the surface and throughout the profile, and some areas where the surface layer is silty clay loam. A few shallow gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability limit some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 2c.

Elioak loam, 15 to 25 percent slopes, eroded (EmD2).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the slightly browner surface layer is only about 4 inches thick. The solum is about 32 inches thick.

Included with this soil in mapping were small areas where the solum is thinner than is typical, some areas where the surface layer is silty clay loam, some areas where a few angular quartz pebbles are on the surface and in the profile, and small areas where bedrock is at a depth of 2 to 6 feet. A few shallow gullies have formed.

Runoff is rapid. The erosion hazard is very severe in cultivated areas. Slope is the dominant limitation for many nonfarm uses. Capability unit IVe-1; woodland group 2c.

Elioak silty clay loam, 7 to 15 percent slopes, severely eroded (EnC3).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the surface layer is reddish brown to red and is largely subsoil material. The solum is ordinarily about 32 inches thick, but in some areas it is as thin as 18 inches.

Included with this soil in mapping were some areas where a few angular quartz pebbles are on the surface and throughout the profile and a few small areas where bedrock is at a depth of 2 feet.

Runoff is rapid. The erosion hazard is very severe in cultivated areas. A good seedbed is difficult to prepare. Slope, the severe erosion hazard, and permeability limit some nonfarm uses of this soil. Capability unit IVe-3; woodland group 2c.

Elioak silty clay loam, 15 to 25 percent slopes, severely eroded (EnD3).—This soil formed in material weathered from mica schist and phyllite rock. It has a profile similar to the one described as representative of the series, but the surface layer is reddish brown to red and is largely subsoil material. The solum is ordinarily about 32 inches thick, but in some small areas it is as thin as 18 inches.

Included with this soil in mapping were some areas where a few angular quartz pebbles are on the surface and throughout the profile and a few small areas where hard rock is at a depth of 2 feet.

Runoff is rapid. The erosion hazard is very severe unless a good plant cover is maintained. The soil is poorly suited to farm uses other than hay or pasture. Slope is the dominant limitation. Capability unit VIe-1; woodland group 2c.

Eubanks Series

The Eubanks series consists of deep, well-drained soils on uplands of the Piedmont Plateau. These soils formed in material weathered from dark-colored crystalline rocks, such as granodiorite.

In a respresentative profile the surface layer is dominantly yellowish-brown fine gravelly loam about 9 inches thick. The subsoil extends to a depth of 45 inches. It is yellowish-red fine gravelly clay loam in the upper 5 inches, red fine gravelly clay loam in the next 19 inches, and red light gravelly clay loam mottled with reddish yellow and yellowish red in the lower 12 inches. The substratum is mottled reddish-yellow fine gravelly sandy loam. Hard granite is at a depth of 76 inches.

Eubanks soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

These soils are well suited to general farm crops, and a large acreage is farmed. Many areas are wooded, especially the steeper areas.

Representative profile of Eubanks fine gravelly loam, 2 to 7 percent slopes, about 4 miles east of Haywood on the west side of State Road 604 at the junction of State Road 606:

A1—0 to 1 inch, dark yellowish-brown (10YR 4/4) fine gravelly loam; moderate, fine, granular structure; very friable; many fine roots; about 20 percent fine quartz gravel; strongly acid; clear, smooth boundary.

A2—1 to 9 inches, yellowish-brown (10YR 5/6) fine gravelly loam; moderate, fine, granular structure; very friable; many fine and medium roots; 20 percent fine quartz gravel; strongly acid; clear, smooth boundary.

B1t—9 to 14 inches, yellowish-red (5YR 5/8) fine gravelly light clay loam; weak, fine, subangular blocky structure; friable; common fine and medium roots; many thin clay films; few very fine mica flakes; 20 percent fine gravel; strongly acid; gradual, smooth boundary.

B2t—14 to 33 inches, red (2.5YR 5/8) fine gravelly clay loam; moderate, fine, subangular blocky structure; friable; common fine and medium roots; many thin clay films; few fine mica flakes; 20 percent fine gravel; strongly acid; gradual, smooth boundary.

B3t—33 to 45 inches, red (2.5YR 5/6) fine gravelly light clay loam; common, fine, yellowish-red (5YR 5/8) and reddish-yellow (5YR 7/8) mottles; weak, medium and fine, subangular blocky structure; friable; few fine roots; common thin and moderately thick clay films; 30 percent fine quartz gravel; strongly acid; gradual, smooth boundary.

C—45 to 76 inches, reddish-yellow (5YR 6/8) fine gravelly sandy loam; many, fine and medium, yellowish-red (5YR 5/8), strong-brown (7.5YR 5/6), black (N2/0), and white (N8/0) mottles; massive; very friable; common very fine mica flakes; strongly acid; gradual, wavy boundary.

R—76 inches, massive, coarse-grained granitic rock.

The solum ranges from 30 to 48 inches in thickness, but averages about 45 inches. Depth to bedrock ranges from 5 to 10 feet or more. The content of fine and very fine angular quartz fragments ranges from 5 to 30 percent.

Where plowed, the Ap horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 or 5; and chroma of 4 to 6. The A horizon ranges from fine gravelly loam to loam and to clay loam in areas where the soil is severely eroded. The B2t horizon is red in hue of 2.5YR, value of 4 or 5, and chroma of 6 to 8. The Bt horizon is 25 to 35 percent clay. The lower part of the B horizon and the C horizon commonly have high chroma mottling.

Eubanks soils are near or adjacent to Chester, Brandywine, Lloyd, and Meadowville soils. They have a redder subsoil than Chester and Meadowville soils. They have a coarser textured subsoil than Lloyd soils. They have a redder, much thicker, and finer textured subsoil than Brandywine soils.

Eubanks fine gravelly loam, 2 to 7 percent slopes (EsB).—This soil is on moderately wide to narrow ridgetops. It has the profile described as representative of the series. The surface layer ranges from 8 to 12 inches in thickness, but averages about 9 inches. It is friable and is easily tilled.

Included with this soil in mapping were a few small areas where the surface layer is eroded and ranges to reddish-brown fine gravelly light clay loam, small areas where the solum is thin, and an occasional outcrop of rock that is shown by a spot symbol on the soil map.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Eubanks fine gravelly loam, 7 to 15 percent slopes (EsC).—This soil has a profile similar to the one described as representative of the series, but the solum is slightly thinner. The surface layer is about 7 inches thick. Fine and very fine gravel makes up 15 to 25 percent of the soil profile. Included in mapping were a few small areas where slopes are slightly steeper and a few areas of Rock outcrop.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Eubanks fine gravelly loam, 7 to 15 percent slopes, eroded (EsC2).—This soil has a profile similar to the one described as representative of the series, but the solum is thinner and the surface layer is only about 5 inches thick. In plowed areas the surface layer is a mixture of the original surface layer and material

from the subsoil. It is redder and slightly finer textured than the surface layer in uneroded areas.

Included with this soil in mapping were a few small areas where the soil is severely eroded and the surface layer is light clay loam and a few small areas where slopes are slightly steeper. Outcrop of rock occurs in a few places.

Runoff is medium to rapid. This soil is highly susceptible to erosion if used for cultivated crops. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Eubanks loam, very deep, 2 to 7 percent slopes (EtB).—This soil has a profile similar to the one described as representative of the series, but the substratum is 10 to more than 30 feet deep over bedrock and no fine or very fine gravel occurs in the profile. The solum is about 38 inches thick. The surface layer is friable and is easily tilled.

Included with this soil in mapping were small areas where the surface layer is eroded.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Eubanks loam, very deep, 7 to 15 percent slopes, eroded (EtC2).—This soil has a profile similar to the one described as representative of the series, but the substratum is 10 to more than 30 feet deep over bedrock and the soil does not have a high content of fine and very fine gravel throughout the profile. The surface layer is thin because it is eroded. It is redder than is typical and ranges to light clay loam.

Runoff is medium to rapid. The erosion hazard is severe if this soil is used for cultivated crops. Slope and permeability limit many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Eubanks loam, very deep, 15 to 25 percent slopes, eroded (EtD2).—This soil has a profile similar to the one described as representative of the series, but the substratum is 10 to more than 30 feet deep over bedrock and the soil does not have a high content of fine and very fine gravel throughout the profile. The solum is only about 36 inches thick. The surface layer is light clay loam and is thinner and redder than is typical because it is eroded. A few shallow and moderately deep gullies have formed. Included in mapping were a few small areas where slopes are steeper than 25 percent.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland group 3r.

Eubanks-Lloyd clay loams, 7 to 15 percent slopes, severely eroded (EuC3).—This mapping unit is about 65 percent Eubanks soil and 35 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd clay loam is described under the heading "Lloyd Series." The surface layer of both soils is thin, and the plow layer is largely subsoil material.

Included with these soils in mapping were a few small areas where the solum is only 18 inches thick. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe in cultivated areas. The soils are suited to pasture or hay. Slope and erosion limit some nonfarm uses. Capability unit IVe-3; woodland group 4c.

Eubanks-Lloyd clay loams, 15 to 25 percent slopes, severely eroded (EuD3).—This mapping unit is about 65 percent Eubanks soil and 35 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd clay loam is described under the heading "Lloyd Series." The surface layer of both soils is thin, and the plow layer is largely subsoil material.

Included with these soils in mapping were a few small areas where the solum is only 18 inches thick. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe in cultivated areas. The soils are suited to pasture or hay crops. Slope is the dominant limitation. Capability unit VIe-1; woodland group 4c.

Eubanks-Lloyd clay loams, 25 to 45 percent slopes, severely eroded (EuE3).—This mapping unit is about 65 percent Eubanks soil and 35 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd clay loam is described under the heading "Lloyd Series." The surface layer of both soils is thin, and the plow layer is largely subsoil material.

Included with these soils in mapping were a few small areas where the solum is thinner than is typical. A few shallow, moderately deep, and deep gullies have formed. Rock crops out in some areas.

Runoff is very rapid. The erosion hazard is very severe unless a dense plant cover is maintained. Slope is the dominant limitation. Capability unit VIIe-1; woodland group 4c.

Eubanks-Lloyd loams, 2 to 7 percent slopes (EyB).—This mapping unit is about 55 percent Eubanks soil and 45 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks Series, but does not have a high content of fine gravel. A Lloyd loam is described under the heading "Lloyd Series." The surface layer of both soils is friable and is easily tilled.

Included with these soils in mapping were a few small areas where the solum is thin and weakly expressed and a few areas where the lower part of the subsoil and the substratum have a fairly high content of mica.

Runoff is slow to medium. The erosion hazard is moderate if these soils are cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Eubanks-Lloyd loams, 2 to 7 percent slopes, eroded (EyB2).—This mapping unit is about 55 percent Eubanks soil and 45 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd loam is described under the heading "Lloyd Series." The surface layer of both soils is friable and is easily tilled.

Included with these soils in mapping were a few small areas where the surface layer is reddish-brown to red clay loam, a few small areas where the lower part of the subsoil and the substratum have a high mica content, and a few small areas where the solum is thinner than is typical.

Runoff is slow to medium. The erosion hazard is moderate if these soils are cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Eubanks-Lloyd loams, 7 to 15 percent slopes (EyC).—This mapping unit is about 60 percent Eubanks soil and 40 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd loam is described under the heading "Lloyd Series." The surface layer of both soils is friable and is easily tilled.

Included with these soils in mapping were a few small areas where the solum is thin and weakly expressed and a few areas where the lower part of the subsoil and the substratum have a fairly high content of mica.

Runoff is rapid. The erosion hazard is severe if these soils are cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Eubanks-Lloyd loams, 7 to 15 percent slopes, eroded (EyC2).—This mapping unit is about 60 percent Eubanks soil and 40 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd loam is described under the heading "Lloyd Series." The surface layer of both soils is friable in all but the more severely eroded areas.

Included with these soils in mapping were a few small areas where the solum is thin and weakly expressed and a few areas where the lower part of the subsoil and the substratum have a high content of mica.

Runoff is rapid. The erosion hazard is severe if these soils are cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Eubanks-Lloyd loams, 15 to 25 percent slopes, eroded (EyD2).—This mapping unit is about 70 percent Eubanks soil and 30 percent Lloyd soil. The Eubanks soil has a profile similar to the one described as representative of the Eubanks series, but does not have a high content of fine gravel. A Lloyd loam is described under the heading "Lloyd Series." The surface layer of both soils is friable in all but the severely eroded spots.

Included with these soils in mapping were a few areas where the solum is thin and weakly expressed, a few areas where the lower part of the subsoil and the substratum have a high mica content, and a few small areas where the surface layer is redder than is typical and is clay loam.

Runoff is rapid. The erosion hazard is very severe if these soils are cultivated. Slope is the major limitation for most nonfarm uses. Capability unit IVe-1; woodland group 3r.

Fauquier Series

The Fauquier series consists of deep, well-drained soils on uplands of the Piedmont Plateau. These soils formed in material weathered from chloritic greenstone schist.

In a representative profile the surface layer is dominantly reddish-brown silt loam about 7 inches thick. The subsoil extends to a depth of 40 inches. The upper 5 inches is red silty clay loam. The next 15 inches is red silty clay. The lower 13 inches is red silty clay loam. The substratum is yellowish-red silty clay loam mottled with red and yellowish brown. It is mixed with strongly weathered greenstone schist. Bedrock is at a depth of 69 inches.

Fauquier soils have a medium acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

A large acreage is used for general crops and hay and pasture. A small acreage is woodland.

Representative profile of Fauquier silt loam, 2 to 7 percent slopes, near Madison Mills on the Rosni Farm about one-half mile north of main house:

A1—0 to 1 inch, dark reddish-brown (2.5YR 3/4) silt loam; moderate, very fine and fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

A2—1 to 7 inches, reddish-brown (5YR 4/4) silt loam; moderate, fine and very fine, granular structure; friable; many fine and medium roots; medium acid; clear, smooth boundary.

B1t—7 to 12 inches, red (2.5YR 4/8) light silty clay loam; moderate to weak, very fine, subangular blocky structure; friable; many fine and medium roots; few thin clay films; medium acid; clear, smooth boundary.

B2t—12 to 27 inches, red (10R 4/6) silty clay; moderate, fine and very fine, subangular blocky structure; firm; thin to medium continuous clay films; few weathered greenstone fragments; common fine roots; medium acid; clear, smooth boundary.

B3—27 to 40 inches, red (10R 4/6) silty clay loam; weak, medium, subangular blocky structure; friable; many weathered greenstone fragments; medium acid; gradual, smooth boundary.

C—40 to 69 inches, yellowish-red (5YR 5/6) silty clay loam mottled with yellowish brown (10YR 5/6) and red (10R 4/6); mixed with strongly weathered greenstone schist; many thin and medium clay films in cracks between schist fragments; medium acid; diffuse, wavy boundary.

R—69 inches, partly weathered greenstone schist rock.

The solum ranges from about 20 to 40 inches in thickness. It is 0 to 10 percent coarse fragments. Depth to hard bedrock ranges from 40 to 60 inches or more.

The A2 horizon has hue of 7.5YR and 5YR, value of 3 to 5, and chroma of 2 to 4. It ranges from silt loam to loam or silty clay loam. The Bt horizon has hue of 2.5YR or 10R, value of 3 or 4, and chroma of 6 to 8. It ranges from silty clay loam to clay and has a clay content of 35 to 45 percent.

Fauquier soils are near or adjacent to Catoctin, Lloyd, and Davidson soils. They have a redder and thicker Bt horizon than Catoctin soils. They have a thinner solum than Lloyd soils. They do not have the dark-red color that is characteristic of Davidson soils.

Fauquier silt loam, 2 to 7 percent slopes (FaB).—This soil is on ridgetops. It occurs as areas small to medium in size. It has the profile described as representative of the series. The surface layer is friable and is easily tilled.

Included with this soil in mapping were a few areas where the surface layer is yellowish brown and the subsoil is yellowish red and a few areas where the profile is either thicker or thinner than is typical. Also included were some areas of Rock outcrop, which are shown on the soil map by spot symbols.

Runoff is slow to medium. The erosion hazard is moderate if this soil is used for cultivated crops. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 1c.

Fauquier silty clay loam, 2 to 7 percent slopes, eroded (FcB2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 5 inches thick. The present surface layer is a mixture of the original surface layer and material from the subsoil. It is fairly easy to till.

Included with this soil in mapping were a few areas where the subsoil is yellowish red and a few small areas where the soil is shallow over hard rock.

Runoff is medium. The erosion hazard is moderate if this soil is used for cultivated crops. Slope, surface texture, and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 3c.

Fauquier silty clay loam, 7 to 15 percent slopes, eroded (FcC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only 5 inches thick and the solum is slightly thinner than is typical. The plow layer is a mixture of the original surface layer and material from the subsoil. It is fairly easy to till.

Included with this soil in mapping were a few areas where the subsoil is yellowish red and a few areas where the soil is shallow over bedrock. A few shallow gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe if this soil is used for cultivated crops. Slope and permeability are limitations for some nonfarm uses. Capability unit IIIe-1; woodland group 3c.

Fauquier silty clay loam, 15 to 25 percent slopes, eroded (FcD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 4 inches thick and the solum is thinner than is typical. The plow layer is a mixture of the original surface layer and material from the subsoil. It is fairly easy to till.

Included with this soil in mapping were a few areas where the subsoil is yellowish red and a few areas where the soil is

shallow over bedrock. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is used for cultivated crops. Slope is the dominant limitation for many nonfarm uses. Capability unit IVe-1; woodland group 3c.

Glenelg Series

The Glenelg series consists of deep, well-drained soils on uplands of the Piedmont Plateau. These soils formed in material weathered from mica schist, phyllite, and graywacke sandstone.

In a representative profile the surface layer is dominantly yellowish-brown loam about 8 inches thick. The subsoil extends to a depth of 33 inches. The upper 3 inches is strong-brown loam. The lower 22 inches is yellowish-red silty clay loam. The substratum to a depth of 65 inches is yellowish-brown, highly micaceous loam.

Glenelg soils have a strongly acid subsoil and are low in organic-matter content. They are low in natural fertility. The subsoil is moderately permeable, and the underlying material is rapidly permeable. Available water capacity is medium.

Most of the acreage is wooded. A sizeable acreage, however, is used for general crops, hay, or pasture.

Representative profile of Glenelg loam, 5 to 15 percent slopes, eroded, 1 1/2 miles east of Uno on the north side of State Road 620:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) loam; moderate, very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

A2—1 to 8 inches, yellowish-brown (10YR 5/4) loam; moderate, very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—8 to 11 inches, strong-brown (7.5YR 5/8) heavy loam; weak, fine, subangular blocky structure; friable; many fine roots; few, thin, patchy clay films; common fine mica flakes; strongly acid; clear, smooth boundary.

B2t—11 to 28 inches, yellowish-red (5YR 5/8) silty clay loam, crushes to strong-brown (7.5YR 5/6) moderate, fine, subangular blocky structure; friable; thin continuous clay films; common fine roots; common fine mica flakes; strongly acid; clear, smooth boundary.

B3—28 to 33 inches, yellowish-red (5YR 5/8) light silty clay loam; weak, fine, subangular blocky structure; friable; few fine roots; many fine mica flakes; strongly acid; clear, smooth boundary.

C—33 to 65 inches, light yellowish-brown (10YR 6/4) loam streaked with yellowish brown (10YR 5/6), strong brown (7.5YR 5/6) and light brownish gray (10YR 6/2); massive; very friable; highly micaceous; few fine schist fragments in lower part; strongly acid.

The solum ranges from 20 to 42 inches in thickness. Depth to bedrock ranges from 8 to 30 feet or more. Few to common angular quartz fragments are on the surface in places.

The A2 horizon has hue of 7.5YR and 10YR, value of 4 to 6, and chroma of 2 to 4. It ranges from loam to silt loam and fine sandy loam. The B2t horizon has hue of 5YR and 7.5YR, value of 5 to 6, and chroma of 4 to 8. It is heavy loam to light clay loam. The clay content is 18 to 35 percent. The B horizon has common to many mica flakes throughout.

Glenelg soils are near or adjacent to Elioak, Manor, and Hazel soils. They have a browner, less clayey subsoil than Elioak soils. They have a thicker, more clayey subsoil than Hazel and Manor soils.

Glenelg loam, 5 to 15 percent slopes, eroded (G1C2).—This soil is on ridgetops and gentle side slopes. It occurs as areas small to medium in size. It has the profile described as representative of the series. Slopes are mainly 7 to 15 percent. The surface layer is 4 to 10 inches thick. The plow layer is a mixture of the original surface layer and material from the subsoil. A few angular quartz fragments are on the surface in places.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses of this soil. Capability unit IIIe-1; woodland group 2o.

Glenelg loam, 15 to 25 percent slopes, eroded (G1D2).—This soil has a profile similar to the one described as representative of the series, but the solum is thinner. The surface layer is about 5 inches thick. It is a mixture of the original surface layer and material from the subsoil.

Included with this soil in mapping were areas where a few angular quartz fragments are on the surface and a few small areas where slopes range up to 35 percent. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. Slope is the dominant limitation for many nonfarm uses of this soil. Capability unit IVe-1; woodland group 2r.

Hazel Series

The Hazel series consists of moderately deep, excessively drained soils on uplands of the Piedmont Plateau. These soils formed in material weathered from schist, phyllite, and graywacke sandstone.

In a representative profile the surface layer is dark yellowish-brown loam about 8 inches thick. The subsoil, about 6 inches thick, is dark-brown loam mottled with strong brown and yellowish red. The substratum is light olive-brown fine sandy loam mottled with brownish yellow and strong brown. It is mixed with strongly weathered graywacke sandstone and phyllite. Hard graywacke sandstone and phyllite are at a depth of 38 inches.

Hazel soils are strongly acid unless limed. They are low in organic-matter content and natural fertility. Permeability is moderately rapid, and available water capacity is low.

Most of the acreage is wooded. Most cleared areas are used for pasture.

Representative profile of Hazel loam, 7 to 15 percent slopes, about 3 miles northeast of Uno near Beautiful Run on the west side of State Road 616:

Ap—0 to 8 inches, dark yellowish-brown (10YR 4/4) loam; moderate, fine, granular structure, very friable; many fine roots; 0 to 5 percent fine schist and sandstone fragments; strongly acid; clear, smooth boundary.

B—8 to 14 inches, dark-brown (7.5YR 4/4) loam; common strong-brown (7.5YR 5/6) and yellowish-red (5YR 5/6) mottles; weak, medium and fine, subangular block structure; very friable; strongly acid; clear, smooth boundary.

C—14 to 38 inches, light olive-brown (2.5Y 5/4) fine sandy loam; common brownish-yellow (10YR 6/6) and strong-brown mottles; massive; very friable; highly weathered micaceous graywacke sandstone and phyllite; thin clay films in crevices between rocks; strongly acid.

R—38 inches +, highly micaceous, hard graywacke sandstone and phyllite.

The solum ranges from 14 to 20 inches in thickness. Minimum depth to hard bedrock is 20 inches. Lenses less than 6 inches thick of fine sandy clay loam are in some profiles. Coarse fragments of angular quartz and weathered schist, phyllite, and sandstone range from 0 to 10 percent in the A and B horizons and up to 30 percent in the underlying material. Mica flakes are common throughout the profile.

The Ap horizon has hue of 10YR and 7.5YR, value of 4 to 5, and chroma of 2 to 4. The A horizon is loam or silt loam and ranges to fine sandy loam. The B horizon ranges from 6 to 8 inches in thickness. It has hue of 7.5YR, value of 4 to 5, and chroma of 4 to 8. It ranges from loam to fine sandy loam.

Hazel soils are near or adjacent to Glenelg, Elioak, and Manor soils. They have a coarser textured and thinner subsoil than Glenelg and Elioak soils. They have a thinner substratum than Manor soils.

Hazel loam, 7 to 15 percent slopes (HaC).—This soil is on the tops and sides of ridges. It has the profile described as representative of the series. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the subsoil is thin, firm sandy clay loam; a few small areas where bedrock is within a depth of 10 inches; a few areas where hard rock crops out; and a few small areas where slopes are 2 to 7 percent.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. The soil is poorly suited to row crops. It is better suited to small grain and pasture or hay. Slope, depth to rock, and permeability limit many nonfarm uses. Capability unit IVe-2; woodland group 4d.

Hazel loam, 15 to 25 percent slopes (HaD).—This soil has a profile similar to the one described as representative of the series, but is generally not so deep over bedrock. Included in mapping were a few small areas where the subsoil is thin, firm sandy clay loam and a few areas, identified by a spot symbol on the soil map, where bedrock crops out. A few shallow to deep gullies have formed.

Runoff is very rapid. The erosion hazard is severe unless a dense plant cover is maintained. The soil is better suited to pasture than to cultivated crops. Slope and depth to bedrock limit most nonfarm uses. Capability unit VIe-2; woodland group 4d.

Hazel loam, 25 to 55 percent slopes (HaF).—This soil has a profile similar to the one described as representative of the series, but is much thinner overall. Rock crops out in a few areas. The outcrops are identified by spot symbols on the soil map. Included in mapping were small areas where the substratum is 10 feet deep or more over hard rock. A few shallow, moderately deep, and deep gullies have formed.

Runoff is very rapid, and the erosion hazard is very severe. Steep slopes and droughtiness make this soil better suited to permanent pasture or trees than to other farm uses. Slope and depth to rock are the dominant limitations. Capability unit VIIe-1; woodland group 4d.

Hiwassee Series

The Hiwassee series consists of deep, well-drained soils on river terraces throughout the Piedmont. These soils formed in old alluvium that washed from other soils of the Piedmont and the Blue Ridge Mountains.

In a representative profile the surface layer is dominantly dark reddish-brown loam about 9 inches thick. The subsoil extends to a depth of 96 inches. The upper 73 inches is dark-red, firm, sticky clay. The lower 14 inches is firm, red clay loam. The substratum to a depth of 100 inches is friable loam weathered from biotite gneiss.

Hiwassee soils have a medium to strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is high.

These soils are generally well suited to the crops commonly grown in the county. A large acreage is used for farming. A smaller acreage is wooded.

Representative profile of Hiwassee loam, 2 to 7 percent slopes, about 3 miles east of Wolftown, one-half mile south of State Route 230 on the east side of County Road 663:

A1—0 to 1 inch, very dusky red (2.5YR 2/2) loam; weak, very fine and fine, granular structure; friable; many fine and medium roots; strongly acid; clear, smooth boundary.

A2—1 to 9 inches, dark reddish-brown (2.5YR 3/4) loam; moderate, very fine and fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

B21t—9 to 60 inches, dark-red (10R 3/6) clay; moderate, fine, subangular blocky structure; firm, very plastic and very sticky; many moderately thick clay films; common black concretions and streaks; few to common fine and medium roots; few, fine, rounded quartz pebbles; strongly acid; clear, smooth boundary.

B22t—60 to 82 inches, dark-red (10R 3/6) clay; moderate, coarse, blocky structure; firm, plastic and very sticky; moderately thick clay films on vertical ped surfaces; few fine roots; rounded quartz gravel; lime at a depth of 82 inches; strongly acid; clear, smooth boundary.

IIB3—82 to 96 inches, red (10R 4/6) clay loam; massive; firm; many fine mica flakes increasing in amount with increasing depth; strongly acid; gradual, smooth boundary.

IIC—96 to 100 inches, mottled red (2.5YR 4/6), yellowish-red (5YR 5/6), strong-brown (7.5YR 5/6), and brownish-yellow (10YR 6/6) loam; massive; very friable; many fine mica flakes; appears to be strongly weathered biotite gneiss.

The solum ranges from 40 to more than 60 inches in thickness. In places it has few to common, fine to medium quartz pebbles. Depth to hard rock ranges from about 5 to more than 30 feet.

The A horizon has hue of 5YR, 2.5YR, and 10R; value less than 4; and chroma of 2 to 4. It is commonly loam, but if eroded, it ranges from fine sandy loam to clay loam. The Bt horizon has hue of 10R and 2.5YR, value of 3 or less, and chroma of 2 to 6. It is commonly clay, but ranges to clay loam and silty clay. It has a clay content of 35 to 50 percent. The C horizon is dark red or red mottled with yellowish brown, brownish yellow, strong brown, and yellowish red. It ranges from sandy loam to clay. Quartz gravel and cobbles are common in the C horizon and lower part of the B horizon.

Hiwassee soils are near or adjacent to Wickham, Altavista, Augusta, and Roanoke soils. They have a redder, thicker, and more clayey subsoil than Wickham soils. They are redder and better drained and are at higher elevations than Altavista, Augusta, and Roanoke soils.

Hiwassee loam, 2 to 7 percent slopes (HsB).—This soil is on high river terraces. It has the profile described as representative of the series. The surface layer is friable and is easily tilled. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the solum is only 30 inches thick and a few areas where few to common pebbles are on the surface.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. A sticky clay subsoil, slope, and permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2o.

Hiwassee loam, 2 to 7 percent slopes, eroded (HsB2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The plow layer is a mixture of the original surface layer and material from the subsoil. Included in mapping were small areas where the surface layer is clay loam and a few areas where a few rounded pebbles are on the surface. The surface layer is easy to till except in areas where it is clay loam.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. Slope, a sticky subsoil, and permeability limit some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2o.

Hiwassee loam, 7 to 15 percent slopes, eroded (HsC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The plow layer is a mixture of the original surface layer and material from the subsoil. Included in mapping were small areas where the surface layer is clay loam and a few areas where a few rounded quartz pebbles are on the surface. The surface layer is easy to till except in areas where it is clay loam.

Runoff is medium. The erosion hazard is severe if this soil is cultivated. Slope and permeability limit some nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Hiwassee loam, 15 to 25 percent slopes, eroded (HsD2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The plow layer is a mixture of the original surface layer and material from the subsoil. Included in mapping were a few small areas where the surface layer is clay loam and a few areas where a few rounded quartz pebbles are on the surface. The surface layer is friable except in areas where it is clay loam.

Runoff is rapid. The erosion hazard is very severe if this soil is used for cultivated crops. The soil is better suited to small grain and pasture or hay than to row crops. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland group 2r.

549-665 O - 75 - 3

Iredell Series

The Iredell series consists of deep, moderately well drained to somewhat poorly drained soils of the Piedmont Uplands. These soils formed in material weathered from dark-colored basic rocks, such as diabase and gabbro.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. It is mottled with brown and light brownish gray. The subsoil extends to a depth of 32 inches. The upper 13 inches is mottled dark yellowish-brown extremely plastic clay, and the lower 12 inches is mottled dark yellowish-brown to olive-brown clay loam. The substratum is mottled light olive-brown, olive-yellow, white, green, and black loam. Weathered diabase rock is at a depth of 66 inches.

Iredell soils have a slightly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is slowly permeable. Available water capacity is medium.

The acreage is about equally divided between general farm crops and woodland.

Representative profile of Iredell silt loam, 2 to 7 percent slopes, about 1 1/2 miles east of Locust Dale, north of County Road 614 on a flat north of Hartland Hall:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, brown (10YR 4/3) and light brownish-gray (2.5Y 6/2) mottles; moderate, very fine and fine, granular structure; friable; few very dark brown to black concretions; few fine quartz pebbles; many fine roots; medium acid; abrupt, smooth boundary.

B2t—7 to 20 inches, dark yellowish-brown (10YR 4/4) clay; many, medium, distinct, olive (5Y 4/4) mottles; moderate, medium and coarse, subangular blocky structure; very firm, extremely plastic and sticky; few black streaks in lower 3 inches; moderately thick continuous clay films; common fine roots; slightly acid; clear, smooth boundary.

B3t—20 to 32 inches, dark yellowish-brown (10YR 4/4) to olive-brown (2.5Y 4/4) clay loam; many, fine, black (10YR 2/1), white (10YR 8/1), and strong-brown (7.5YR 5/6) mottles; weak, coarse, prismatic structure; firm; few fine roots; moderately thick continuous clay films on vertical faces; slightly acid; clear, smooth boundary.

C—32 to 66 inches, mottled light olive-brown (2.5Y 5/4), olive-yellow (2.5Y 6/6), white, green, and black loam; tongues and streaks of clay from B horizon in crevices; massive; friable; neutral; clear, wavy boundary.

R—66 inches, weathered diabase rock.

The solum ranges from 20 to 40 inches in thickness, but averages about 32 inches. Minimum depth to hard bedrock is 40 inches.

The Ap horizon has hue of 10YR and 2.5Y, value of 3 to 4, and chroma of 2 to 3. The A horizon is silt loam or loam. The B2t horizon has hue of 10YR, value of 3 to 5, and chroma of 3 to 8. It is extremely plastic clay. The B3t horizon commonly has low chroma mottling.

Iredell soils are near or adjacent to Elbert, Davidson, Bremo, and Fauquier soils. They are better drained than Elbert soils and more poorly drained than Davidson soils. They have a thicker solum than Bremo soils. They are less red throughout and have a much more plastic subsoil than Fauquier soils.

Iredell silt loam, 2 to 7 percent slopes (IrB).—This soil is on low ridges. Areas are small to medium in size. Included in mapping were a few small areas where the surface layer is eroded and is silty clay loam to clay. Also included were a few small areas where the solum is thin and some areas, identified by spot symbols on the soil map, where a few angular quartz pebbles or rounded diabase boulders are on the surface.

Runoff is slow to medium. The erosion hazard is severe if this soil is farmed. A high water table is common in winter and spring and after heavy rains. Slow permeability and seasonal wetness are the dominant limitations. Capability unit IIIe-2; woodland group 4w.

Lewisberry Series

The Lewisberry series consists of deep, well-drained soils on Triassic uplands. These soils formed in material weathered from sandstone and conglomerate.

In a representative profile the surface layer is dark-brown sandy loam about 9 inches thick. The subsoil extends to a depth of 27 inches. The upper 6 inches is reddish-brown gravelly sandy loam. The lower 12 inches is dark reddish-brown gravelly sandy clay loam. The substratum is about 18 inches of sandy loam mixed with strongly weathered red sandstone conglomerate. Hard sandstone conglomerate is at a depth of 45 inches.

Lewisberry soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil has moderately rapid permeability. Available water capacity is low.

About 60 percent of the acreage is used for general farm crops. The rest is largely wooded.

The Lewisberry soils in Madison County are not so thick as Lewisberry soils elsewhere.

Representative profile of Lewisberry sandy loam, 10 to 25 percent slopes, about 2 miles south of Locust Dale, one-half mile east of State Highway 15 on the south side of County Road 671:

Ap—0 to 9 inches, dark-brown (7.5YR 3/2) sandy loam; moderate, fine and very fine, granular structure; very friable; many fine roots; 5 to 10 percent weathered sandstone and shale fragments less than 2 inches in diameter; strongly acid; clear, smooth boundary.

B1t—9 to 15 inches, reddish-brown (5YR 4/3) gravelly sandy loam; weak, fine, subangular blocky structure; friable; many fine roots; 30 percent fine sandstone and shale fragments; few thin clay films; strongly acid; clear, smooth boundary.

B2t—15 to 27 inches, dark reddish-brown (5YR 3/4) gravelly light sandy clay loam; weak, fine and medium, subangular blocky structure; friable; common fine roots; few thin clay films; 40 percent weathered sandstone and shale fragments; strongly acid; clear, smooth boundary.

C—27 to 45 inches, dark reddish-brown (5YR 3/4), grayish-brown (10YR 5/2) and yellowish-red (5YR 4/6) sandy loam and highly weathered trap conglomerate, largely red sandstone; few medium clay flows in crevices between rocks; strongly acid; abrupt, irregular boundary.

R—45 inches, hard Triassic conglomerate rock, largely sandstone.

The solum ranges from about 20 to 45 inches in thickness, but averages about 27 inches. Depth to bedrock ranges from 2 to 5 feet. The content of coarse fragments is 5 to 10 percent in the A horizon and is more than 40 percent in the lower part of the B horizon and the C horizon.

The Ap horizon has hue of 7.5YR, 5YR, and 2.5YR; value of 3 to 5; and chroma of 2 to 6. The A horizon is typically sandy loam, but ranges to loam and fine sandy loam. The Bt horizon has hue of 5YR and 2.5YR, value of 3 to 5, and chroma of 3 to 6. It ranges from sandy loam to light sandy clay loam and has a clay content of 10 to 18 percent.

Lewisberry soils are near or adjacent to Penn, Bucks, and Mayodan soils. They have a coarser textured solum than Penn soils. They resemble Bucks soils in color, but have a coarser textured subsoil. They have a darker colored surface layer and a coarser textured subsoil than Mayodan soils.

Lewisberry sandy loam, 10 to 25 percent slopes (LeD).—This soil is mainly on narrow side slopes of the Triassic uplands. Slopes are mainly 15 to 25 percent, but range from 10 to 25 percent.

Included with this soil in mapping were a few small areas where slopes are only 5 percent and a few areas where slopes are as much as 35 percent. A few shallow gullies have formed. Rock outcrop is common in a few areas and is identified by a spot symbol on the soil map.

Runoff is medium. The erosion hazard is very severe if this soil is cultivated. The soil is better suited to small grain or grass than to row crops. Slope is the dominant limitation. Capability unit IVe-1; woodland group 3r.

Lloyd Series

The Lloyd series consists of deep, well-drained soils on the Piedmont Uplands. These soils formed in material weathered from mixed acid and basic rocks, such as granite gneiss and hornblende gabbro.

In a representative profile the surface layer is reddish-brown loam about 9 inches thick. The subsoil extends to a depth of 49 inches. The upper 31 inches is red to dark-red clay. The lower 9 inches is red clay loam. The substratum to a depth of 49 to 88 inches is yellowish-red loam mixed with strongly weathered granite and hornblende gabbro.

Lloyd soils have a medium acid to strongly acid subsoil. They are low in organic-matter content and medium in natural fertility. The subsoil is moderately permeable. Available moisture capacity is medium.

The undulating and rolling soils are used mainly for general farm crops. The steeper soils are used mainly for woodland. A significant acreage of all the soils is wooded.

Representative profile of Lloyd loam, 2 to 7 percent slopes, about 2 1/2 miles south of Madison on the west side of U.S. Highway 29 and south of State Route 230:

AP—0 to 9 inches, reddish-brown (5YR 4/4) loam; moderate, fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.
B21t—9 to 22 inches, red (10R 4/6) crushed clay; dark-red (2.5YR 3/6) coatings on ped surfaces; moderate, fine, subangular blocky structure; firm; many fine roots; thin continuous clay films; medium acid; clear, smooth boundary.
B22t—22 to 40 inches, red (10R 4/6) crushed clay; dark-red (10R 3/6) coatings on ped surfaces; moderate, fine and medium, angular blocky structure; firm; moderately thick continuous clay films; common fine roots; medium acid; clear, smooth boundary.
B3t—40 to 49 inches, red (2.5YR 4/8 clay loam; weak, medium, subangular blocky structure; friable; common fine mica flakes; few fine roots; many moderately thick clay films; medium acid; clear, smooth boundary.
C—49 to 88 inches, yellowish-red (5YR 4/6) loam and strongly weathered granite and hornblende gabbro; massive; very friable; thin clay flows in crevices in upper part; common mica flakes; medium acid.

The solum ranges from about 40 to 60 inches in thickness. Depth to bedrock ranges from 3 1/2 to more than 15 feet. The Ap horizon has hue of 2.5YR and 5YR, value of 3 to 4, and chroma of 2 to 4. It is typically loam, but ranges to fine sandy loam. It is clay in areas where erosion was severe. The B2t horizon has hue of 10R and 2.5YR, value of 3 or 4, and chroma of 6 or 8. The Bt horizon ranges from clay to heavy clay loam and generally has a clay content of 35 to 50 percent.

Lloyd soils are near or adjacent to Cecil, Elioak, Eubanks, Hazel, and Louisburg soils. They have a darker colored surface layer and a darker red subsoil than Cecil soils. They have a darker colored surface layer, a higher clay content, and a thicker solum than Elioak and Eubanks soils. They have a much thicker subsoil and much higher clay content than Hazel and Louisburg soils.

Lloyd fine sandy loam, 2 to 7 percent slopes (LfB).—This soil formed in material weathered from graywacke sandstone. It has a profile similar to the one described as representative of the series, but the surface layer is fine sandy loam. The surface layer is friable and is easily tilled. The substratum is thin.

Included with this soil in mapping were a few small areas where part of the surface layer has been removed through erosion. In these areas the surface layer is about 7 inches thick and is slightly finer than is typical. Also included are some areas where the substratum is as much as 40 feet deep over hard bedrock.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses of this soil. Capability unit IIe-1; woodland group 3o.

Lloyd fine sandy loam, 7 to 15 percent slopes, eroded (LfC2).—This soil has a profile similar to the one described as representative of the series, but it formed in material weathered from graywacke sandstone. The surface layer is fine sandy loam. The plow layer is a mixture of the original surface layer and material from the subsoil. It is very friable and is easily tilled.

Included with this soil in mapping were a few small areas where the surface layer is sandy clay loam and some areas where the substratum is 40 feet deep or more over bedrock.

Runoff is rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability are limitations for many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Lloyd fine sandy loam, 15 to 25 percent slopes, eroded (LfD2).—This soil has a profile similar to the one described as representative of the series, but it formed in material weathered from graywacke sandstone. The surface layer is fine sandy loam. The plow layer is a mixture of the original surface layer and material from the subsoil.

Included with this soil in mapping were a few small areas where the surface layer is sandy clay loam and some areas where the substratum is 40 feet deep or more over bedrock. A few shallow gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. The soil is better suited to small grain and hay or pasture than to row crops. Slope is the dominant limitation for many nonfarm uses. Capability unit IVe-1; woodland group 3r.

Lloyd loam, 2 to 7 percent slopes (L1B).—This soil is on ridgetops. It occurs as areas small to medium in size. It has the profile described as representative of the series. The surface layer is friable and is easily tilled.

Included with this soil in mapping were a few small areas where the subsoil and substratum are moderately micaceous and small areas where few to common angular quartz pebbles are on the surface and throughout the profile.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Lloyd loam, 2 to 7 percent slopes, eroded (L1B2).—This soil has a profile similar to the one described as representative of the series, but the plow layer is a mixture of the original surface layer and material from the subsoil. The surface layer is friable and is easily tilled except in areas where it is severely eroded.

Included with this soil in mapping are small areas where the subsoil and substratum are moderately micaceous and some areas where few to common angular quartz pebbles are on the surface and in the profile.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Lloyd loam, 7 to 15 percent slopes, eroded (L1C2).—This soil has a profile similar to the one described as representative of the series, but the plow layer is a mixture of the original surface layer and material from the subsoil. The surface layer is friable and is easily tilled except in areas where it is clay loam.

Included with this soil in mapping were a few small areas where the subsoil and substratum are moderately micaceous and some areas where few to common angular quartz pebbles are on the surface and in the profile. A few shallow gullies have formed.

Runoff is moderately rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Lloyd clay loam, 7 to 15 percent slopes, severely eroded (LnC3).—This soil has a profile similar to the one described as representative of the series, but the plow layer is largely subsoil material. The surface layer is sticky and is difficult to till.

Included with this soil in mapping were small areas where the subsoil and substratum are moderately micaceous and some areas where few to common angular quartz pebbles are on the surface. A few shallow, moderately deep, and deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if this soil is cultivated. Slope, permeability, and the severe erosion hazard are limitations for some uses of this soil. Capability unit IVe-3; woodland group 3c.

Lloyd clay loam, 15 to 25 percent slopes, severely eroded (LnD3).—This soil has a profile similar to the one described as representative of the series, but the plow layer is largely subsoil material. The surface layer is clayey and is difficult to till.

Included with this soil in mapping were a few small areas where the subsoil and substratum are moderately micaceous and some areas where few to common angular quartz pebbles are on the surface. A few shallow, moderately deep, and deep gullies have formed.

Runoff is rapid. The erosion hazard is severe unless a dense plant cover is maintained. The soil is better suited to hay and pasture than to cultivated crops. Slope is the dominant limitation for most nonfarm uses. Capability unit VIe-1; woodland group 3c.

Lloyd Series, Thin Solum Variant

The Lloyd series, thin solum variant, consists of deep, well-drained soils on the Piedmont Uplands. These soils formed in material weathered from biotite gneiss.

In a representative profile the surface layer is dominantly reddish-brown loam about 6 inches thick. The subsoil extends to a depth of 24 inches. The upper 13 inches is dark-red clay. The lower 5 inches is mottled red clay loam. The substratum to a depth of 82 inches is red or yellowish-red, very micaceous loam derived from deeply weathered gneiss.

The Lloyd variant has a medium acid to strongly acid subsoil and is low in organic-matter content. Natural fertility is medium. Permeability is moderate in the subsoil and moderately rapid in the underlying material. Available water capacity is medium.

Representative profile of Lloyd loam, thin solum variant, 2 to 7 percent slopes, eroded, about one-fourth mile north of Novum on the west side of County Route 605:

A1—0 to 1 inch, dark reddish-brown (5YR 3/4) loam; moderate, very fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

A2—1 to 6 inches, reddish-brown (2.5YR 4/4) loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; strongly acid; clear, smooth boundary.

B2t—6 to 19 inches, dark-red (10R 3/6) clay; moderate, fine and medium, subangular blocky structure; friable to firm; many fine and medium roots; common very fine mica flakes; thin continuous clay films; medium acid; clear, smooth boundary.

B3—19 to 24 inches, red (10R 4/6) clay loam; many, distinct, red (2.5YR 4/6), yellowish-red (5YR 5/8), and dark-red (10R 3/6) mottles; weak, fine, subangular blocky structure; friable; moderately thick dark-red clay films on vertical surfaces; many fine mica flakes; common fine roots; medium acid; clear, smooth boundary.

IIC1—24 to 39 inches, red (2.5YR 4/6) highly micaceous loam; many yellowish-red (5YR 5/8) mottles; massive; very friable; moderately thick to thick dark-red (10R 3/6) clay films in crevices; medium acid; gradual, smooth boundary.

IIC2—39 to 82 inches +, yellowish-red (5YR 5/8) highly micaceous loam; massive; very friable; medium acid.

The solum averages about 24 inches in thickness, but ranges from 15 to 35 inches. Depth to hard rock is generally greater than 20 feet. The A2 horizon has hue of 2.5YR and 5YR, value of 3 or 4, and chroma of 2 to 4. The B2t horizon has hue of 10R and 2.5YR, value of 3 or 4, and chroma of 6 to 8. The Bt horizon ranges from clay loam to clay and has a clay content of 35 to 50 percent.

The Lloyd thin solum variant is near or adjacent to Chester and Brandywine soils. It has a darker red color and a higher clay content in the Bt horizon than Chester soils. It has a thicker solum and a more clayey subsoil than Brandywine soils.

Lloyd loam, thin solum variant, 2 to 7 percent slopes, eroded (LmB2).—This soil has the profile described as representative of the series. The surface layer is friable and is easily tilled. Included in mapping were small areas where the surface layer is clay loam.

Runoff is moderate. The erosion hazard is moderate if this soil is cultivated. Slope and permeability are limitations for some uses. Capability unit IIe-1; woodland group 3o.

Lloyd loam, thin solum variant, 7 to 15 percent slopes, eroded (LmC2).—Included with this soil in mapping were a few small areas where the surface layer is clay loam. A few shallow and moderately deep gullies have formed.

Runoff is rapid. The erosion hazard is severe if this soil is cultivated. Slope and permeability are limitations for some nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Lloyd loam, thin solum variant, 15 to 25 percent slopes, eroded (LmD2).—Included with this soil in mapping were small areas where the surface layer is clay loam. A few shallow, moderately deep, and deep gullies have formed.

Runoff is rapid. The erosion hazard is severe unless a dense plant cover is maintained. The soil is poorly suited to cultivated crops. It is better suited to hay or pasture. Slope is the dominant limitation for most uses of this soil. Capability unit IVe-1; woodland group 3r.

Louisburg Series

The Louisburg series consists of moderately deep, well-drained to excessively drained soils on the Piedmont Uplands. These soils formed in material weathered from granite and granite gneiss.

In a representative profile the surface layer, about 12 inches thick, is dominantly light yellowish-brown sandy loam. The subsoil is yellowish-brown sandy loam about 10 inches thick. The substratum is yellowish-brown coarse sandy loam about 7 inches thick. Granite bedrock is at a depth of 29 inches.

Louisburg soils are very strongly acid and are low in organic-matter content and natural fertility. Permeability is rapid throughout, and available water capacity is low.

A large acreage is woodland. A smaller acreage is used for pasture and cultivated crops.

Representative profile of Louisburg sandy loam, 5 to 15 percent slopes, near Brightwood on west side of State Road 639 about one-half mile south of junction with State Road 640:

A1—0 to 2 inches, dark yellowish-brown (10YR 4/4) sandy loam; moderate; very fine, granular structure; very friable; many fine roots; few fine granite and quartz pebbles; very strongly acid; clear, smooth boundary.

A2—2 to 12 inches, light yellowish-brown (10YR 6/4) sandy loam; moderate, very fine and fine, granular structure; very friable; many fine roots; few fine granite and quartz pebbles; very strongly acid; clear, smooth boundary.

B—12 to 22 inches, yellowish-brown (10YR 5/6) sandy loam streaked with strong brown (7.5YR 5/6); single grained; very friable; few, thin, discontinuous lenses of yellowish-red sandy clay loam; few to common granite fragments; very strongly acid; gradual, smooth boundary.

C—22 to 29 inches, yellowish-brown (10YR 5/6) weathered granite rock; firm in place, but crushes easily in fingers to coarse sandy loam.

R—29 inches +, hard, slightly weathered granite bedrock.

The solum ranges from about 12 to 24 inches in thickness. Depth to hard rock is 24 to 40 inches. The content of coarse fragments is 0 to 10 percent in the solum and 25 percent in the underlying material.

The A2 horizon has hue of 10YR and 2.5Y, value of 5 and 6, and chroma of 2 to 4. The B horizon has hue of 10YR and 7.5YR, value of 5 or 6, and chroma of 4 or 6. It ranges from sandy loam to light sandy clay loam.

Louisburg soils are near or adjacent to Appling, Cecil, and Lloyd soils. They have a thinner solum and are coarser textured throughout than those soils. They are also shallower over bedrock than those soils.

Louisburg sandy loam, 5 to 15 percent slopes (LoC).—This soil is on the tops and sides of ridges. It has the profile described as representative of the series. Areas are medium to small in size. Slopes are mainly 7 to 15 percent.

Included with this soil in mapping were small areas where the subsoil is clay loam up to 6 inches thick, a few areas of

Rock outcrop, and small areas where the subsoil has a fairly high mica content and is underlain by a micaceous substratum.

Runoff is slow to medium, and the erosion hazard is moderate. The soil is droughty and is poorly suited to cultivated crops. It is better suited to pasture and trees. Slope and depth to bedrock are limitations for many nonfarm uses of this soil. Capability unit IVe-2; woodland group 3d.

Louisburg sandy loam, 15 to 25 percent slopes (LoD).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. Included in mapping were small areas where the subsoil is clay loam up to 6 inches thick, a few areas of Rock outcrop, and small areas where the subsoil and substratum are micaceous. A few shallow and moderately deep gullies have formed.

Runoff is medium, and the erosion hazard is severe. The soil is droughty and is poorly suited to cultivated crops. It is better suited to pasture and trees. Capability unit VIe-2; woodland group 3d.

Louisburg sandy loam, 25 to 55 percent slopes (LoF).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 8 inches thick. Slopes are mainly 25 to 45 percent.

Included with this soil in mapping were small areas where the subsoil is clay loam up to 6 inches thick, a few areas of Rock outcrop, and small areas where the subsoil and substratum are micaceous. A few shallow, moderately deep, and deep gullies have formed.

Runoff is medium to rapid, and the erosion hazard is very severe. The soil is droughty and is poorly suited to pasture. It is better suited to trees. Capability unit VIIe-1; woodland group 3d.

Made Land

Made land (Ma) consists of areas of cut and fill where the soil has been disturbed appreciably by heavy equipment and the original soil profile has been destroyed. It is dominantly in areas of Lloyd, Cecil, and similar soils that have a clayey subsoil.

Most of the acreage is used for parking areas and athletic fields and for trash disposal. The largest areas are around schools and other large buildings. The total acreage is small. Woodland group 5.

Manassas Series

The Manassas series consists of deep, well drained to moderately well drained soils. These soils formed largely in colluvial soil material that washed from adjacent slopes.

In a representative profile the surface layer is dark reddish-brown silt loam about 10 inches thick. The subsoil extends to a depth of 47 inches. The upper 31 inches is reddish-brown light silty clay loam, and the lower 6 inches is dark reddish-brown heavy silt loam. The substratum to a depth of 65 inches is a mixture of silt loam and strongly weathered Triassic conglomerate.

Manassas soils have a strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. A high water table is common in winter and spring. Available water capacity is high.

A large acreage is used for the crops commonly grown in the county. A smaller acreage is woodland.

Representative profile of Manassas silt loam, 2 to 7 percent slopes, near Madison Mills about one-fourth mile southwest of the junction of U.S. Highway 15 and State Highway 230:

Ap—0 to 10 inches, dark reddish-brown (5YR 3/4) silt loam; moderate, very fine and fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—10 to 18 inches, reddish-brown (5YR 4/4) light silty clay loam; weak, very fine and fine, subangular blocky structure; friable; many fine roots; few, thin, patchy clay films; strongly acid; clear, smooth boundary.

B2t—18 to 41 inches, reddish-brown (5YR 4/4) light silty clay loam; weak to moderate, fine, subangular blocky structure; friable; common, thin, patchy clay films; common fine roots; strongly acid; clear, smooth boundary.

IIB3—41 to 47 inches, dark reddish-brown (5YR 3/4) heavy silt loam; weak, fine, subangular blocky structure; friable; few fine roots; many, fine, weathered rock fragments of shale, sandstone, quartz, and greenstone; strongly acid; clear, smooth boundary.

IIC—47 to 65 inches, dark reddish-brown (5YR 3/4) streaked with brown (10YR 4/3), yellowish-brown (10YR 5/6), purple, and green strongly weathered Triassic conglomerate that breaks easily to friable silt loam; massive; strongly acid.

The solum ranges from 36 to 50 inches in thickness. Depth to hard bedrock is 3 to 8 feet. The content of coarse fragments is 5 to 10 percent in the solum and up to 25 percent in the underlying material.

The Ap horizon has hue of 5YR and 2.5YR, value of 3 to 5, and chroma of 3 or 4. It is largely silt loam, but ranges to loam and fine sandy loam in places. The Bt horizon has hue of 5YR and 2.5YR, value of 3 or 5, and chroma of 4 or 6. It ranges from heavy silt loam to light silty clay loam and is 18 to 35 percent clay. In places it has low chroma mottling in the lower part.

Manassas soils are near or adjacent to Bucks, Penn, Lewisberry, and Rapidan soils. They have a thicker solum than Bucks soils and are not so well drained. They have a thicker, more clayey Bt horizon than Penn and Lewisberry soils. They have less clay in the subsoil than Rapidan soils.

Manassas silt loam, 2 to 7 percent slopes (MnB).—This soil is in small areas along drainageways and in depressions. Included in mapping were small areas where the surface layer is fine sandy loam that is paler than is typical and some areas where few fragments of shale and sandstone are on the surface but are common to many in the lower part of the subsoil and in the substratum. Also included were a few wet spots.

Runoff is slow to medium, and the erosion hazard is moderate. Although a high water table is common in winter and spring, this soil is well suited to cultivated crops. The seasonal high water is a limitation for some nonfarm uses. Capability unit IIe-1; woodland group 2o.

Manor Series

The Manor series consists of deep, well drained to somewhat excessively drained soils of the Piedmont Uplands. These soils formed in material weathered from mica schist, phyllite, and graywacke sandstone.

In a representative profile the surface layer is light yellowish-brown silt loam about 9 inches thick. The subsoil is 10 inches of yellowish-brown micaceous loam mottled with brownish yellow and strong brown. The substratum to a depth of 52 inches is mottled light yellowish-brown fine sandy loam mixed with strongly weathered mica schist and graywacke sandstone.

Manor soils are strongly acid and are low in organic-matter content and natural fertility. Permeability is moderate to moderately rapid, and available water capacity is low.

Most of the acreage is woodland. The rest is used largely for pasture. A few areas are cultivated.

Representative profile of Manor silt loam, 7 to 20 percent slopes, near Rochelle on the west side and at the end of State Route 682:

Ap—0 to 9 inches, light yellowish-brown (10YR 6/4) silt loam; moderate, fine and very fine, granular structure; very friable; many fine mica flakes; many fine roots; strongly acid; clear, smooth boundary.

B—9 to 19 inches, yellowish-brown (10YR 5/8), highly micaceous loam; many, medium, distinct, brownish-yellow (10YR 6/6) and strong-brown (7.5YR 5/6) mottles; weak, fine, subangular blocky structure; very friable; many fine roots; gradual, smooth boundary.

C—19 to 52 inches, light yellowish-brown (10YR 6/4) fine sandy loam mottled with yellowish brown (10YR 5/8), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2); mixed with strongly weathered mica schist

and graywacke sandstone; massive; very friable; few, fine, hard schist fragments; strongly acid.

The solum averages about 19 inches in thickness, but ranges from 15 to 24 inches. Depth to hard rock ranges from 5 to more than 40 feet. The content of coarse fragments ranges from 0 to 10 percent in the solum and increases to about 25 percent in the C horizon. Coarse fragments consist of weathered schist, sandstone, and angular quartz. The content of mica is high throughout the profile.

The Ap horizon has hue of 10YR and 7.5YR, value of 4 to 6, and chroma of 1 to 4. It is commonly silt loam, but ranges to loam and fine sandy loam in places. The B horizon has hue of 10YR and 7.5YR, value of 5 or 6, and chroma of 4 to 8. It is commonly mottled with redder and yellower hues. It is commonly loam, but ranges to silt loam and fine sandy loam.

Manor soils are near or adjacent to Elioak, Glenelg, and Hazel soils. They have a thinner solum and a lower clay content in the subsoil than Elioak and Glenelg soils. They are much deeper over bedrock than Hazel soils.

Manor silt loam, 7 to 20 percent slopes (MoC).—This soil is on the narrow tops and the sides of ridges. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the subsoil is silty clay loam and is only 6 inches thick and a few small areas where slopes are as much as 45 percent. A few shallow, moderately deep, and deep gullies have formed.

Runoff is medium to rapid. The erosion hazard is very severe if this soil is cultivated. The soil is droughty and is better suited to small grain, pasture, or trees than to row crops. Slope is the dominant limitation for many nonfarm uses of this soil. Capability unit IVe-2; woodland group 2o.

Mayodan Series

The Mayodan series consists of deep, well-drained soils of the Triassic uplands. These soils formed in material weathered from sandstone.

In a representative profile the surface layer is dominantly yellowish-brown fine sandy loam about 11 inches thick. The subsoil extends to a depth of 55 inches. It is about 5 inches of strong-brown sandy clay loam, 17 inches of yellowish-red clay, 9 inches of yellowish-red clay mottled with red and brownish yellow, and 13 inches of yellowish-red sandy clay loam mottled with brownish yellow and light gray. The substratum to a depth of 91 inches is brownish-yellow sandy loam mottled with strong brown, white, and red. It is mixed with strongly weathered sandstone fragments.

Mayodan soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

Most of the acreage is used for cultivated crops and pasture. Some of the acreage is wooded.

Representative profile of Mayodan fine sandy loam, 2 to 7 percent slopes, on the east side of U.S. Highway 15, about 100 yards north of Woodberry Forest Lane:

A1—0 to 2 inches, dark grayish-brown (10YR 4/2) fine sandy loam; moderate, fine and very fine, granular structure; very friable; matted with fine roots; very strongly acid; clear, smooth boundary.

A2—2 to 11 inches, yellowish-brown (10YR 5/4) fine sandy loam; moderate, fine and very fine, granular structure; very friable; many fine roots; very strongly acid; clear, smooth boundary.

B1t—11 to 16 inches, strong-brown (7.5YR 5/6) sandy clay loam; weak, fine, subangular blocky structure; friable; few thin clay films; few fine roots; very strongly acid; clear, smooth boundary.

B21t—16 to 33 inches, yellowish-red (5YR 4/6) light clay; moderate, fine and medium, subangular blocky structure; friable to firm; thin continuous clay films; few fine roots; very strongly acid; clear, smooth boundary.

B22t—33 to 42 inches, yellowish-red (5YR 4/8) clay; common, medium, distinct, red (2.5YR 5/8) and brownish-yellow (10YR 6/8) mottles; moderate, medium and fine, subangular blocky structure; firm; moderately thick continuous clay films; very strongly acid; clear, smooth boundary.

B3—42 to 55 inches, yellowish-red (5YR 4/8) sandy clay loam; many, medium, distinct, brownish-yellow (10YR 6/8) and light-gray (5YR 7/1) mottles; weak, fine, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

C—55 to 91 inches, brownish-yellow (10YR 6/6), weathered Triassic sandstone streaked with strong brown, white, and purplish red; massive; crushes easily to very friable sandy loam.

The solum ranges from 40 to 60 inches in thickness. Depth to hard bedrock is 5 to 10 feet. The A2 horizon has hue of 2.5Y and 10YR, value of 6, and chroma of 3 or 4. The A horizon is fine sandy loam, loam, or sandy loam. The B2t horizon has hue of 5YR, 7.5YR, and 10YR; value of 4 to 6; and chroma from 4 to 8. It ranges from heavy clay loam to clay and is 35 to 50 percent clay.

Mayodan soils are near or adjacent to Calverton, Creedmoor, Penn, Bucks, and Lewisberry soils. They are better drained than Calverton and Creedmoor soils. They have a thicker solum and have a higher clay content in the subsoil than Penn and Lewisberry soils. In contrast with Bucks soils, they are not reddish in the upper part of the subsoil.

Mayodan fine sandy loam, 2 to 7 percent slopes (MuB).—This soil is on the tops and sides of ridges. It has the profile described as representative of the series. The surface layer is very friable and is easily tilled. Areas are small to medium in size.

Included with this soil in mapping were small areas of a soil that did not have a red subsoil but was otherwise similar to Mayodan soils. Also included were small areas of eroded soils that have a sandy clay loam surface layer and a few small areas of soils that have a brownish-yellow subsoil and a weak fragipan at a depth of about 30 inches.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. The soil is well suited to general farming. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 3o.

Mayodan fine sandy loam, 7 to 15 percent slopes, eroded (MuC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The plow layer is a mixture of the original surface layer and material from the subsoil. In small areas it is sandy clay loam. Although eroded, it is friable and is easily tilled.

Included with this soil in mapping were small areas where the subsoil is red and small areas where slopes are as much as 25 percent.

Runoff is medium to rapid. This soil is highly susceptible to erosion if used for cultivated crops. Slope is the dominant limitation for many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Meadowville Series

The Meadowville series consists of deep, well drained to moderately well drained soils. These soils formed in local alluvium or in colluvium that washed from adjacent, higher lying soils of the Piedmont Plateau.

In a representative profile the surface layer is brown to dark-brown loam about 14 inches thick. The subsoil extends to a depth of 52 inches. The upper 24 inches is strong-brown loam, the next 8 inches is yellowish-brown light silty clay loam, and the lower 6 inches is yellowish-brown sandy clay loam mottled with gray. The substratum to a depth of 76 inches is brownish-yellow fine sandy loam mottled with strong brown and light gray. It is mixed with strongly weathered mica schist.

Meadowville soils have a strongly acid subsoil and are medium in organic-matter content and natural fertility. The subsoil is moderately permeable. A high water table is common in winter and spring. Available water capacity is high.

The gently sloping Meadowville soils are used mostly for general farming and less extensively for woodland. The sloping Meadowville soils are used mostly for woodland.

Representative profile of Meadowville loam, 2 to 7 percent slopes, 2 miles east of Elly on State Highway 614:

A1—0 to 2 inches, dark-brown (7.5YR 3/2) light loam; moderate, very fine, granular structure; very friable; many fine roots; common very fine mica flakes; medium acid; clear, smooth boundary.
A2—2 to 14 inches, brown to dark-brown (7.5YR 4/4) loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; common fine and medium pores; common very fine mica flakes; medium acid; clear, smooth boundary.
B21t—14 to 38 inches, strong-brown (7.5YR 5/6) loam; weak, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common fine roots; common fine and medium pores; few, thin, patchy clay films; common fine mica flakes; 5 to 10 percent angular quartz pebbles; strongly acid; gradual, smooth boundary.
B22t—38 to 46 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, fine and medium, subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine roots; few fine and medium pores; few, thin, patchy clay films; many fine mica flakes; few, soft, black concretions; 3 to 5 percent angular quartz pebbles; strongly acid; gradual, smooth boundary.
IIB23t—46 to 52 inches, yellowish-brown (10YR 5/6) sandy clay loam; few, fine and medium, distinct, light-gray (10YR 7/2) mottles; moderate, medium and fine, subangular blocky structure; hard, firm, sticky and plastic; few fine roots; few, thin, patchy clay films; many fine mica flakes; strongly acid; clear, smooth boundary.
IIIC—52 to 76 inches, brownish-yellow (10YR 6/6) fine sandy loam and strongly weathered mica schist; streaks and mottles of strong brown (7.5YR 5/6) and light gray (10YR 7/2); rock-controlled structure; firm in place, very friable when disturbed; thin lenses of silty clay loam in crevices of weathered rock; many fine mica flakes; strongly acid.

The solum ranges from 40 to 60 inches in thickness and is 3 to 10 percent coarse fragments. Depth to bedrock is about 4 to 10 feet. The A2 horizon has hue of 10YR and 7.5YR, value of 4 to 5, and chroma of 3 to 4. The A horizon ranges from fine sandy loam to silt loam, but is dominantly loam. The B2t horizon has hue of 10YR and 7.5YR, value of 5 or 6, and chroma of 6 to 8. In places low chroma mottling occurs 24 inches below the top of the Bt horizon. The Bt horizon ranges from loam to sandy clay loam or to light clay loam and silty clay loam. Weathered rock fragments are common in the lower part of the Bt horizon and in the C horizon.

Meadowville soils are near or adjacent to Elioak, Glenelg, Hazel, Manor, Chester, Brandywine, Eubanks, Fauquier, Catoctin, and Worsham soils. They are seasonally wetter than Elioak, Glenelg, Eubanks, Chester, Fauquier, and Manor soils because they are subject to seepage. They have a thicker subsoil and a higher clay content than Brandywine, Hazel, and Catoctin soils. They are better drained than Worsham soils.

Meadowville loam, 2 to 7 percent slopes (MvB).—This soil is along drainageways, in depressions, and on toe slopes. It has the profile described as representative of the series. Areas are small to medium in size. The surface layer is friable and is easily tilled.

Included with this soil in mapping were small areas where the soil is grayer and more poorly drained. Also included is a sizeable acreage of a similar soil, near Appling, Cecil, and Louisburg soils, that has a pale-brown fine sandy loam surface layer and a brownish-yellow sandy clay loam subsoil.

Runoff is slow to medium, and the erosion hazard is moderate. The water table is seasonally high for short periods in winter and spring. The soil is well suited to cultivated crops. The seasonal high water table and slope are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 2o.

Meadowville loam, 7 to 15 percent slopes (MvC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The surface layer, however, is easily tilled. A few shallow gullies have formed.

Runoff is medium. The erosion hazard is severe if this soil is cultivated. Seepage is common in the lower part of the subsoil in winter and spring. Slope is the dominant limitation for some nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Myersville Series

The Myersville series consists of deep, well-drained soils of the Blue Ridge Mountains. These soils formed in material weathered from greenstone schist.

In a representative profile the surface layer is dominantly dark yellowish-brown very stony silt loam about 8 inches thick. The subsoil extends to a depth of about 34 inches. The upper 4 inches is strong-brown heavy silt loam, the next 14 inches is mottled yellowish-red silty clay loam, and the lower 8 inches is mottled strong-brown silt loam. The substratum is strong-brown, yellowish-brown, and yellowish-red silt loam mixed with strongly weathered greenstone schist. Hard bedrock is at a depth of 48 inches.

Myersville soils have a medium acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium to high.

A few small areas of Myersville soils are cleared and used for recreation. Most of the acreage is wooded.

Representative profile of Myersville very stony silt loam in an area of Myersville-Catoctin very stony silt loams, 7 to 15 percent slopes, on the south side of State Road 615 about 6 miles west of Graves Mill:

A1—0 to 2 inches, very dark brown (10YR 2/2) very stony silt loam; moderate, very fine, granular structure; friable; many fine and medium roots; many fine and few coarse fragments of greenstone; medium acid; clear, smooth boundary.
A2—2 to 8 inches, dark yellowish-brown (10YR 4/4) very stony silt loam; moderate, fine and very fine, granular structure; friable; many fine and medium roots; many fine and few coarse greenstone fragments; medium acid; clear, smooth boundary.
B1t—8 to 12 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, fine and very fine, subangular blocky structure; friable; many fine and medium roots; many fine and coarse greenstone fragments; few to common stones; medium acid; clear, smooth boundary.
B2t—12 to 26 inches, yellowish-red (5YR 4/6) silty clay loam; common strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, subangular blocky structure; friable; common fine and medium roots; many fine and few coarse greenstone fragments; few to common stones; few thin clay films; medium acid; clear, smooth boundary.
B3t—26 to 34 inches, strong-brown (7.5YR 5/6) silt loam; many, fine and medium, distinct, yellowish-red (5YR 4/6) and yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; few fine and medium roots; many fine and coarse greenstone fragments; few to common stones; medium acid; gradual, smooth boundary.
C—34 to 48 inches, strong-brown (7.5YR 5/6), yellowish-brown (10YR 5/6), and yellowish-red (5YR 4/6) silt loam between strongly weathered greenstone schist; few fine and medium roots; medium acid; diffuse, wavy boundary.
R—48 inches, hard greenstone schist.

The solum ranges from about 20 to 44 inches in thickness. Depth to hard rock is 3 1/2 to 8 feet. Stone fragments are common on the surface and throughout the profile.

The A2 horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 or 4. The A horizon is dominantly silt loam, but in places is loam. The Bt horizon has hue of 5YR to 10YR, value of 4 to 6, and chroma of 4 to 8. The B2t horizon is heavy silt loam or silty clay loam and is 18 to 35 percent clay.

Myersville soils are near or adjacent to Catoctin, Porters, Unison, and Baile soils. They have a thicker solum than Catoctin soils. They have a finer textured surface layer and subsoil than Porters soils. They typically have a thinner solum than Unison soils and are much better drained than Baile soils.

Myersville-Catoctin very stony silt loams, 7 to 15 percent slopes (MyC).—This mapping unit is about 70 percent Myersville soil and 30 percent Catoctin soil. It is largely in the Shenandoah National Park and in areas managed by the Virginia Game Commission. The Myersville soil has the profile described as representative of the Myersville series. A Catoctin silt loam is described under the heading "Catoctin Series." The very stony surface

layer of these soils limits their use for pasture. The acreage is dominantly wooded.

Included with these soils in mapping were a few areas where the subsoil is yellowish-brown silty clay loam. Outcrop of rock is common in some areas.

Runoff is slow because these soils are stony and forested. Capability unit VIs-1; woodland group 1o for Myersville soil, 4d for Catoctin soil.

Myersville-Catoctin very stony silt loams, 15 to 25 percent slopes (MyD).—This mapping unit is about 70 percent Myersville soil and 30 percent Catoctin soil. It is largely in the Shenandoah National Park and in areas managed by the Virginia Game Commission. The Myersville soil has a profile similar to the one described as representative of the Myersville series, but the solum is only about 30 inches thick. A Catoctin silt loam is described under the heading "Catoctin Series." Both soils have a very stony surface layer.

Included with these soils in mapping were areas where the subsoil is yellowish-brown silty clay loam. Outcrop of rock is common in some areas.

Runoff is slow to medium because these soils are stony and forested. Areas are dominantly used for woodland because slope and stoniness limit other uses. Capability unit VIs-1; woodland group 3r.

Myersville-Catoctin very stony silt loams, 25 to 45 percent slopes (MyE).—This mapping unit is about 70 percent Myersville soil and 30 percent Catoctin soil. It is largely in the Shenandoah National Park and in areas managed by the Virginia Game Commission. The Myersville soil has a profile similar to the one described as representative of the Myersville series, but the solum is only about 28 inches thick. A Catoctin silt loam is described under the heading "Catoctin Series." Both soils have a very stony surface layer.

Included with these soils in mapping were areas where the subsoil is yellowish-brown silty clay loam. Outcrop of rock is common in some areas.

Runoff is medium to slow because these soils are stony and densely forested. Steep slopes and stoniness are limitations for most uses. Capability unit VIIs-1; woodland group 3r.

Penn Series

The Penn series consists of moderately deep, well-drained soils of the Triassic uplands. These soils formed in material weathered from red shale, trap conglomerate, and fine-grained sandstone.

In a representative profile the surface layer is dark reddish-brown loam about 9 inches thick. The subsoil extends to a depth of 29 inches. The upper 6 inches is reddish-brown shaly light clay loam, and the lower 14 inches is mottled reddish-brown loam mixed with strongly weathered conglomerate. The substratum is weathered conglomerate that crushes to loamy material. Hard rock is at a depth of 36 inches.

Penn soils have a strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil has moderate to moderately rapid permeability. Available water capacity is low.

General farm crops, including pasture and hay, are grown on about 50 percent of the acreage. The rest is largely wooded.

Representative profile of Penn loam, 5 to 15 percent slopes, south of State Route 230, one-fourth mile west of U.S. Route 15 near Madison Mills:

Ap—0 to 9 inches, dark reddish-brown (5YR 3/4) loam; moderate, fine and very fine, granular structure; very friable; many fine roots; few fine shale and greenstone fragments; strongly acid; clear, smooth boundary.

B2t—9 to 15 inches, reddish-brown (5YR 4/4) shaly light clay loam; weak, fine and medium, subangular blocky structure; friable; many fine roots; common fine shale and greenstone fragments; few, thin, patchy clay films; strongly acid; clear, smooth boundary.

B3—15 to 29 inches, reddish-brown (2.5YR 4/4) loam; many, medium, distinct, yellowish-red (5YR 4/6) and reddish-yellow (7.5YR 6/6) mottles; weak, fine, subangular blocky structure; friable; common fragments of shale, sandstone, and greenstone; thin clay films in crevices; few fine roots; strongly acid; gradual, smooth boundary.

C—29 to 36 inches, weak-red (10R 4/3), strongly weathered Triassic conglomerate mottled with purplish red and yellowish brown; crushes easily to loamy soil material; wavy, diffuse boundary.

R—36 inches, hard trap conglomerate of red shale and sandstone.

The solum ranges from about 20 to 36 inches in thickness. Depth to bedrock ranges from about 20 to 40 inches. Weathered shale, sandstone, and greenstone fragments increase with increasing depth from 0 to 10 percent in the A horizon to more than 50 percent in the C horizon.

The A horizon has hue of 5YR to 10R, value of 2 to 4, and chroma of 2 to 4. It ranges from loam to silt loam and shaly silt loam. The B horizon has hue of 5YR to 10R, value of 3 or 4, and chroma of 3 or 4. It is loam or light clay loam. The Bt horizon is 18 to 25 percent clay.

Penn soils are near or adjacent to Bucks, Rapidan, Mayodan, and Lewisberry soils. They typically have a thinner solum and a less clayey subsoil than Bucks, Rapidan, and Mayodan soils. They have a finer textured subsoil than Lewisberry soils.

Penn loam, 5 to 15 percent slopes (PnC).—This soil is on the tops and sides of ridges. It has the profile described as representative of the series. Areas are small to medium in size.

Included with this soil in mapping were a few small areas of a grayer soil that formed in material weathered from baked shale. Also included were a few small areas where the surface layer is paler, the subsoil is yellower, and the substratum contains more greenstone than is typical and small areas where bedrock is at a depth of 48 inches.

Runoff is medium. The erosion hazard is severe if this soil is cultivated. The soil is somewhat droughty and is better suited to small grain than to row crops. Slope, droughtiness, and depth to bedrock are limitations for many nonfarm uses. Capability unit IIIe-1; woodland group 3o.

Penn loam, 15 to 25 percent slopes (PnD).—This soil has a profile similar to the one described as representative of the series, but the surface layer is slightly thinner. Included in mapping were a few small areas of a grayer soil that formed in material weathered from baked shale and a few small areas where slopes are as much as 45 percent.

Runoff is rapid. The erosion hazard is severe if this soil is cultivated. The soil is too droughty for most cultivated crops. It is better suited to small grain, pasture, and trees than to row crops. Slope and depth to rock are the dominant limitations for many nonfarm uses. Capability unit IVe-1; woodland group 3r.

Porters Series

The Porters series consists of moderately deep to deep, well-drained soils of the Blue Ridge Mountains. These soils formed in material weathered from granodiorite, granite, and gneiss.

In a representative profile the surface layer is very dark brown very stony loam about 4 inches thick. The subsurface layer is dark-brown very stony loam about 10 inches thick. The subsoil extends to a depth of 36 inches. The upper 15 inches is strong-brown light clay loam, and the lower 7 inches is yellowish-brown loam mottled with white and black. The substratum is mottled brownish-yellow, strong-brown, white, and black sandy loam mixed with strongly weathered granodiorite. Bedrock is at a depth of 56 inches.

Porters soils have a medium acid subsoil. The organic-matter content is fairly high in the upper 10 inches of the profile, and natural fertility is medium. Permeability is moderately rapid throughout, and available water capacity is medium to high.

Most areas are wooded. A few areas have been cleared for pasture, orchards, and recreation.

Representative profile of Porters very stony loam, 7 to 15 percent slopes, on the south side of old State Road 675 and 4 miles west of Graves Mill:

A1—0 to 4 inches, very dark brown (10YR 2/2) very stony loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; 20 percent coarse granodiorite fragments; medium acid; clear, smooth boundary.

A2—4 to 14 inches, dark-brown (7.5YR 4/4) very stony loam; moderate, fine and very fine, granular structure; very friable; many fine and medium roots; 20 percent coarse granodiorite fragments; medium acid; clear, smooth boundary.

B2t—14 to 29 inches, strong-brown (7.5YR 5/6) light clay loam; weak, fine, subangular blocky structure; friable; many fine and medium roots; 20 percent coarse rock fragments and stones; few, thin, patchy clay films; medium acid; clear, smooth boundary.

B3—29 to 36 inches, yellowish-brown (10YR 5/6) loam; many, fine, white (10YR 8/1) and black (10YR 2/1) mottles; very weak, fine, subangular blocky structure; friable; common fine and medium roots; 25 percent stones and rock fragments; medium acid; clear, smooth boundary.

C—36 to 56 inches, mottled brownish-yellow (10YR 6/6), strong-brown (7.5YR 5/6), white (10YR 8/1) and black (10YR 2/1), strongly weathered granodiorite; massive; slightly acid; breaks easily to very friable sandy loam.

R—56 inches, hard, massive granodiorite.

The solum averages about 36 inches in thickness, but ranges from 20 to 40 inches. It is 10 to 35 percent coarse fragments. Depth to hard bedrock is generally more than 2, but less than 6 feet.

The A1 horizon has hue of 10YR or 7.5YR, value of less than 4, and chroma of 1 to 3. The A horizon ranges from loam to sandy loam. The Bt and C horizons have hue of 10YR or 7.5YR, value of 5 to 6, and chroma of 4 to 8. The Bt horizon is loam, sandy clay loam, or clay loam and is 18 to 35 percent clay.

Porters soils are near or adjacent to Myersville, Catoctin, Brandywine, and Tusquitee soils. They have a darker surface layer and a higher sand content in the Bt horizon than Myersville soils. They have a thicker solum than Catoctin and Brandywine soils. They have a thinner solum and a darker colored surface layer than Tusquitee soils.

Porters very stony loam, 7 to 15 percent slopes (PoC).—This soil is on the tops and sides of mountain ridges. It has the profile described as representative of the series.

Included with this soil in mapping were small areas where the solum is only 12 inches thick. Outcrop of bedrock is common and is identified by a spot symbol on the soil map.

Runoff is slow to medium because the surface is very stony and is densely covered with mosses and forest litter. The soil is better suited to trees than to most other uses because it is very stony. If cleared, it is suited to pasture. Capability unit VIs-1; woodland group 2o.

Porters very stony loam, 15 to 25 percent slopes (PoD).—This soil has a profile similar to the one described as representative of the series, but the solum is generally thinner. The surface layer is only about 10 inches thick.

Included with this soil in mapping were small areas where the solum is only 12 inches thick. Outcrop of bedrock is common and is identified by a spot symbol on the soil map. A few moderately deep and shallow gullies have formed.

Runoff is medium because the surface is very stony and is densely covered with forest litter. The soil is generally too steep and stony for farming and other uses. It is well suited to trees. Capability unit VIs-1; woodland group 2r.

Porters very stony loam, 25 to 50 percent slopes (PoF).—This soil has a profile similar to the one described as representative of the series, but the solum is thinner. The surface layer is only about 10 inches thick.

Included with this soil in mapping were small areas where the solum is only 12 inches thick. Outcrop of bedrock is common and is identified by a spot symbol on the soil map. A few moderately deep and shallow gullies have formed.

Runoff is medium because this soil is very stony and densely forested. The soil is better suited to trees than to most other uses. Steep to very steep slopes and stoniness are the dominant limitations. Capability unit VIIs-1; woodland group 2r.

Rapidan Series

The Rapidan series consists of deep, well-drained soils of the Triassic uplands. These soils formed in material weathered from trap conglomerate and a mixture of red shale and greenstone.

In a representative profile the surface layer is dark reddish-brown silt loam about 9 inches thick. The subsoil extends to a depth of 36 inches. The upper 16 inches is dusky red clay, and the lower 11 inches is dark reddish-brown heavy clay loam. The substratum is dark-red clay loam mixed with strongly weathered trap conglomerate. Hard bedrock is at a depth of 69 inches.

Rapidan soils have a medium acid to strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium to high.

About 80 to 90 percent of the acreage is used for general farm crops. The rest is largely wooded.

Representative profile of Rapidan silt loam, 2 to 7 percent slopes, near Madison Mills on the Rosni Farm about 200 yards east of the main house:

Ap—0 to 9 inches, dark reddish-brown (2.5YR 3/4) silt loam; moderate, very fine and fine, granular structure; friable; many fine roots; few, fine, weathered Triassic shale and greenstone fragments; medium acid; clear, smooth boundary.

B21t—9 to 25 inches, dusky red (10R 3/4) clay; moderate, fine and very fine, subangular blocky structure; firm; thin to medium continuous clay films; many fine roots; few, fine, weathered Triassic shale and greenstone fragments; medium acid; clear, smooth boundary.

B22t—25 to 36 inches, dark reddish-brown (2.5YR 3/4) heavy clay loam; weak, fine and medium, subangular blocky structure; few, thin, patchy clay films; few fine roots; approximately 30 percent weathered shale and greenstone fragments; medium acid; clear, smooth boundary.

C—36 to 69 inches, dark-red (2.5YR 3/6) clay loam streaked with yellowish red (5YR 4/6), strong brown (7.5YR 5/6), and purplish red; strongly weathered trap conglomerate with soil material in crevices between rock fragments; medium acid; gradual, irregular boundary.

R—69 inches, hard massive conglomerate of greenstone, shale, and sandstone.

The solum is typically about 36 inches thick, but ranges from 30 to 46 inches. Depth to hard rock ranges from 45 inches to more than 8 feet. The Ap horizon has hue of 2.5YR to 10R, value of 2 to 4, and chroma of 2 to 4. It is dominantly silt loam, but ranges to loam and silty clay loam. The Bt horizon has hue of 2.5YR to 10R, value of 3 to 5, and chroma of 4 or 6. It ranges from heavy clay loam to clay and has a clay content of 35 to 50 percent.

Rapidan soils are near or adjacent to Bucks, Penn, Fauquier, and Catoctin soils. They have a higher clay content in the subsoil than Bucks soils. They have a thicker solum and a higher clay content than Penn and Catoctin soils. They have a darker red surface layer and subsoil than Fauquier soils.

Rapidan silt loam, 2 to 7 percent slopes (RdB).—This soil is on ridgetops. It has the profile described as representative of the series. Areas are small to medium in size. The surface layer is friable and, except in eroded areas, is easily tilled.

Included with this soil in mapping were a few areas where the plow layer is eroded and is clay loam to clay. In these areas the plow layer is a mixture of the original surface layer and material from the subsoil. Also included were some areas where few to common fine fragments of greenstone and shale are on the surface and a few small areas where the soil is shallower over bedrock than is typical.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. The soil is well suited to general farm crops. Slope and permeability are limitations for some nonfarm uses of this soil. Capability unit IIe-1; woodland group 2c.

Rapidan silty clay loam, 7 to 15 percent slopes, eroded (ReC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is only about 6 inches thick. Erosion has removed a large part of the surface

layer, and the present surface layer, which ranges from silty clay loam to clay, is a mixture of the original surface layer and material from the subsoil. Tillage is somewhat difficult.

Included with this soil in mapping were a few small areas where slopes are 15 to 25 percent. A few shallow gullies have formed.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. The soil is suited to general farm crops. Slope and permeability are limitations for some nonfarm uses. Capability unit IIIe-1; woodland group 3c.

Riverwash

Riverwash (Rh) (fig. 6) is on flood plains along major streams that flow from the Blue Ridge Mountains. It is alluvial material consisting of coarse fragments that range from gravel to boulders mixed with sandy soil material. Coarse fragments make up 75 to 90 percent of the total mass. Areas are small to medium in size, and the total acreage is small.

Riverwash is near or adjacent to the Codorus soil and Alluvial land. It differs from the Codorus soil in having a high content of coarse fragments and in lacking uniform layers. It differs from Alluvial land mainly in content of coarse fragments.

The vegetation is sparse. It consists mainly of a few sycamore trees and mullein plants. Capability unit VIIIs-1; woodland group 5.

Roanoke Series

The Roanoke series consists of deep, poorly drained soils on stream terraces of the Piedmont Plateau. These soils formed in alluvial sediments that washed from other soils of the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is dominantly gray silt loam about 9 inches thick. The subsoil extends to a depth of 46 inches. The upper 6 inches is mottled gray silty clay loam. The lower 31 inches is light-gray, plastic clay mottled with dark gray, brownish yellow, and olive yellow. The substratum to a depth of 62 inches is mottled and stratified. It ranges from gravelly sand to clay.

Roanoke soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is slowly permeable. Available water capacity is medium to high.

These soils are mostly used for pasture or woodland. Only a few small areas are cultivated.

Representative profile of Roanoke silt loam near Hebron Church about one-eighth mile north of Robinson River:

A1—0 to 3 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine and very fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

A2g—3 to 9 inches, gray (10YR 5/1) silt loam; few, medium, distinct, light olive-brown (2.5Y 5/4) mottles; moderate, fine, granular structure; friable; many fine roots; strongly acid; clear, smooth boundary.

Figure 6.—An area of Riverwash. The surface area is dominantly coarse fragments of waterworn gravel and boulders mixed with sandy soil material.

B1tg—9 to 15 inches, gray (10YR 5/1) silty clay loam; few, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate, medium and fine, subangular blocky structure; friable; common fine roots; few thin clay films; strongly acid; clear, smooth boundary.

B21tg—15 to 32 inches, light-gray (N 6/0) clay; many, medium, dark-gray (N 4/0) and brownish-yellow (10YR 6/8) mottles; moderate, medium and coarse, subangular blocky structure; very firm and plastic; thin continuous clay films; strongly acid; clear, smooth boundary.

B22tg—32 to 46 inches, light-gray (5Y 6/1) clay; many, medium, distinct, brownish-yellow (10YR 6/6) and olive-yellow (2.5Y 6/6) mottles; moderate, coarse, prismatic structure; firm and very plastic; dark-gray coatings on ped faces; strongly acid; clear, smooth boundary.

Cg—46 to 62 inches, light-gray (5Y 6/1) stratified soil material ranging from sand to clay; many, dark-gray (N 4/0), olive (5Y 5/4), green, and bluish mottles; 30 to 40 percent rounded gravel.

The solum ranges from 40 to 60 or more inches in thickness. Depth to bedrock is generally more than 10 feet. The A1 horizon has hue of 10YR or yellower, value of 2 to 4, and chroma of 1 or 2. The A2 horizon has hue of 10YR or yellower, value of 5 or 6, and chroma of 1 or 2. In places it has mottles in chroma of 4 to 8. The A horizon is dominantly silt loam or loam, but ranges to silty clay loam. The Bt horizon has hue of 5Y to 10YR, value of 4 to 6, and chroma of 0 to 2. The B2t horizon is typically clay, but ranges to heavy silty clay loam, heavy clay loam, and silty clay.

Roanoke soils are near or adjacent to Hiwassee, Wickham, Augusta, and Altavista soils. They are more poorly drained than any of those soils. Also, they have a more clayey Bt horizon than Wickham, Altavista, and Augusta soils.

Roanoke silt loam (Rk).—This soil is on broad, nearly level river terraces. Slopes range from 0 to 2 percent. Included in mapping were a few small areas where the surface layer is fine sandy loam.

Runoff is very slow. There is little or no hazard of erosion. A seasonal high water table and slow permeability make this soil poorly suited to cultivated crops. If adequately drained and fertilized, this soil is suited to pasture. Seasonal wetness and slow permeability are limitations for many nonfarm uses. Capability unit Vw-1; woodland group 1w.

Rock Land

Rock land is in areas where outcrop of bedrock is too numerous for the use of farm machinery. The acreage mapped has limited use for crops, pasture, or trees.

Rock land, acidic (Rn).—This land is on gently sloping ridgetops and very steep side slopes. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Plateau.

Rock land, acidic, is in areas where bedrock covers 50 to 90 percent of the surface. The bedrock is largely granite, granite gneiss, sandstone, or granodiorite. The soil between the outcrop has little or no horizon development, except for a dark-colored surface layer. It ranges from loam to sandy loam.

Only a few small areas are cleared for pasture. The rest is in mixed woodland. Capability unit VIIs-1; woodland group 5.

Rock land, basic (Ro).—This land is on gently sloping ridgetops and very steep side slopes. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Plateau. The bedrock is dominantly greenstone, amphibolite, gabbro, and similar rocks.

Rock land, basic, is in areas where bedrock covers 50 to 90 percent of the surface area. The soil between the outcrop has little or no horizon development, except for a dark-colored surface layer that ranges from loam to silty clay loam.

Only a few small areas are cleared for pasture. The rest is in mixed woodland. Capability unit VIIs-1; woodland group 5.

Rock land, Myersville and Catoctin materials, moderately steep (RrD).—This mapping unit is on the tops and sides of ridges. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Plateau. The exposed rock is dominantly greenstone, gabbro, amphibolite, and similar rocks.

This mapping unit is in areas where bedrock covers 25 to 50 percent of the surface area. The soils between the outcrop are similar to Myersville and Catoctin soils, but they are thinner than is typical.

Only a few small areas are cleared for pasture. Most of the acreage is in mixed woodland. Capability unit VIIs-1; woodland group 5.

Rock land, Myersville and Catoctin materials, steep (RrE).—This mapping unit is on side slopes. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Plateau. The exposed rock is dominantly greenstone, gabbro, amphibolite, and similar rocks.

This mapping unit is in areas where bedrock covers 25 to 50 percent of the surface area. The soils between the outcrop are similar to Myersville and Catoctin soils, but they are thinner than is typical.

All the acreage is in mixed woodland of oak, pine, hemlock, and other species. Capability unit VIIs-1; woodland group 5.

Rock land, Porters and Hazel materials, moderately steep (RtD).—This mapping unit is on the tops and sides of ridges. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Plateau. The exposed rock is dominantly granodiorite, granite, granite gneiss, sandstone, and similar rocks.

This mapping unit is in areas where bedrock covers 25 to 50 percent of the surface. The soils between the outcrop are similar to Porters and Hazel soils, but they are thinner than is typical.

Only a few small areas are cleared for pasture. Most of the acreage is in mixed woodland of oak, pine, hemlock, and other species. Capability unit VIIs-1; woodland group 5.

Rock land, Porters and Hazel materials, steep (RtE).—This mapping unit is on side slopes. The largest areas are commonly in the Blue Ridge Mountains, but small areas occur throughout the Piedmont Uplands. The exposed rock is dominantly granodiorite, granite, granite gneiss, sandstone, and similar rocks.

This mapping unit is in areas where bedrock covers 25 to 50 percent of the surface. The soils between the outcrop are similar to Porters and Hazel soils, but they are thinner than is typical.

All the acreage is in mixed woodland of oak, pine, hemlock, and other species. Capability unit VIIs-1; woodland group 5.

Rock Outcrop

Rock outcrop (Ru) is on gently sloping ridges and precipitous side slopes in the Blue Ridge Mountains. It consists of both acid and basic rocks, but is dominantly granite and greenstone.

Rock outcrop is in areas where bedrock covers 90 to 100 percent of the surface area. The soil between the outcrop is sandy to clayey.

The sparse vegetation consists of mosses and ferns and a few scraggly oaks or pines. Capability unit VIIIs-1; woodland group 5.

Starr Series

The Starr series consists of deep, well-drained soils of the Piedmont Plateau. These soils formed in local alluvium that washed from adjacent, higher areas.

In a representative profile the surface layer is dark reddish-brown silt loam about 13 inches thick. The subsoil extends to a depth of 52 inches. The upper 27 inches is dark-red light clay

loam. The lower 12 inches is reddish-yellow and strong-brown heavy clay loam mottled with grayish brown. The substratum to a depth of 72 inches is reddish-yellow and strong-brown, stratified silt loam and fine sandy loam.

Starr soils have a slightly acid to medium acid subsoil and are low to medium in organic-matter content. They are medium in natural fertility. The subsoil is moderately rapidly permeable. Available water capacity is high.

Most of the acreage is used for general farm crops. The rest is mostly wooded.

Representative profile of Starr silt loam about one-fourth mile south of Pratts on the east side of State Route 231:

Ap—0 to 13 inches, dark reddish-brown (2.5YR 3/4) silt loam; moderate, fine, granular structure; friable; many fine roots; few very fine mica flakes; medium acid; clear, smooth boundary.

B1—13 to 27 inches, dark-red (2.5YR 3/6) light clay loam; weak, fine, subangular blocky structure; friable; many fine roots; few fine mica flakes; medium acid; gradual, smooth boundary.

B2—27 to 40 inches, dark-red (2.5YR 3/6) light clay loam; moderate, fine, subangular blocky structure; friable to firm; few, fine and medium, black concretions; few fine mica flakes; few fine roots; medium acid; clear, smooth boundary.

B3—40 to 52 inches, reddish-yellow (5YR 6/6) and strong-brown (7.5YR 5/6) heavy clay loam; many, medium, distinct, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure; friable, slightly sticky; few, fine, black concretions; medium acid; clear, smooth boundary.

IIC—52 to 72 inches, reddish-yellow (5YR 6/6) and strong-brown (7.5YR 5/6), stratified silt loam and fine sandy loam; many, medium, distinct mottles of light gray (10YR 6/1); single grained; friable; many fine mica flakes; medium acid.

The solum ranges from 30 to 60 inches in thickness. Depth to bedrock is more than 10 feet. The A horizon has hue of 7.5YR to 2.5YR, value of 3 or 4, and chroma of 4 to 8. It is typically loam or silt loam, but ranges from heavy fine sandy loam to light clay loam. The B horizon has hue of 7.5YR to 2.5YR, value of 3 to 5, and chroma of 3 to 8. It ranges from silty clay loam to light clay loam or heavy loam. The clay content from a depth of 10 to 40 inches is 18 to 35 percent.

Starr soils are near or adjacent to Lloyd, Dyke, Davidson, Hiwassee, and Worsham soils. They have a lower clay content in the subsoil and are less red than Lloyd, Davidson, Dyke, and Hiwassee soils. They are better drained than Worsham soils.

Starr silt loam, 2 to 10 percent slopes (SrC).—This soil is along drainageways, in depressions, and at the base of slopes. Areas are small to medium in size. Slopes are mainly 2 to 5 percent, but range from 2 to 10 percent.

Included with this soil in mapping were a few small areas where the soil is moderately well drained and somewhat poorly drained, a few small areas where the surface layer is fine sandy loam, and some areas where few to common angular quartz pebbles are on the surface.

Runoff is slow, and the erosion hazard is slight. A seasonal high water table is common for short periods after heavy rains and in winter. The soil is well suited to corn and similar cultivated crops. Seasonal wetness and slope are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 1o.

Thurmont Series

The Thurmont series consists of deep, well-drained soils on foothills of the Blue Ridge Mountains and on the Piedmont Uplands. These soils formed in old colluvial deposits of soil and rock that washed and rolled from higher areas.

In a representative profile the surface layer is dominantly yellowish-brown loam about 9 inches thick. The subsoil extends to a depth of 48 inches. The upper 27 inches is strong-brown clay loam, and the lower 12 inches is yellowish-red sandy clay loam. The substratum to a depth of 70 inches is 12 inches of strong-brown cobbly sandy loam mixed with rock fragments and 10 inches of weathered granite that crushes easily to sandy loam.

Thurmont soils have a strongly acid subsoil and are low in organic-matter content. They are low to medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium.

The acreage is used about equally for farming and woodland.

The Thurmont soils in Madison County are mapped only with Braddock soils.

Representative profile of Thurmont loam in an area of Braddock and Thurmont loams, 2 to 7 percent slopes, on the north side of State Road 613 about 100 yards west of the junction of Route 230:

O1—4 to 2 inches, partly decomposed and fresh leaves and twigs of deciduous trees.

O2—2 inches to 0, very dark gray partly decomposed organic matter.

A1—0 to 1 inch, dark yellowish-brown (10YR 4/4) loam; moderate, fine, granular structure; very friable; many fine and medium roots; few partially rounded and angular rock fragments 1 to 4 inches in diameter; strongly acid; clear, abrupt boundary.

A2—1 to 9 inches, yellowish-brown (10YR 5/6) loam; weak, fine and very fine, granular structure; very friable; many fine and medium roots; few rounded and angular rock fragments 1 to 6 inches in diameter; very strongly acid; clear, smooth boundary.

B1t—9 to 14 inches, strong-brown (7.5YR 5/6) light clay loam; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky; many fine and medium roots; few fine and medium pores; few thin clay films; common rounded and angular rock fragments 1 to 8 inches in diameter; very strongly acid; clear, smooth boundary.

B21t—14 to 30 inches, strong-brown (7.5YR 5/8) clay loam; moderate, medium, subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few to common fine roots; few fine and medium pores; few thin clay films; common rounded and angular rock fragments 1 to 6 inches in diameter; very strongly acid; clear, smooth boundary.

B22t—30 to 36 inches, strong-brown (7.5YR 5/6) clay loam; few, medium, distinct mottles of yellowish red (5YR 5/6) and red (2.5YR 4/8); moderate, medium, subangular blocky structure; hard, firm, sticky and slightly plastic; few fine and medium roots; few fine and medium pores; common thin clay films; common rounded and angular rock fragments 4 to 8 inches in diameter; very strongly acid; gradual, smooth boundary.

B3t—36 to 48 inches, yellowish-red (5YR 4/8) sandy clay loam; common, medium, distinct mottles of red (2.5YR 4/8), strong brown (7.5YR 5/8), and grayish brown (2.5Y 5/2); weak, coarse, subangular blocky structure; slightly hard, friable, slightly sticky; few fine roots; few fine pores; few thin clay films; common rounded and angular rock fragments 6 to 10 inches in diameter; very strongly acid; gradual, smooth boundary.

C1—48 to 60 inches, strong-brown (7.5YR 5/6) cobbly sandy loam; many, coarse, distinct mottles of yellowish brown (10YR 5/8) and yellowish red (2.5YR 4/8); massive; friable; many rounded and angular rock fragments 6 to 8 inches in diameter; very strongly acid; gradual, wavy boundary.

IIC2—60 to 70 inches, yellowish-red (5YR 5/6), strong-brown (7.5YR 5/6), white (10YR 8/2), and black (10YR 2/1) granitic saprolite that crushes easily to sandy loam.

The solum is typically about 48 inches thick, but ranges from 30 to 60 inches. Depth to bedrock is generally greater than 5 feet, but ranges from 4 to more than 20 feet. The content of coarse fragments is 10 to about 35 percent in the solum and generally increases with increasing depth until contact with the underlying residual material.

The A2 horizon has hue of 10YR and 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is commonly loam, but ranges to sandy loam. The B2t horizon has hue of 7.5YR and 5YR, value of 4 to 6, and chroma of 4 to 8. It ranges from heavy loam to clay loam and is 20 to 35 percent clay.

Thurmont soils are near or adjacent to Braddock, Dyke, Trego, and Unison soils. They do not have the red clayey subsoil that is characteristic of Dyke and Braddock soils. They are better drained than Trego soils. They have a higher sand content and lower silt content than Unison soils.

Trego Series

The Trego series consists of deep, moderately well drained soils on old colluvial fans at the base of the Blue Ridge Mountains. These soils formed in colluvium that washed and rolled from other soils of the mountains and the Piedmont Plateau.

In a representative profile the surface layer is dominantly dark yellowish-brown loam about 8 inches thick. The subsoil extends to a depth of 36 inches. The upper 14 inches is mottled yellowish-brown light clay loam. The lower 14 inches is a firm, brittle

fragipan of light olive-brown sandy loam mottled with strong brown and gray. The substratum to a depth of 72 inches is sandy loam stratified with many granodiorite stones and pebbles.

Trego soils have a strongly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil, including the fragipan, is slowly permeable. Available water capacity is medium to low.

Less than 50 percent of the acreage is used for farming. The rest is in water-tolerant trees.

Representative profile of Trego loam, 2 to 10 percent slopes, about 2 miles west of Etlan on the north side of Route 645:

A1—1 to 3 inches, very dark grayish-brown (10YR 3/2) loam; moderate, fine and very fine, granular structure; very friable; matted with fine roots; strongly acid; clear, smooth boundary.

A2—3 to 8 inches, dark yellowish-brown (10YR 4/4) loam; many, medium, distinct, light olive-brown (2.5Y 5/4) mottles; moderate, fine and very fine, granular structure; very friable; many fine roots; few fine blue quartz fragments; strongly acid; clear, smooth boundary.

B2—8 to 22 inches, yellowish-brown (10YR 5/6) light clay loam; few, medium, distinct, strong-brown (7.5YR 5/6) and light olive-brown (2.5Y 4/4) mottles; weak to moderate, fine, subangular blocky structure; friable, slightly sticky; few, thin, patchy clay films; few fine roots; few, fine and medium, quartz and partly weathered granodiorite fragments; strongly acid; clear, smooth boundary.

Bx—22 to 36 inches, light olive-brown (2.5Y 5/4) sandy loam; many, medium, distinct, strong-brown (7.5YR 5/6) and gray 10YR 5/1) mottles; moderate, medium, platy structure; firm; brittle; 10 percent weathered granodiorite gravel; strongly acid; clear, smooth boundary.

C—36 to 72 inches+, partly weathered granodiorite stones and pebbles stratified with coarse sandy loam; about 60 percent rock fragments.

The solum ranges from 30 to 60 inches in thickness. Depth to bedrock is 6 to 20 feet. Coarse fragments generally increase with increasing depth and range from few in the A horizon to more than 50 percent in the C horizon.

The A2 horizon has hue of 10YR to 2.5Y, value of 5 to 7, and chroma of 2 to 4. It is dominantly loam, but ranges to sandy loam and silt loam. The B2t horizon has hue of 10YR and 2.5Y, value of 5 to 6, and chroma of 4 to 8. It ranges from sandy clay loam to light clay loam and in places has low chroma mottles. The C horizon is colluvium that is somewhat stratified.

Trego soils are near or adjacent to Tusquitee, Unison, and Baile soils, and Colluvial land, very stony. They are more poorly drained than Tusquitee and Unison soils. They are better drained than Baile soils. They contain fewer stones than Colluvial land, very stony.

Trego loam, 2 to 10 percent slopes (TrC).—This soil is in small areas along drainageways, in depressions, and at the heads of drainageways. Slopes are mainly 2 to 7 percent, but range from 2 to 10 percent.

Included with this soil in mapping were small areas where the soil does not have a fragipan and the subsoil is heavy clay loam and light clay. Also included were a few small areas where slopes are as much as 20 percent and some areas where the soil is more poorly drained than is typical.

Runoff is slow to medium. A seasonal high water table and the slowly permeable subsoil are limitations for farm and nonfarm uses. The more sloping areas of this soil are subject to erosion if they are cultivated. Capability unit IIIw-2; woodland group 3o.

Tusquitee Series

The Tusquitee series consists of deep, well-drained soils at the base of the Blue Ridge Mountains. These soils formed on colluvial fans of soil and rock material that rolled and washed from other soils of the mountains.

In a representative profile (fig. 7) the surface layer is brown to dark-brown stony loam about 11 inches thick. The subsoil extends to a depth of 45 inches. The upper 4 inches is brown loam; the next 15 inches is strong-brown clay loam; and the lower 15 inches is strong-brown loam. The substratum to a depth of 66 inches is strong-brown or brownish-yellow loamy soil material. Coarse fragments, ranging from fine gravel to small boulders, make up about 60 percent of the substratum.

Tusquitee soils have a medium acid subsoil and are medium to low in organic-matter content. They are medium in natural fertility. The subsoil has moderately rapid permeability. Available water capacity is medium to high.

Most of the acreage is used for woodland. Some of the gently sloping and sloping Tusquitee soils are used for general crops, pasture, orchards, or other uses.

Representative profile of Tusquitee stony loam, 2 to 7 percent slopes, about 4 miles west of Graves Mill on Virginia Game Commission land on the north side of State Route 615:

O1—1 inch to 0, very dark brown to black, partially decomposed hardwood leaves and twigs mixed with small amount of mineral soil.

A1—0 to 8 inches, dark-brown (7.5YR 3/2) stony loam; moderate, fine and very fine, granular structure; very friable; many fine roots; 10 to 20 percent coarse fragments less than 10 inches in diameter; medium acid; clear, smooth boundary.

A3—8 to 11 inches, brown to dark-brown (7.5YR 4/2) loam; moderate, very fine and fine, granular structure; very friable; many fine and medium roots; 10 to 20 percent coarse fragments; medium acid; clear, smooth boundary.

B1—11 to 15 inches, brown (7.5YR 4/4) heavy loam; weak, fine, subangular blocky structure; friable; 10 to 20 percent coarse fragments; many fine and medium roots; medium acid; clear, smooth boundary.

B21t—15 to 30 inches, strong-brown (7.5YR 5/6) clay loam; weak, fine, subangular blocky structure; friable; few thin clay films; common fine and medium roots; 15 to 20 percent coarse granodiorite rock fragments; medium acid; gradual, smooth boundary.

B22t—30 to 45 inches, strong-brown (7.5YR 5/6) heavy loam; moderate, fine, subangular blocky structure; friable; few thin clay films; common fine roots; 20 percent fine to coarse rock fragments; medium acid; gradual, smooth boundary.

IIC—45 to 66 inches +, beds of stones; strong-brown (7.5YR 5/6) or brownish-yellow (10YR 6/6) loamy soil material between stones; about 60 percent coarse fragments ranging from fine gravel to small boulders.

The solum is more than 40 inches thick. Depth to bedrock is more than 6 feet. The content of pebbles, cobbles, and stones is 10 to 35 percent in the solum and more than 50 percent in the underlying strata.

The A1 horizon has hue of 10YR and 7.5YR, value of 2 or 3, and chroma of 1 to 3. The A horizon is commonly loam, but ranges to silt loam and fine sandy loam. The B horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 6. It ranges from loam to clay loam.

Tusquitee soils are near or adjacent to Porters, Unison, Dyke, and Trego soils and stony Colluvial land. They have a thicker solum than Porters soils. They have a coarser textured subsoil than Unison and Dyke soils and are better drained than Trego soils. They have stronger horizonation and contain fewer stones than stony Colluvial land.

Tusquitee stony loam, 2 to 7 percent slopes (TuB).—This soil is on colluvial fans in valleys and on mountain foot slopes. The stones on and in this soil range from 10 to 24 inches in diameter and are approximately 30 to 100 feet apart. The profile is the one described as representative of the series.

Included with this soil in mapping were small areas of moderately well drained soils and small areas where the soil has only a limited number of stones in the upper part. The boulders on the surface in a few areas are identified by spot symbols on the soil map.

Runoff is medium. The erosion hazard is severe if this soil is cultivated. The coarse fragments damage and dull plowshares, and seedbed preparation is difficult. The soil is suited to general farm crops. Slope is a limitation for some nonfarm uses. Capability unit IIe-1; woodland group 1o.

Tusquitee stony loam, 7 to 15 percent slopes (TuC).—This soil has a profile similar to the one described as representative of the series, but the surface layer is slightly thinner. Included in mapping were a few small areas where the stone content in the upper part of the soil is lower than is typical, and small areas where the lower part of the subsoil is mottled with gray. The boulders on the surface in a few areas are identified by spot symbols on the soil map.

Figure 7.—Profile of Tusquitee stony loam, 2 to 7 percent slopes, along the Rapidan River near Graves Mill.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. Stones in the surface layer interfere appreciably with cultivation. The soil is better suited to pasture or trees than to cultivated crops. Slope is a limitation for many nonfarm uses. Capability unit IIIe-1; woodland group 1o.

Tusquitee stony loam, 15 to 25 percent slopes (TuD).—This soil has a profile similar to the one described as representative of the series, but it has a slightly thinner surface layer and subsoil. Included in mapping were a few small areas where the lower part of the subsoil is mottled with gray. The boulders on the surface in a few areas are identified by spot symbols on the soil map. A few deep gullies have formed.

Runoff is rapid. Stones and slopes interfere appreciably with cultivation. The soil is better suited to trees or pasture than to cultivated crops. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland group 2r.

Tusquitee stony loam, 25 to 45 percent slopes (TuE).—This soil has a profile similar to the one described as representative of the series, but it has a slightly thinner surface layer and subsoil. Included in mapping were a few small areas where the surface layer is very stony loam. The few boulders on the surface in some areas are identified by spot symbols on the soil map. A few deep gullies have formed.

Runoff is rapid. The erosion hazard is very severe if the plant cover is destroyed. Stones and steep slopes interfere with farming. The soil is better suited to trees or limited pasture than to crops. Slope is a limitation for most nonfarm uses. Capability unit VIe-1; woodland group 2r.

Unison Series

Soils in the Unison series are deep, well-drained soils at the base of the Blue Ridge Mountains. They formed on colluvial fans of soil and rock material that rolled and washed from other soils of the mountains.

In a representative profile the surface layer is brown loam about 9 inches thick. The subsoil extends to a depth of 50 inches. The upper 3 inches is reddish-brown clay loam, the next 21 inches is yellowish-red clay, and the lower 17 inches is strong-brown clay. The substratum to a depth of 72 inches is strong-brown cobbly clay loam that is about 25 percent coarse fragments of greenstone and granodiorite rocks.

Unison soils have a medium acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil is moderately permeable. Available water capacity is high.

Unison soils are generally used for general crops or orchards except where limited by slope or stoniness. Some areas are in woodland.

Representative profile of Unison loam, 7 to 15 percent slopes, about 1 1/2 miles north of Graves Mill and 100 yards south of house, in pasture:

Ap—0 to 9 inches, brown (7.5YR 4/4) loam; moderate, fine, granular structure; very friable; many fine roots; few fine quartz pebbles; medium acid; clear, smooth boundary.

B1t—9 to 12 inches, reddish-brown (5YR 4/4) clay loam; weak, fine and very fine, subangular blocky structure; friable; many fine roots; few thin clay films; few fine quartz pebbles; medium acid; clear, smooth boundary.

B21t—12 to 33 inches, yellowish-red (5YR 4/6) clay; moderate, fine, subangular blocky structure; firm, sticky and plastic; common fine roots; thin patchy clay films; few greenstone and granodiorite pebbles and cobbles less than 10 inches in diameter; medium acid; clear, smooth boundary.

B22t—33 to 50 inches, strong-brown (7.5YR 5/6) clay; weak, fine, subangular blocky structure; firm, sticky and plastic; common fine roots; few thin clay films; few greenstone and granodiorite pebbles and cobbles; medium acid; gradual, wavy boundary.

C—50 to 72 inches, strong-brown (7.5YR 5/6) cobbly clay loam; massive; friable and sticky; about 25 percent coarse fragments of greenstone and granodiorite; medium acid.

The solum ranges from about 30 to 60 inches in thickness. Depth to bedrock is generally greater than 5 feet.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The A horizon ranges from loam to silt loam. In spots it is fine sandy loam and clay loam. The Bt horizon has hue of 5YR and 7.5YR, value of 4 to 5, and chroma of 3 to 8. The B2t horizon is 35 to 50 percent clay. The C horizon is somewhat stratified loamy and silty material mixed with coarse greenstone and granodiorite fragments.

Unison soils are near or adjacent to Tusquitee, Dyke, Trego, Porters, and Myersville soils. They have a finer textured subsoil than Tusquitee soils. They have a browner subsoil and are slightly coarser textured than Dyke soils. They are better drained than Trego soils. They have a thicker solum than Porters and Myersville soils.

Unison loam, 2 to 7 percent slopes (UnB).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thicker. The surface layer is friable and is easily tilled.

Included with this soil in mapping were a few small areas of moderately well drained soils that are mottled with gray in the lower part of the subsoil, small areas where few to common stone fragments are on the surface and throughout the solum, and some areas where the solum is thicker than is typical.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. The soil is well suited to general farm crops or orchards. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 1o.

Unison loam, 7 to 15 percent slopes (UnC).—This soil is on colluvial fans in mountain valleys and on foot slopes. It has the profile described as representative of the series. Areas are small to medium in size. The surface layer is friable and is easily tilled.

Included with this soil in mapping were a few small areas of a moderately well drained soil that is mottled with gray in the lower part of the subsoil, small areas where few to common stone fragments are on the surface and throughout the solum, and a few small areas where the surface layer is clay loam.

Runoff is rapid. The erosion hazard is severe if this soil is farmed. If protected from erosion, the soil is well suited to general farm crops. Slope and permeability are limitations for some nonfarm uses. Capability unit IIIe-1; woodland group 1o.

Unison loam, 15 to 25 percent slopes (UnD).—This soil has a profile similar to the one described as representative of the series, but it has a slightly thinner surface layer and subsoil. The surface layer is friable and is easily tilled. Tillage is somewhat difficult in areas where the surface layer is clay loam.

Included with this soil in mapping were a few small areas where slopes are as much as 45 percent and small areas where the surface layer is eroded and is clay loam. A few shallow and moderately deep gullies have formed.

Runoff is moderately rapid. The erosion hazard is very severe if this soil is disturbed or cultivated. The soil is better suited to small grain, grass, or trees than to row crops. Slope is the dominant limitation for most nonfarm uses. Capability unit IVe-1; woodland group 2r.

Unison very stony silt loam, 7 to 15 percent slopes (UsC).—This soil has a profile similar to the one described as representative of the series, but it formed in colluvial material weathered mainly from greenstone schist. Many stone fragments, largely greenstone schist, are on the surface and throughout the profile. They make up 20 to 40 percent of the volume. The surface layer is friable, but the high stone content interferes with tillage.

Included with this soil in mapping were a few small areas where slopes are 2 to 7 percent and small areas of moderately well drained soils that are mottled with gray in the lower part of the subsoil.

Runoff is moderate. The erosion hazard is moderate if the plant cover is removed. Slope and stoniness are limitations for farm and nonfarm uses. Capability unit VIs-1; woodland group 1o.

Unison very stony silt loam, 15 to 25 percent slopes (UsD).—This soil has a profile similar to the one described as representative of the series, but it formed in colluvial material weathered mainly from greenstone schist. Stone fragments make up about 20 to 40 percent of the surface layer and subsoil.

Included with this soil in mapping were a few small areas where slopes are 25 to 45 percent and a few small areas where the surface layer is eroded and is silty clay loam.

Runoff is medium. Erosion is a hazard if the plant cover is removed. Stoniness and slope interfere with tillage and are limitations for most farm and nonfarm uses. Capability unit VIs-1; woodland group 2r.

Watt Series

The Watt series consists of moderately deep, well-drained to excessively drained soils of the Piedmont Uplands. These soils formed in material weathered from graphitic schist and phyllite.

In a representative profile the surface layer is dominantly dark olive-gray channery silt loam about 9 inches thick. The subsoil is olive-gray channery silt loam about 4 inches thick. The substratum is 13 inches of black very channery silt loam streaked with olive gray and olive yellow. It is mixed with strongly weathered graphitic schist. Hard, dark-gray to black schist is at a depth of 26 inches.

Watt soils are very strongly acid and are low in organic-matter content and natural fertility. Permeability is moderate to moderately rapid throughout the profile. Available water capacity is very low.

Most of the acreage is wooded. A few areas have been cleared for general farm crops.

Representative profile of Watt channery silt loam, 5 to 15 percent slopes, near Twymans Mill on west side of State Road 705, about 1 mile north of Route 230:

O1—3 to 1/2 inch, partially decomposed leaves and twigs of deciduous trees

O1—1/2 inch to 0, black partially decomposed organic matter.

A11—0 to 2 inches, black (5Y 2/1) channery silt loam; moderate, fine and very fine, granular structure; very friable; many fine roots; 20 percent fragments of black graphitic schist; very strongly acid; clear, smooth boundary.

A12—2 to 9 inches, dark olive-gray (5Y 3/2) channery silt loam; moderate, fine, granular structure; very friable; many fine and medium roots; few fine and medium pores; 25 percent fragments of black graphitic schist; very strongly acid; clear, smooth boundary.

B—9 to 13 inches, olive-gray (5Y 4/2) channery silt loam; weak, fine, subangular blocky structure; slightly hard, friable, slightly sticky; common

fine roots; few fine and medium pores; 40 percent fragments of black graphitic schist; very strongly acid; gradual, smooth boundary.

C—13 to 26 inches, black (5Y 2/1) very channery silt loam streaked with olive gray (5Y 4/2) and olive yellow (2.5Y 6/8); massive; firm; 55 percent fragments of black graphitic schist; very strongly acid; clear, wavy boundary.

R—26 inches, hard, dark-gray or black graphitic schist.

The solum ranges from about 10 to 20 inches in thickness. Depth to bedrock is 20 to 36 inches. The content of coarse fragments below the A horizon is greater than 35 percent.

The A horizon has hue of 2.5Y to 5Y, value of 2 or 3, and chroma of 1 to 3 when moist and value of 5 or less when dry. It ranges from silt loam to channery silt loam. The B horizon has hue of 5Y or 2.5Y, value of 2 to 4, and chroma of 1 to 3. It is channery silt loam to channery light silty clay loam. The C horizon is black to dark-gray silt loam mixed with strongly weathered graphitic schist.

Watt soils are near or adjacent to Elioak, Glenelg, and Hazel soils. They have a thinner solum and a less clayey subsoil than Elioak and Glenelg soils. They are similar in thickness to Hazel soils, but are black throughout and have a lower mica content than those soils.

Watt channery silt loam, 5 to 15 percent slopes (WaC).—This soil is in small areas on the tops and sides of ridges. It has the profile described as representative of the series. Slopes are mainly 7 to 15 percent.

Included with this soil in mapping were a few small areas where the surface layer is lighter colored than is typical, a few small areas where bedrock is at a depth of 6 feet, and a few small areas where the subsoil is olive-yellow silty clay loam up to 14 inches thick.

Runoff is medium. The erosion hazard is very severe if this soil is cultivated. The soil is very droughty and poorly suited to cultivated crops. Slope and depth to rock are limitations for many nonfarm uses. Capability unit IVe-2; woodland group 4d.

Watt channery silt loam, 15 to 35 percent slopes (WaE).—This soil has a profile similar to the one described as representative of the series, but the solum ranges from 10 to 18 inches in thickness. The surface layer is about 7 inches thick.

Included with this soil in mapping were a few small areas where bedrock is at a depth of 6 feet and a few small areas where the surface layer is light olive-brown silt loam and the subsoil is olive-yellow silty clay loam. A few shallow gullies have formed.

Runoff is rapid. The erosion hazard is severe if this soil is cultivated. Slope and droughtiness make this soil poorly suited to cultivated crops. The soil is better suited to pasture or trees. Slope is the dominant limitation for most nonfarm uses. Capability unit VIe-2; woodland group 4d.

Wehadkee Series

The Wehadkee series consists of deep, poorly drained soils on the flood plain along streams of the Piedmont Plateau. These soils formed in alluvial material that washed from other soils of the Piedmont Plateau and the Blue Ridge Mountains.

In a representative profile the surface layer is mottled dark grayish-brown silt loam about 11 inches thick. The subsoil extends to a depth of 38 inches. The upper 10 inches is dark-gray silt loam mottled with strong brown. The lower 17 inches is dark-gray silty clay loam mottled with olive yellow. The substratum to a depth of 68 inches is gray silty clay loam and fine sandy loam.

Wehadkee soils have a medium acid to slightly acid subsoil and are medium to low in organic-matter content. They are medium in natural fertility. Permeability is moderate, and internal drainage is very slow. Available water capacity is medium to high. These soils are subject to periodic overflow and flooding.

Approximately half the acreage is used for general farm crops. The rest is mainly wooded.

A representative profile of Wehadkee silt loam about 4 miles east of Uno, about one-fourth mile east of the end of Route 616, near the Rapidan River:

Ap—0 to 11 inches, dark grayish-brown (10YR 4/2) silt loam; many, coarse, dark-gray (10YR 4/1) mottles; moderate, fine, granular structure; friable, slightly sticky; many fine roots; medium acid; clear, smooth boundary.

B1g—11 to 21 inches, dark-gray (10YR 4/1) silt loam; many, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, fine and medium, subangular blocky structure; friable, slightly sticky; common fine roots; medium acid; clear, smooth boundary.

B2g—21 to 38 inches, dark-gray (N 4/0) light silty clay loam; few, medium, distinct, olive-yellow (2.5Y 6/6) mottles; weak, coarse, prismatic structure; friable, slightly plastic; few very fine mica flakes; medium acid; clear, smooth boundary.

Cg—38 to 52 inches, gray (N 5/0) silty clay loam; common, medium, distinct, dark-gray (N 4/0) and few, fine, distinct, olive-yellow (2.5Y 6/6) mottles; massive; friable, sticky; thick lenses and pockets of sand; many fine mica flakes; medium acid; clear, smooth boundary.

IICg—52 to 68 inches, gray (N 5/0) fine sandy loam; single grained; very friable; thin lenses of silty clay; many fine mica flakes.

The solum ranges from about 36 to 60 inches in thickness and is 0 to 5 percent coarse fragments. Depth to bedrock is 5 to more than 20 feet. The content of mica flakes ranges from few to many.

The Ap horizon has hue of 7.5YR to 2.5Y, value of 3 to 6, and chroma of 0 to 3. It is mainly silt loam, but in places is loam and fine sandy loam. The B horizon has hue of 7.5YR to 2.5Y or neutral, value of 4 to 6, and chroma 0 to 1. High chroma mottling is common in the B horizon. The B horizon ranges from heavy sandy loam to silty clay loam and is 18 to 30 percent clay. The C horizon is stratified with sand, silty clay, and gravel.

Wehadkee soils are on flood plains near Congaree, Chewacla, and Buncombe soils. They are more poorly drained and are grayer throughout than those soils. They also differ from Buncombe soils in having a higher silt and clay content.

Wehadkee silt loam (We).—This soil is on nearly level flood plains along the larger streams. Areas are small to medium in size.

Included with this soil in mapping were a few small areas where the soils have a silty clay or clay subsoil and substratum, small areas where the surface layer is loam or fine sandy loam, and small areas where considerable gravel is on the surface and throughout the profile.

Runoff is very slow. Most areas are frequently flooded. A seasonal high water table and slow internal drainage make this soil poorly suited to cultivated crops. If adequately drained, this soil is suited to pasture. Seasonal wetness and flooding are limitations for most nonfarm uses. Capability unit IVw-1; woodland group 3w.

Wickham Series, Clayey Subsoil Variant

The Wickham series, clayey subsoil variant, consists of deep, well-drained soils on river terraces of the Piedmont Plateau. These soils formed in alluvial sediments that washed from other soils of the Piedmont Plateau and the Blue Ridge Mountains. They differ from Wickham soils elsewhere in having a clayey subsoil.

In a representative profile the surface layer is dark-brown loam about 10 inches thick. The subsoil extends to a depth of 50 inches. The upper 30 inches is yellowish-red light clay, and the lower 10 inches is strong-brown heavy clay loam mottled with brownish yellow, red, and light olive brown. The substratum to a depth of 75 inches is mottled brownish-yellow clay loam.

The Wickham clayey subsoil variant has a medium acid subsoil and is low in organic-matter content. It is medium in natural fertility. The subsoil is moderately permeable. Available water capacity is medium to high.

Most of the acreage is used for general farm crops. A small acreage is wooded.

Representative profile of Wickham loam, clayey subsoil variant, 2 to 7 percent slopes, near Hebron Church on the south side of Route 638, about one-half mile east of Route 231:

Ap—0 to 10 inches, dark-brown (7.5YR 3/2) loam; moderate, fine and very fine, granular structure; friable; many fine roots; medium acid; clear, smooth boundary.

B2t—10 to 40 inches, yellowish-red (5YR 4/8) light clay; moderate, fine, subangular blocky structure; friable to firm; thin patchy clay films; many, very fine, black concretions; few fine roots; few, small, rounded quartz pebbles, medium acid; clear, smooth boundary.

B3t—40 to 50 inches, strong-brown (7.5YR 5/6) heavy clay loam mottled with brownish yellow (10YR 6/8), red (2.5YR 5/8), and light olive brown (2.5Y 5/4); moderate, fine, subangular blocky structure; friable; medium continuous clay films; few fine roots; few fine quartz pebbles; medium acid; clear, smooth boundary.

C—50 to 75 inches, brownish-yellow (10YR 6/6) clay loam; many, medium and fine, distinct, strong-brown (7.5YR 5/6) and light brownish-gray (2.5Y 6/2) mottles; massive; friable; medium acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock ranges from 6 to more than 20 feet. The content of coarse fragments is 0 to 10 percent in the solum and as much as 50 percent in the substratum. Mica flakes are few to common throughout the solum.

The Ap horizon has hue of 10YR to 5YR, value of 3 to 6, and chroma of 2 to 6. It ranges from loam to fine sandy loam. The Bt horizon has hue dominantly of 5YR and 2.5YR, value of 4 to 6, and chroma of 3 or more. Subhorizons that have hue of 7.5YR or 10YR are common. The Bt horizon is about 35 to 45 percent clay.

Wickham soils are near or adjacent to Hiwassee, Altavista, Augusta, and Roanoke soils on the river terraces and to Congaree and Chewacla soils on the flood plains. They are not so red as Hiwassee soils. They are better drained than Altavista, Augusta, and Roanoke soils. They have a more clayey subsoil than Congaree and Chewacla soils.

Wickham loam, clayey subsoil variant, 2 to 7 percent slopes (WhB).—This soil is on river terraces. It has the profile described as representative of the series. The surface layer is friable and is easily tilled.

Included with this soil in mapping were a few small areas where the surface layer is eroded and is light clay loam, a few areas where the surface layer is gravelly, and a few areas that are subject to infrequent flooding.

Runoff is slow to medium. The erosion hazard is moderate if this soil is cultivated. The soil is well suited to cultivated crops. Slope and permeability are limitations for some nonfarm uses. Capability unit IIe-1; woodland group 2o.

Wickham loam, clayey subsoil variant, 7 to 15 percent slopes, eroded (WhC2).—This soil has a profile similar to the one described as representative of the series, but the surface layer is thinner. The surface layer is easily tilled.

Included with this soil in mapping were a few small areas where slopes are 15 to 25 percent, small areas where the surface layer is light clay loam, and a few areas where the soil is gravelly.

Runoff is rapid. The erosion hazard is severe if this soil is cultivated. Slope is the dominant limitation for farm and nonfarm uses. Capability unit IIIe-1; woodland group 2o.

Worsham Series

The Worsham series consists of deep, poorly drained soils of the Piedmont Plateau. These soils formed in local alluvium or colluvium along small drainageways, and in depressions.

In a representative profile the surface layer is dominantly grayish-brown loam about 7 inches thick. The subsoil extends to a depth of 44 inches and has common to many mottles of yellowish brown, brownish yellow, and dark gray. The upper 4 inches is gray heavy loam, the next 24 inches is gray heavy clay loam, and the lower 9 inches is light brownish-gray clay loam. The substratum to a depth of 76 inches is light olive-gray fine sandy loam that has thin lenses of clay loam.

Worsham soils have a strongly acid to very strongly acid subsoil and are low in organic-matter content and natural fertility. The subsoil is slowly permeable. Available water capacity is medium to high.

Most of the acreage is wooded. About 25 percent of the acreage is used for crops and pasture.

Representative profile of Worsham loam, 2 to 7 percent slopes, near Aroda on the west side of Route 607 about one-half mile north of Route 230:

A1—0 to 1 inch, dark-gray (10YR 4/1) loam; moderate, fine, granular structure; very friable; matted with fine roots; very strongly acid; clear, smooth boundary.

A2—1 to 7 inches, grayish-brown (10YR 5/2) loam; moderate, fine, granular structure; very friable; many fine and medium roots; very strongly acid; clear, smooth boundary.

B1tg—7 to 11 inches, gray (10YR 5/1) heavy loam; many, medium and fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; common fine roots; very strongly acid; clear, smooth boundary.

B2tg—11 to 35 inches, gray (10YR 5/1) heavy clay loam; many, medium and coarse, distinct, brownish-yellow (10YR 6/6) and dark-gray (10YR 4/1) mottles; moderate, medium and fine, subangular blocky structure; friable; few fine roots; few fine mica flakes; sandy coatings on ped faces; very strongly acid; clear, smooth boundary.

B3tg—35 to 44 inches, light brownish-gray (2.5Y 6/2) heavy clay loam; many, medium, distinct, dark-gray (10YR 4/1) and brownish-yellow (10YR 6/6) mottles; weak, medium and fine, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

Cg—44 to 76 inches, light olive-gray (5Y 6/2) fine sandy loam; streaks and pockets of gray (5Y 5/1) clay loam; single grained; very friable; many fine mica flakes.

The solum ranges from 40 to 60 inches in thickness. Depth of bedrock ranges from 5 to 10 feet. The content of coarse fragments is 0 to 10 percent. Mica flakes are few to common throughout the profile.

The A2 horizon has hue of 10YR or 2.5Y, value of 5 or more, and chroma of 2 or less. The A horizon ranges from loam to fine sandy loam and silt loam. The Bt horizon has hue of 10YR and 2.5Y, value of 5 or more, and chroma of 2 or less. The B2t horizon ranges from heavy clay loam to clay. High chroma mottling is common in the B horizon.

Worsham soils are near or adjacent to Meadowville, Starr, Colfax, Appling, and Elioak soils. They are more poorly drained than those soils. In contrast with Colfax soils, they do not have a fragipan.

Worsham loam, 2 to 7 percent slopes (WmB).—This soil is in small areas along drainageways, in depressions, and on toe slopes. Included in mapping were a few small areas where the subsoil has a fragipan, small areas where the surface layer and the upper part of the subsoil is browner than is typical, and a few small areas where slopes are as much as 12 percent.

Runoff is slow, and the erosion hazard is slight. A high water table and slow permeability make this soil poorly suited to cultivated crops. If adequately drained, this soil is suited to pasture. Capability unit Vw-1; woodland group 2w.

Zion Series

The Zion series consists of moderately deep, well drained to moderately well drained soils of the Piedmont Uplands. These soils formed in material weathered from basic rocks, such as hornblende gabbro.

In a representative profile the surface layer, about 9 inches thick, is dominantly light yellowish-brown silt loam mottled with grayish brown and yellowish brown. The subsoil extends to a depth of 24 inches. The upper 9 inches is mottled yellowish-brown very gravelly silty clay loam that is very firm and compact. The lower 6 inches is extremely plastic, yellowish-brown clay. The substratum is yellowish-brown, very plastic clay mixed with strongly weathered hornblende rock. Hard bedrock is at a depth of 29 inches.

Zion soils have a slightly acid subsoil and are low in organic-matter content. They are medium in natural fertility. The subsoil has moderately slow to slow permeability. Available water capacity is medium to low.

549-665 O - 75 - 4

Most of the acreage is wooded. A smaller acreage is used for pasture or general farm crops.

Representative profile of Zion silt loam, 2 to 7 percent slopes, near Twymans Mill on the east side of Route 705 and south of its junction with Route 614:

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) silt loam; moderate, fine and very fine, granular structure; friable; many fine and medium roots; few, fine, dark-brown and black concretions; strongly acid; clear, smooth boundary.

A2—1 to 9 inches, light yellowish-brown (10YR 6/4) silt loam; many, fine, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/8) mottles; moderate, fine, granular structure; friable; many fine, medium, and coarse roots; common, fine, brown and black concretions; strongly acid; clear, smooth boundary.

Bcn—9 to 18 inches, yellowish-brown (10YR 5/4) very gravelly silty clay loam; many, medium, distinct, pale-brown (10YR 6/3) and grayish-brown (2.5Y 5/2) mottles; massive; very firm and compact; hard to penetrate with a spade or auger; 60 percent black and brown concretions 1/16- to 1/2-inch in diameter; medium acid; clear, wavy boundary.

B2t—18 to 24 inches, yellowish-brown (10YR 5/6) clay streaked with black on structural faces; moderate, coarse, angular blocky structure; extremely hard, extremely plastic; few fine roots; slightly acid; clear, irregular boundary.

C—24 to 29 inches, mottled reddish-yellow (7.5YR 6/8), strong-brown (7.5YR 5/6), and black (10YR 2/1), weathered hornblende rock; yellowish-brown (10YR 5/6), very plastic clay in crevices between rocks; black concretionary material on faces; slightly acid; clear, wavy boundary.

R—29 inches, hard, massive hornblende gabbro.

The solum ranges from 20 to 40 inches in thickness. Depth to weathered bedrock is generally less than 40 inches. The A2 horizon has hue of 10YR and 2.5Y, value of 4 to 6, and chroma of 2 to 4. The A horizon ranges from silt loam to loam. The Bcn horizon is mottled with hue of 10YR and 2.5Y, value of 5 or 6, and chroma of 2 to 4. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. It is clay and has a clay content greater than 50 percent.

Zion soils are near or adjacent to Bremo, Lloyd, and Davidson soils. They have a thicker B horizon and a much higher clay content than Bremo soils. They have a thinner solum, a yellower hue throughout, and a more plastic Bt horizon than Lloyd and Davidson soils.

Zion silt loam, 2 to 7 percent slopes (ZoB).—This soil is on ridgetops. It has the profile described as representative of the series. Areas are small to medium in size.

Included with this soil in mapping were small areas where the soil does not have the plastic subsoil layer and small areas where it does not have a distinct, concretionary horizon. Also included were a few outcrops of rock and a few areas of rounded boulders, which are indicated by spot symbols on the soil map.

Runoff is medium. The erosion hazard is moderate if this soil is cultivated. The soil is suited to cultivated crops, but is better suited to small grain than to row crops. Permeability and slope are limitations for many nonfarm uses. Capability unit IIe-2; woodland group 3o.

Zion silt loam, 7 to 15 percent slopes (ZoC).—This soil has a profile similar to the one described as representative of the series, but it has a thinner surface layer. The solum is about 20 inches thick.

Included with this soil in mapping were small areas where the soil does not have a plastic subsoil layer and small areas where it does not have a distinct, concretionary horizon. Also included were a few outcrops of rock and a few small areas where slopes are as much as 25 percent.

Runoff is medium to rapid. The erosion hazard is severe if this soil is cultivated. The soil is suited to farming, but is better suited to small grain and grasses than to row crops. Slope and permeability are limitations for most nonfarm uses. Capability unit IIIe-2; woodland group 3o.

Use and Management of the Soils

This section suggests management of the soils for crops and pasture and presents facts about woodland and wildlife of the county. It also provides soil information to be considered in engineering and in town and country planning.

Management for Crops and Pasture

The paragraphs that follow define general principles of soil management, explain the system of capability classification used by the Soil Conservation Service, and suggest use and management of the soils by capability units. Yields of various crops under high level management are shown in table 2.

Basic principles of soil management

Soil structure, texture, depth, and organic-matter content, as well as the type and amount of clay, influence the availability of water and nutrients to a crop. Soil drainage and available water capacity often limit production. Compacted layers in the soil or an imbalance of plant nutrients can limit root penetration and subsequent utilization of moisture.

Different soils have varying degrees of suitability (fig. 8) for the production of consistently high yields of specific crops. Maintaining an optimum balance of plant nutrients and retaining desirable physical conditions in the soil are essential for consistently high yields. Annual losses of essential plant nutrients by crops and by leaching must be replaced through fertilization at the optimum time to prevent retarded plant growth. Soil tests are designed to measure the availability of nutrients. They serve as a valuable aid in determining fertilizer applications (*5, 6*).

Because soils differ considerably in physical and chemical characteristics, they require different kinds and levels of management for optimum yields. Generally, as slope, erosion, stoniness, and other features become more restrictive, management needs increase, and expected yields decrease. Liming, fertilizing, and preparing the soil, as well as planting, controlling weeds and pests, and harvesting, are necessary components of a successful management program.

For additional information the farmer can contact the county extension agent and the local representative of the Soil Conservation Service.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to horticultural crops, or other crops requiring special management.

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

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

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

- Class I soils have few limitations that restrict their use. (No class I soils in Madison County.)

Figure 8.—Corn on Starr, Chewacla, and Congaree soils. These soils are well suited to corn grown year after year. The rolling Lloyd, Brandywine, Eubanks, and Chester soils on uplands are well suited to hay, pasture, and rotation crops.

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

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

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

Class V soils are subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife.

Class VI soils have severe limitations that make them generally unsuitable for cultivation and limit their use largely to pasture or range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuitable for cultivation and that restrict their use largely to pasture or range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

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

In class I there are no subclasses because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture or range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-1 or IIIe-2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

On the following pages the capability units in Madison County are described and use and management of the soils are suggested.

CAPABILITY UNIT IIe-1

The soils in this unit are on uplands or high terraces. They are deep, gently sloping soils of the Altavista, Appling, Braddock, Brandywine, Bucks, Cecil, Chester, Davidson, Dyke, Elioak, Eubanks, Fauquier, Hiwassee, Lloyd, Manassas, Mayodan, Meadowville, Rapidan, Starr, Thurmont, Tusquitee, Unison, and Wickham series.

The Altavista soil is moderately well drained; Manassas and Meadowville soils are well drained to moderately well drained; and the rest are well drained. Permeability is moderately rapid in Rapidan and Tusquitee soils and moderate in the rest. All have medium or high available water capacity and low or medium organic-matter content and natural fertility.

The surface layer is friable loam, silt loam, fine sandy loam, or fine gravelly loam in all but the Davidson soil, which has a less friable clay loam surface layer, and the Tusquitee soil, which is stony. None of the soils have a root-restricting layer. Some are uneroded, and others are moderately eroded.

These soils are well suited to corn, small grain, and most hay crops. All but Altavista, Manassas, Meadowville, and Starr soils are suited to alfalfa. Seepage and seasonal wetness make those soils poorly suited to alfalfa. The Unison soil is especially well suited to orchards. Crops respond well to lime and fertilizer.

Erosion is a moderate hazard if these soils are cultivated. The effect of erosion is less severe on Manassas, Meadowville, and Starr soils because they accumulate sediments from surrounding areas.

CAPABILITY UNIT IIe-2

The one soil in this unit, Zion silt loam, 2 to 7 percent slopes, is a moderately deep, well-drained soil on uplands. It has moderately slow to slow permeability, medium to low available water capacity, low organic-matter content, and medium natural fertility. The surface layer is friable. The subsoil is very plastic clay, which tends to restrict root penetration.

This soil is suited to corn, small grain, grasses, and most legumes. It is poorly suited to alfalfa.

Erosion is a moderate hazard if this soil is cultivated.

CAPABILITY UNIT IIw-1

The only soils in this unit, Congaree fine sandy loam and Congaree loam, are nearly level, deep, and well drained. They are on flood plains and are subject to periodic overflow. They have moderate permeability, high available water capacity, and medium organic-matter content and natural fertility. They have a friable surface layer and no root-restricting layer.

These soils are well suited to corn, grasses, legumes, small grain, and truck crops. Frequent flooding is the dominant hazard. It mainly occurs early in spring, but can occur at other times. It is particularly hazardous to small grain. Some areas accumulate appreciable sediment during floods. Small areas are subject to scouring.

CAPABILITY UNIT IIw-2

The one soil in this unit, Altavista loam, clayey subsoil variant, 0 to 2 percent slopes, is a deep, nearly level, moderately well drained soil on terraces. Permeability is moderate, available water capacity is medium, organic-matter content is low, and natural fertility is medium. The surface layer is friable. The water table is seasonally high.

This soil is well suited to corn, hay crops, and pasture. It is poorly suited to alfalfa. Crops respond well to lime and fertilizer.

Seasonal wetness is the dominant hazard. Ponding occurs in low areas during winter and spring. Locating drainage outlets is difficult in some areas.

CAPABILITY UNIT IIIe-1

The soils in this unit are on uplands or terraces. They are deep, sloping soils of the Appling, Braddock, Brandywine, Bucks, Cecil, Chester, Davidson, Dyke, Elioak, Eubanks, Fauquier, Glenelg, Hiwassee, Lloyd, Mayodan, Meadowville, Penn, Rapidan, Thurmont, Tusquitee, Unison, and Wickham series.

The Meadowville soil is well drained to moderately well drained, and the rest are well drained. Permeability is moderately rapid in Penn, Rapidan, and Tusquitee soils and moderate in the rest. Available water capacity is low in the Penn soil and medium or high in the rest. All are low or medium in organic-matter content and natural fertility.

The surface layer is friable loam, silt loam, fine sandy loam, or fine gravelly loam in all but the Davidson soil, which has a less friable, clay loam surface layer, and the Tusquitee soil, which has a stony loam surface layer. Some of the soils are uneroded, and others are moderately eroded. None have a root-restricting layer.

These soils are suited to corn, small grain, hay, and other field crops commonly grown in the county. Yields are less satisfactory on the Penn soil than on the other soils. The Meadowville soil is poorly suited to alfalfa. Removing stones from the Tusquitee soil facilitates tillage. Crops respond well to lime and fertilizer.

Erosion is a severe hazard if these soils are cultivated and not protected.

CAPABILITY UNIT IIIe-2

The soils in this unit, Iredell silt loam, 2 to 7 percent slopes, and Zion silt loam, 7 to 15 percent slopes, are on uplands of the Piedmont Plateau. The Iredell soil is deep and moderately well drained to somewhat poorly drained. The Zion soil is moderately deep and well drained. Both soils have a very plastic clayey subsoil that restricts the movement of air and water and the growth of plant roots. Permeability is moderately slow to slow, available water capacity is medium to low, organic-matter content is low, and natural fertility is medium.

Because these soils are shallow over a clay subsoil, they are better suited to small grain and hay or pasture than to corn. They are well suited to red clover, Ladino clover, tall fescue, timothy, and orchardgrass.

Erosion is a severe hazard if these soils are cultivated.

CAPABILITY UNIT IIIw-1

This unit consists of nearly level, moderately well drained to somewhat poorly drained soils on flood plains. These are Alluvial land, mixed, and soils of the Chewacla and Codorus series. Permeability is mostly moderate, but is highly variable in Alluvial land, mixed. Available water capacity is medium or high, organic-matter content is medium to low, and natural fertility is mostly medium.

These soils are commonly in low, wet areas that are subject to flooding. Many areas are too small or inaccessible for farming. If adequate outlets can be obtained, artificial drainage is easy and beneficial. Flooding is frequent and is most hazardous to early hay and small grain. If adequately drained, these soils are well suited to corn. They are suited to grasses and legumes that can tolerate seasonal wetness and flooding.

CAPABILITY UNIT IIIw-2

This unit consists of deep, moderately well drained or somewhat poorly drained soils on uplands, terraces, or colluvial fans and toe slopes. These are soils of the Augusta, Calverton, Creedmoor, Colfax, and Trego series. Slopes are dominantly low, but some range up to 10 percent.

These soils either have a seasonal high water table or tend to collect seepage and runoff from higher lying soils. Permeability is moderate to very slow, and available water capacity is medium to high. Organic-matter content and natural fertility are low to medium. The surface layer is friable silt loam. The seasonal high water table, the clayey subsoil, and the dense, compact fragipan in the subsoil do not favor root penetration.

These soils are suited to corn and to mixed hay of grasses and legumes that tolerate wetness. They are poorly suited to alfalfa.

Excessive wetness is the main hazard to crops. Open ditches and tile drains are beneficial. Erosion is a hazard in the more sloping areas. Erosion control is needed in cultivated areas.

CAPABILITY UNIT IIIs-1

The only soil in this unit, Buncombe loamy fine sand, is a nearly level soil on flood plains. It is excessively drained and, consequently, droughty. Water moves through this soil rapidly, and only a small amount of water is available to plants. The organic-matter content and natural fertility are low. There are no root-restricting layers in this soil.

This soil is suited to most of the crops commonly grown in the county. Yields are poor in dry seasons unless the soil is irrigated. Seedling emergence is poor unless adequate moisture is available at the proper time.

Droughtiness is the dominant limitation. Also seasonal flooding is a hazard. Planting deep-rooted crops and conserving soil moisture are the chief management needs. The soil is suited to irrigation. Frequent applications are needed in dry seasons.

CAPABILITY UNIT IVe-1

The soils in this unit are mostly deep, well drained to excessively drained, and moderately steep. These are soils of the Braddock, Brandywine, Cecil, Chester, Davidson, Dyke, Elioak, Eubanks, Lloyd, Fauquier, Glenelg, Hiwassee, Lewisberry, Penn, Thurmont, Tusquitee, and Unison series.

Permeability is moderate to rapid, available water capacity is medium or high, and organic-matter content and natural fertility are low or medium. The Glenelg, Lewisberry, and Penn soils typically are more droughty than the other soils. The Tusquitee soil has a stony loam surface layer. The rest have a friable surface layer that ranges from fine sandy loam to silty clay loam. Some of the soils are uneroded, and others are moderately eroded. None have a root-restricting layer.

These soils are suited to the crops commonly grown in the county, but are better suited to close-growing crops than to row crops. Erosion is difficult to control if these moderately steep soils are cultivated. Erosion control is the chief management need.

CAPABILITY UNIT IVe-2

This unit consists of soils of the Brandywine, Bremo, Catoctin, Hazel, Louisburg, Manor, and Watt series. These soils are mostly moderately deep, well drained to excessively drained, and sloping. Some have a moderately thick solum.

Permeability is moderately rapid to rapid, available water capacity is low to very low, organic-matter content is low, and natural fertility is low to medium. The surface layer is commonly friable sandy loam, loam, or silt loam. The surface layer in some of the Brandywine soils is gravelly and that in the Watt soil is channery.

These soils are better suited to small grain and hay or pasture than to row crops. They tend to be droughty in summer. The dominant hazard to farming is the very severe erosion hazard.

CAPABILITY UNIT IVe-3

This unit consists of deep, well-drained, sloping, severely eroded soils of the Cecil, Elioak, Eubanks, and Lloyd series. These soils have moderate permeability, medium available water capacity, low to very low organic-matter content, and low to medium natural fertility. The surface layer is clay loam or silty clay loam that is sticky when wet and hard when dry. A good seedbed is difficult to prepare. Seedling emergence is commonly poor, especially in dry periods.

Despite the effects of past erosion, these soils are suited to all crops commonly grown in the county. Yields are commonly lower than those in areas where these soils are less eroded because stands are spotty, fertility is lower, and the movement of air and water in the plow layer is restricted.

Erosion is the dominant limitation for cultivated crops. Controlling erosion and improving soil structure are the chief management needs.

CAPABILITY UNIT IVw-1

This unit consists of Baile stony silt loam and Wehadkee silt loam. Both soils are poorly drained. The nearly level Baile soil is in the Blue Ridge Mountains, largely in the Shenandoah National Park, and is not used for farming. The Wehadkee soil is on flood plains along rivers and streams and is subject to frequent flooding. Some areas of the Wehadkee soil are too small or isolated to be farmed.

These soils are seasonally wet. They are generally difficult to drain artifically because relief is low and suitable outlets are scarce. If artifically drained, they are suited to crops that can tolerate some wetness. If drainage is adequate, the Wehadkee soil is suited to corn.

These soils are only marginal for cultivated crops. They are better suited to adapted grasses and legumes.

CAPABILITY UNIT Vw-1

This unit consists of deep, level or nearly level, poorly drained soils on terraces or in depressions on uplands. These are soils of the Albano, Elbert, Roanoke, and Worsham series. All have slow permeability and low organic-matter content. In most places available water capacity is medium to high.

These soils accumulate seepage and runoff from adjacent soils. They are seasonally saturated and are subject to ponding. Low areas along upland drainageways are subject to minor flooding.

These wet soils are poorly suited to cultivated crops. Generally they are difficult to drain, and many areas are too small to justify drainage. Most areas lack adequate outlets, and the soils drain slowly. Ladino clover and tall fescue are suitable for pasture. Forage production can be improved if the soils are drained. Artificial drainage, where feasible, and maintenance of good soil structure are the chief management needs.

CAPABILITY UNIT VIe-1

The soils in this unit are deep, well drained, and steep or moderately steep. They are in the Elioak, Eubanks, Lloyd, and Tusquitee series. Elioak, Eubanks, and Lloyd soils are severely eroded. The steep Tusquitee soil is stony, but not eroded.

The sloping, severely eroded soils are poorly suited to cultivated crops. The surface layer is moderately fine textured and is difficult to till properly. Seedling emergence is poor during dry periods. The surface layer of the Tusquitee soil is friable, but stones interfere with tillage. All the soils are suited to tame grasses and legumes for pasture. Proper fertilization is needed in order to maintain a dense plant cover for erosion control.

CAPABILITY UNIT VIe-2

Soils in this unit are moderately deep or deep, dominantly moderately steep, and well drained to excessively drained. They are in the Brandywine, Bremo, Hazel, Louisburg, and Watt series. Although deep, all lack a thick solum and have a low clay content in the subsoil. Consequently, all are droughty. Also, they contain coarse fragments and have low organic-matter content and low to medium natural fertility.

These soils are poorly suited to cultivated crops. They are suited to improved grasses and legumes, but yields are commonly low. Yields are generally satisfactory if rainfall is timely. Erosion is a severe hazard unless a dense plant cover is maintained.

CAPABILITY UNIT VIs-1

This unit consists of very stony, sloping to moderately steep soils of the Catoctin, Myersville, Porters, and Unison series, Alluvial land, cobbly, and Colluvial land, very stony.

All are droughty and very stony or cobbly. In addition Alluvial land, cobbly, is frequently flooded. None are suited to cultivated crops. All are suited to improved pasture grasses and legumes. Most areas are wooded. A few are used for improved pasture. Some are inaccessible.

CAPABILITY UNIT VIIe-1

The soils in this unit are dominantly very steep and well drained to excessively drained. They are in the Brandywine, Catoctin, Eubanks, Hazel, Lloyd, and Louisburg series.

These soils are not suited to cultivated crops or improved pasture. They are suited to limited grazing of native grasses and to woodland and wildlife. Erosion is a very severe hazard unless an adequate plant cover is maintained.

CAPABILITY UNIT VIIs-1

This unit consists of very stony and generally very steep soils. These are soils of the Catoctin, Myersville, and Porters series, Rock land, and Colluvial land, extremely stony. Rock outcrop is common.

These soils are not suited to farming, other than limited grazing. They are suited to woodland and wildlife.

CAPABILITY UNIT VIIIs-1

This unit consists of Riverwash and Rock outcrop. Both are unsuitable for farming. Riverwash has a high content of cobbles and is subject to frequent flooding. Rock outcrop is steep, and there is little or no soil material. Both can be used to a limited extent for wildlife and recreation, but have little potential for woodland.

Estimated yields

Estimated yields of the principal crops grown in Madison County are shown in table 2. Yields depend on the kind of soil, the climate, the kind of crop, and the level of management. The estimates in table 2 are based on high level management. Under high level management—

1. Fertilizer and lime are applied according to the needs indicated by the results of soil tests.
2. High-yielding varieties of crops are planted.
3. Legumes are inoculated.
4. Soils are properly tilled, and crops are properly cultivated.
5. Weeds, insects, and diseases are controlled.
6. Crop rotations selected conserve moisture and protect the soils from erosion.
7. Runoff is adequately controlled.
8. Overgrazing is avoided, and pasture is well managed.

The estimates in table 2 are based on experience with the crops and soils of the county and on assumptions of average rainfall over a long period, no supplemental irrigation, adequate drainage, and no flooding or ponding.

Woodland[3]

In 1957, the date of the last forest survey, approximately 57 percent, or 119,752 acres, of Madison County was forested. Of this acreage, 32,400 acres was administered by the National Park Service and 87,352 acres was commercial timber.

In the Blue Ridge Mountains, the original forest consisted of stands of chestnut, oak, yellow-poplar, hickory, black walnut, black locust, red maple, and dogwood. In small scattered areas hemlock, white pine, pitch pine, shortleaf pine, and Virginia pine were the dominant species. Before the blight in the early twenties, some forests were as much as 75 percent chestnut. The chestnut forests have since been replaced by chestnut oak, red oak, scarlet oak, white oak, black oak, yellow-poplar, and hickory.

In the Piedmont, the original forest consisted of oak, yellow-poplar, maple, hickory, blackgum, black locust, dogwood, black walnut, shortleaf pine, and Virginia pine. There were a few scattered pure stands of pine.

On the bottom land, the original forest consisted of ash, oak, yellow-poplar, maple, black walnut, sycamore, river birch, sweetgum, and elm.

Most of the original forest was cut over before 1920.

Effective fire control and other management are now recognized in the county. Production is high for high-quality hardwoods. The 1957 forest survey indicates that growth exceeds harvest. For softwood, however, harvest exceeds growth in both sawtimber and growing stock.

Woodland management

The suitability of the soils in Madison County for producing wood crops is shown in table 3. Soil-related factors important to tree growth and woodland management in Madison County are defined in the paragraphs that follow.

Potential productivity is expressed as site index. *Site index* is the height, in feet, that trees of a specified kind can be expected to reach in 50 years on a specified soil. It depends largely on the capacity of the soil to furnish moisture and growing space for roots. The range in site index given in table 3 is based on limited field studies made cooperatively by foresters of the Virginia Division of Forestry and by soil scientists of the Soil Conservation Service.

Erosion hazard is rated according to the risk of erosion after logging; in areas where the soil is exposed along roads, skid trails, and fire lanes; and in log-decking areas. The hazard is *slight* if no special management is needed to control erosion. It is *moderate* if management is needed to minimize erosion. Logs or culverts may be needed to keep water from concentrating on roads and skid trails, for example, until a plant cover is restored in the cutover area. The hazard is *severe* if intensive management is needed, such as seeding cutover areas to grasses or legumes.

[3]L. W. KEMPF, woodland conservationist, Soil Conservation Service, helped prepare this section.

Equipment restriction refers to soil characteristics and topographic features that restrict or prohibit the use of equipment commonly used in woodland management. The limitation is *slight* if the use of equipment is not restricted at any time of year. The limitation is *moderate* if the use of equipment is restricted by one or more unfavorable characteristics, such as slope, rocks or stones, or seasonal wetness. The limitation is *severe* if the use of equipment is severely restricted by a high water table, a very steep slope, or a very rocky or stony surface.

Seedling mortality refers to the expected loss of natural or planted seedlings as influenced by kind of soil, degree of erosion, or other site factors. A rating of *slight* indicates an expected loss of 0 to 25 percent; *moderate*, between 25 and 50 percent; and *severe*, more than 50 percent.

Plant competition refers to the rate of invasion by undesirable species when openings are made in the canopy. A separate rating is made for conifers and hardwoods in table 3. Competition is *slight* if it does not prevent adequate growth of desirable species. Competition is *moderate* if it delays but does not prevent desirable natural or artificial regeneration. Competition is *severe* if it prevents adequate regeneration without intensive site preparation and maintenance.

Windthrow hazard refers to the evaluation of soil characteristics that affect the growth of tree roots and the stability of trees during periods of high winds. A rating of *slight* indicates that trees are not expected to be blown down in commonly occurring winds. *Moderate* indicates that root development is adequate and trees are stable except during periods of excessive wetness or strong winds. *Severe* indicates that roots do not give adequate stability and individual trees will blow over if released on all sides.

Species to be favored in existing stands and those suitable for planting are also shown in table 3. The species listed are currently the most desirable for commercial production. The list does not imply a recommended order of preference.

Woodland groups

The soils in Madison County have been assigned to seventeen woodland suitability groups. All the soils in one group have about the same potential for producing wood crops and are limited to about the same degree by seedling mortality, plant competition, equipment restrictions, and the hazards of erosion and windthrow.

Each group is identified by a two-part symbol, for example, 1c, 2w, 3o. The first part is the *site class number*. This number indicates the site index range for the major tree species growing on a particular soil. The second part of the symbol is a small letter. The letter indicates an important soil or physiographic characteristic that imposes a hazard or limitation in managing the soils of the group for wood crops. The letter *x* shows that the main limitation is stones or rocks. The letter *w* shows that excessive wetness, either seasonal or year round, is the chief limitation. These soils have restricted drainage, a high water table, or an overflow hazard that adversely affects stand development or management. The letter *d* shows that a restricted root zone is the main limitation. The letter *c* shows that the main limitation is the kind or amount of clay in the upper part of the soil profile. The letter *s* indicates that the soils are dry and sandy, have little or no difference in texture between the surface layer and subsoil, have low available water capacity, and are generally low in available plant nutrients. The letter *f* shows that the main limitation is the large amount of coarse fragments, more than 2 millimeters but less than 10 inches in size, in the soil profile. The letter *r* shows that the main limitation is steep slopes. The letter *o* shows that the soils have no significant restrictions or limitations.

Wildlife[4]

Successful management of wildlife on any tract of land requires a suitable combination of available food, cover, and water. A lack of any one of these necessities, an unfavorable balance among them, or an improper distribution can severely limit or even preclude the production of desired wildlife species. A knowledge of soil characteristics is a valuable tool in creating, improving, or maintaining suitable food, cover, and water for wildlife.

Most wildlife habitat is managed by planting suitable vegetation or by manipulating existing vegetation to produce a favorable pattern. Water areas can be created or improved.

Information about soils serves a variety of purposes. It aids in selecting the more suitable sites as various kinds of habitat. It indicates the intensity of management needed to achieve satisfactory results. It can also show why managing a particular area for certain types of wildlife may not be feasible.

Information about soils also serves in broad-scale planning of wildlife management areas, parks, nature areas, and recreation area developments. The potential of groups of soils for specified habitat elements can be delineated on map overlays.

In table 4, the soils of Madison County are rated according to their potential for the creation, improvement, or maintenance of seven wildlife habitat elements. The potential is expressed as *good*, *fair*, *poor*, and *very poor*. Alluvial land, Colluvial land, Made land, Riverwash, Rock land, and Rock outcrop are not listed in the table.

The information in table 4 can be used not only in comparing the suitability or the limitation of different soils for a given habitat element, but also in comparing the importance of a specific soil characteristic in its effect on various habitat elements. For example, a steep slope is a serious limitation for growing grain and seep crops, but is no limitation for growing trees, shrubs, vines, and other woody plants.

Habitat elements.—The eight elements of wildlife habitat shown in table 4 are defined in the following paragraphs.

Grain and seed crops are agricultural grains and seed-producing annuals planted to provide food for wildlife. Examples are corn, wheat, oats, barley, rye, buckwheat, soybeans, cowpeas, millet, sorghum, and sunflower.

Grasses and legumes are forage crops that are commonly planted for wildlife food or cover. Examples are fescue, orchardgrass, bluegrass, timothy, brome, reed canarygrass, clover, alfalfa, lespedeza, trefoil, and crownvetch.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs (weeds) that provide food and cover primarily for upland wildlife. Examples are partridgepea, wild millet, goldenrod, lespedeza, strawberry, broomsedge, beggarweed, ragweed, and dandelion.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, or other food used extensively by wildlife. Examples are oak, beech, hickory, maple, birch, locust, dogwood, viburnum, honeysuckle, grape, sumac, blackberry, autumn-olive, multiflora rose, and shrub lespedeza.

Coniferous woody plants are cone-bearing trees and shrubs that are used primarily as cover but can also be used as food by wildlife. Examples are pine, spruce, hemlock, fir, cedar, juniper, larch, yew, cypress.

[4]R. FRANKLIN DUGAN, biologist, Soil Conservation Service, prepared this section.

TABLE 2.—*Estimated average yields per acre of principal crops under high level management*

[Dashes indicate that the crop is not commonly grown or is not suited to the soil specified. Only arable soils are listed]

Soil	Corn [1]	Wheat	Oats	Barley	Alfalfa [1]	Red clover [1]	Mixed hay [1]	Pasture [1]	
								Bluegrass and white clover	Tall grass and clover
	Bu	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*AUD* [2]	*AUD* [2]
Albano silt loam	–	–	–	–	–	–	–	75	175
Alluvial land, mixed [3]	–	–	–	–	–	–	–	80	220
Alluvial land, cobbly [3]	–	–	–	–	–	–	–	120	–
Altavista loam, clayey subsoil variant, 0 to 2 percent slopes	100	30	55	35	([4])	3.0	3.0	95	185
Altavista loam, clayey subsoil variant, 2 to 7 percent slopes	95	35	60	38	([4])	3.0	3.0	100	185
Appling fine sandy loam, 2 to 7 percent slopes	115	45	70	50	3.5	3.0	3.1	90	220
Appling fine sandy loam, 7 to 15 percent slopes	100	40	65	45	3.2	2.5	2.5	90	210
Appling fine sandy loam, 7 to 20 percent slopes, eroded	90	35	55	42	3.0	2.2	2.3	80	190
Appling fine sandy loam, very deep, 2 to 7 percent slopes	115	45	70	50	3.5	3.0	3.1	90	220
Augusta silt loam, clayey subsoil variant	–	–	–	–	–	–	–	90	180
Baile stony silt loam, 2 to 7 percent slopes	–	–	–	–	–	–	–	70	120
Braddock and Thurmont loams, 2 to 7 percent slopes	125	45	70	50	3.7	3.1	3.1	100	220
Braddock and Thurmont loams, 7 to 15 percent slopes	110	40	65	45	3.3	3.0	3.0	90	200
Braddock and Thurmont loams, 15 to 25 percent slopes, eroded	–	–	–	–	3.1	2.5	2.5	80	160
Brandywine fine gravelly loam, 7 to 15 percent slopes	–	–	–	–	–	1.5	1.7	70	140
Brandywine fine gravelly loam, 15 to 25 percent slopes	–	–	–	–	–	1.2	1.5	60	120
Brandywine loam, very deep, 5 to 15 percent slopes	–	30	55	38	–	1.7	2.0	90	160
Brandywine loam, very deep, 15 to 25 percent slopes	–	25	45	35	–	1.5	1.7	80	140
Brandywine loam, very deep, 25 to 45 percent slopes	–	–	–	–	–	–	–	75	130
Brandywine stony loam, very deep, 7 to 25 percent slopes	–	–	–	–	–	–	–	80	140
Brandywine stony loam, very deep, 25 to 50 percent slopes	–	–	–	–	–	–	–	70	120
Bremo silt loam, 7 to 15 percent slopes	–	30	50	38	–	–	1.5	75	120
Bremo silt loam, 15 to 35 percent slopes	–	–	–	–	–	–	–	70	100

Bucks loam, permeable substratum, 2 to 7 percent slopes	120	45	75	60	4.5	4.0	4.0	110	260
Bucks loam, permeable substratum, 7 to 15 percent slopes, eroded	110	40	70	55	4.0	3.5	3.7	100	250
Buncombe loamy fine sand	60	–	–	–	–	–	–	–	150
Calverton and Creedmoor silt loams, 0 to 7 percent slopes	65	35	60	38	(4)	2.5	3.0	95	180
Catoctin silt loam, 7 to 15 percent slopes	–	30	50	35	–	1.5	1.7	70	145
Catoctin silt loam, 15 to 45 percent slopes	–	–	–	–	–	–	–	60	120
Cecil fine sandy loam, 2 to 7 percent slopes	125	47	70	55	4.2	3.3	3.5	90	230
Cecil fine sandy loam, 2 to 7 percent slopes, eroded	115	45	67	50	3.8	3.0	3.2	85	220
Cecil fine sandy loam, 7 to 15 percent slopes	100	40	67	45	3.5	2.8	3.0	85	210
Cecil fine sandy loam, 7 to 15 percent slopes, eroded	90	35	60	40	3.2	2.5	2.8	80	200
Cecil fine sandy loam, 15 to 25 percent slopes, eroded	60	28	50	35	3.0	2.3	2.7	75	190
Cecil fine sandy loam, very deep, 2 to 7 percent slopes	125	47	70	55	4.0	3.3	3.5	90	230
Cecil clay loam, 7 to 15 percent slopes, severely eroded	60	30	55	35	2.5	2.5	2.5	80	200
Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes	65	35	50	38	2.7	2.8	3.0	90	210
Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes, eroded	60	30	55	35	2.5	2.5	2.7	85	190
Chester-Brandywine loams, very deep, 2 to 7 percent slopes	100	45	70	50	3.5	3.0	3.2	130	200
Chester-Brandywine loams, very deep, 7 to 15 percent slopes	90	40	65	48	3.0	2.6	3.0	120	180
Chester-Brandywine loams, very deep, 7 to 15 percent slopes, eroded	85	38	60	45	3.0	2.5	3.0	120	175
Chester-Brandywine loams, very deep, 15 to 25 percent slopes	70	30	50	35	2.5	2.3	2.7	100	150
Chewacla silt loam[3]	120	–	–	–	–	–	–	140	225
Codorus loam, cobbly subsoil variant[3]	100	–	–	–	–	–	–	130	210
Colfax fine sandy loam, 2 to 10 percent slopes	–	–	–	–	–	–	–	65	155
Colluvial land, very stony	–	–	–	–	–	–	–	60	–
Colluvial land, extremely stony	–	–	–	–	–	–	–	60	–
Congaree fine sandy loam[3]	125	–	–	–	–	–	–	100	260
Congaree loam[3]	150	–	–	–	–	–	–	110	275
Davidson clay loam, 2 to 7 percent slopes, eroded	120	40	70	55	5.0	4.0	4.5	110	275
Davidson clay loam, 7 to 15 percent slopes, eroded	110	35	65	50	4.5	3.2	3.5	95	255
Davidson clay loam, 15 to 25 percent slopes, eroded	–	–	–	–	4.0	3.0	3.0	80	225
Dyke loam, 2 to 7 percent slopes	115	40	70	55	5.0	4.0	4.5	110	275
Dyke loam, 7 to 15 percent slopes, eroded	100	35	65	50	4.5	4.0	4.0	100	255

TABLE 2.—*Estimated average yields per acre of principal crops under high level management—Continued*

Soil	Corn[1]	Wheat	Oats	Barley	Alfalfa[1]	Red clover[1]	Mixed hay[1]	Pasture[1]	
								Bluegrass and white clover	Tall grass and clover
	Bu	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*AUD*[2]	*AUD*[2]
Dyke loam, 15 to 35 percent slopes, eroded	–	–	–	–	3.5	2.8	3.2	90	225
Elbert silt loam	–	–	–	–	–	–	–	70	145
Elioak fine sandy loam, 2 to 7 percent slopes	100	45	65	50	3.5	3.0	3.1	90	220
Elioak fine sandy loam, 2 to 7 percent slopes, eroded	90	40	60	45	3.3	2.8	3.0	85	210
Elioak fine sandy loam, 7 to 15 percent slopes	80	40	55	45	3.2	2.6	2.7	80	180
Elioak fine sandy loam, 7 to 15 percent slopes, eroded	80	35	50	42	3.0	2.2	2.3	80	175
Elioak fine sandy loam, 15 to 25 percent slopes, eroded	–	–	–	–	2.5	2.0	2.3	70	155
Elioak loam, 2 to 7 percent slopes	100	45	65	50	3.5	3.0	3.1	90	220
Elioak loam, 2 to 7 percent slopes, eroded	90	40	60	45	3.3	2.8	3.0	85	210
Elioak loam, 7 to 15 percent slopes, eroded	80	35	50	42	3.0	2.2	2.3	80	175
Elioak loam, 15 to 25 percent slopes, eroded	–	–	–	–	2.5	2.0	2.3	70	155
Elioak silty clay loam, 7 to 15 percent slopes, severely eroded	60	30	45	40	2.8	2.2	2.2	75	165
Elioak silty clay loam, 15 to 25 percent slopes, severely eroded	–	–	–	–	–	–	2.0	60	125
Eubanks fine gravelly loam, 2 to 7 percent slopes	90	45	70	50	3.0	2.8	3.1	90	220
Eubanks fine gravelly loam, 7 to 15 percent slopes	65	40	60	42	3.0	2.6	3.0	80	200
Eubanks fine gravelly loam, 7 to 15 percent slopes, eroded	60	38	55	40	3.0	2.5	2.8	75	190
Eubanks loam, very deep, 2 to 7 percent slopes	125	47	70	55	4.2	3.3	3.5	100	230
Eubanks loam, very deep, 7 to 15 percent slopes, eroded	100	42	65	48	3.7	2.9	3.2	90	220
Eubanks loam, very deep, 15 to 25 percent slopes, eroded	60	30	50	35	3.0	2.3	2.7	75	190
Eubanks-Lloyd clay loams, 7 to 15 percent slopes, severely eroded	60	30	45	32	3.3	3.0	2.9	85	200
Eubanks-Lloyd clay loams, 15 to 25 percent slopes, severely eroded	–	–	–	–	2.5	2.0	2.5	80	180
Eubanks-Lloyd clay loams, 25 to 45 percent slopes, severely eroded	–	–	–	–	–	–	–	70	100
Eubanks-Lloyd loams, 2 to 7 percent slopes	115	40	70	55	4.8	3.8	4.2	110	275

Eubanks-Lloyd loams, 2 to 7 percent slopes, eroded	110	38	65	50	4.5	3.7	3.9	100	255
Eubanks-Lloyd loams, 7 to 15 percent slopes	100	35	60	45	4.0	3.5	3.8	90	240
Eubanks-Lloyd loams, 7 to 15 percent slopes, eroded	90	33	55	42	3.6	3.3	3.5	80	220
Eubanks-Lloyd loams, 15 to 25 percent slopes, eroded	60	30	50	40	3.0	2.8	3.0	75	200
Fauquier silt loam, 2 to 7 percent slopes	110	45	65	55	4.2	3.7	3.8	100	255
Fauquier silty clay loam, 2 to 7 percent slopes, eroded	100	42	60	50	4.0	3.5	3.7	90	240
Fauquier silty clay loam, 7 to 15 percent slopes, eroded	90	37	55	46	3.6	2.5	2.8	85	200
Fauquier silty clay loam, 15 to 25 percent slopes, eroded	60	30	40	40	3.0	2.0	2.3	80	190
Glenelg loam, 5 to 15 percent slopes, eroded	90	35	50	45	3.5	2.9	3.2	110	275
Glenelg loam, 15 to 25 percent slopes, eroded	75	30	45	40	2.8	2.6	2.8	90	220
Hazel loam, 7 to 15 percent slopes	–	30	–	32	–	–	1.5	70	120
Hazel loam, 15 to 25 percent slopes	–	–	–	–	–	–	–	60	100
Hazel loam, 25 to 55 percent slopes	–	–	–	–	–	–	–	50	90
Hiwassee loam, 2 to 7 percent slopes	115	40	70	55	5.0	4.0	4.5	120	275
Hiwassee loam, 2 to 7 percent slopes, eroded	110	38	65	50	4.4	3.8	4.0	100	265
Hiwassee loam, 7 to 15 percent slopes, eroded	100	35	60	55	4.3	3.4	3.6	90	245
Hiwassee loam, 15 to 25 percent slopes, eroded	60	30	40	40	3.6	2.6	3.0	80	230
Iredell silt loam, 2 to 7 percent slopes	60	–	–	–	–	2.0	2.0	90	180
Lewisberry sandy loam, 10 to 25 percent slopes	–	–	–	–	3.0	2.2	2.7	70	150
Lloyd fine sandy loam, 2 to 7 percent slopes	120	40	70	55	5.0	4.0	4.5	130	275
Lloyd fine sandy loam, 7 to 15 percent slopes, eroded	100	35	65	50	4.5	4.0	4.0	100	255
Lloyd fine sandy loam, 15 to 25 percent slopes, eroded	60	30	40	45	3.6	2.6	3.0	80	230
Lloyd loam, 2 to 7 percent slopes	120	45	70	55	5.0	4.0	4.5	130	275
Lloyd loam, 2 to 7 percent slopes, eroded	110	40	65	50	4.7	4.0	4.0	120	255
Lloyd loam, 7 to 15 percent slopes, eroded	100	35	60	45	4.5	3.8	4.0	100	250
Lloyd loam, thin solum variant, 2 to 7 percent slopes, eroded	100	45	70	50	4.0	3.2	3.8	120	230
Lloyd loam, thin solum variant, 7 to 15 percent slopes, eroded	90	40	65	45	3.7	3.0	3.5	110	210
Lloyd loam, thin solum variant, 15 to 25 percent slopes, eroded	60	35	60	40	3.0	2.8	3.3	90	180
Lloyd clay loam, 7 to 15 percent slopes, severely eroded	60	35	60	40	3.5	3.0	3.5	90	200

TABLE 2.- *Estimated average yields per acre of principal crops under high level management–Continued*

Soils	Corn[1]	Wheat	Oats	Barley	Alfalfa[1]	Red clover[1]	Mixed hay[1]	Pasture[1]	
								Bluegrass and white clover	Tall grass and clover
	Bu	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Tons*	*AUD*[2]	*AUD*[2]
Lloyd clay loam, 15 to 25 percent slopes, severely eroded	50	30	50	35	2.5	2.0	2.3	90	150
Louisburg sandy loam, 5 to 15 percent slopes	–	25	40	32	–	–	–	60	100
Louisburg sandy loam, 15 to 25 percent slopes	–	–	–	–	–	–	–	40	70
Manassas silt loam, 2 to 7 percent slopes[5]	110	–	–	–	([4])	4.2	4.2	130	255
Manor silt loam, 7 to 20 percent slopes	–	–	–	–	–	–	–	50	85
Mayodan fine sandy loam, 2 to 7 percent slopes	100	45	65	50	3.5	3.0	3.0	100	225
Mayodan fine sandy loam, 7 to 15 percent slopes, eroded	90	40	60	45	3.2	2.5	2.5	90	200
Meadowville loam, 2 to 7 percent slopes	125	–	–	–	([4])	4.2	4.5	130	275
Meadowville loam, 7 to 15 percent slopes	120	–	–	–	([4])	4.0	4.2	100	250
Myersville-Catoctin very stony silt loams, 7 to 15 percent slopes	–	–	–	–	–	–	–	100	150
Myersville-Catoctin very stony silt loams, 15 to 25 percent slopes	–	–	–	–	–	–	–	90	100
Myersville-Catoctin very stony silt loams, 25 to 45 percent slopes	–	–	–	–	–	–	–	60	75
Penn loam, 5 to 15 percent slopes	75	35	50	32	–	1.5	1.5	70	150
Penn loam, 15 to 25 percent slopes	60	30	40	25	–	–	1.2	60	130
Porters very stony loam, 7 to 15 percent slopes	–	–	–	–	–	–	–	80	160
Porters very stony loam, 15 to 25 percent slopes	–	–	–	–	–	–	–	60	125
Porters very stony loam, 25 to 50 percent slopes	–	–	–	–	–	–	–	50	100
Rapidan silt loam, 2 to 7 percent slopes	120	45	75	60	4.5	4.0	4.3	110	275
Rapidan silty clay loam, 7 to 15 percent slopes, eroded	100	40	65	55	4.0	3.5	4.0	100	250
Roanoke silt loam	–	–	–	–	–	–	–	75	145
Rock land, acidic	–	–	–	–	–	–	–	30	50
Rock land, basic	–	–	–	–	–	–	–	35	60
Rock land, Myersville and Catoctin materials, moderately steep	–	–	–	–	–	–	–	70	120
Rock land, Myersville and Catoctin materials, steep	–	–	–	–	–	–	–	50	75
Rock land, Porters and Hazel materials, moderately steep	–	–	–	–	–	–	–	65	100

Rock land, Porters and Hazel materials, steep	–	–	–	–	–	–	–	50	85
Starr silt loam, 2 to 10 percent slopes[5]	150	–	–	–	([4])	–	–	130	275
Trego loam, 2 to 10 percent slopes	–	–	–	–	–	–	–	85	150
Tusquitee stony loam, 2 to 7 percent slopes	–	–	–	–	–	–	–	120	250
Tusquitee stony loam, 7 to 15 percent slopes	–	–	–	–	–	–	–	115	225
Tusquitee stony loam, 15 to 25 percent slopes	–	–	–	–	–	–	–	100	200
Unison loam, 2 to 7 percent slopes	120	40	70	55	5.0	4.0	4.5	130	275
Unison loam, 7 to 15 percent slopes	100	35	65	50	4.5	3.8	4.0	100	250
Unison loam, 15 to 25 percent slopes	60	30	40	45	3.5	2.6	3.0	90	220
Unison very stony silt loam, 7 to 15 percent slopes	–	–	–	–	–	–	–	120	230
Watt channery silt loam, 5 to 15 percent slopes	–	–	–	–	–	–	1.5	60	100
Watt channery silt loam, 15 to 35 percent slopes	–	–	–	–	–	–	1.3	50	80
Wehadkee silt loam	–	–	–	–	–	–	–	80	150
Wickham loam, clayey subsoil variant, 2 to 7 percent slopes	130	45	70	55	5.0	4.0	4.5	110	275
Wickham loam, clayey subsoil variant, 7 to 15 percent slopes, eroded	100	40	65	50	4.5	3.7	4.0	100	250
Worsham loam, 2 to 7 percent slopes	–	–	–	–	–	–	–	50	75
Zion silt loam, 2 to 7 percent slopes	60	30	55	40	–	2.2	2.2	90	180
Zion silt loam, 7 to 15 percent slopes	–	25	45	38	–	1.7	1.7	80	170

[1] Yields are often limited by inadequate moisture in summer.

[2] Animal-unit-days is the number of days in 1 year that 1 acre will support one cow, one horse, five hogs, or five sheep or goats without injury to the pasture.

[3] Subject to overflow or occasional flooding.

[4] Average life of stand is 1 or 2 years.

[5] Small grain lodges on this soil.

TABLE 3.—*Wood crops and*

Woodland group, map symbols, and descriptions of soils	Principal species	Estimated site index	Erosion hazard	Equipment restriction
Group 1o: Deep, well-drained soils that have few or no limitations for trees. Congaree: Cv, Cw. Myersville: MyC. See 4d for Catoctin part of MyC. Starr: SrC. Tusquitee: TuB, TuC. Unison: UnB, UnC, UsC.	Upland oaks Yellow-poplar Loblolly pine Virginia pine	85+ 95+ 85-95 75-85	Slight	Slight
Group 1c: Deep, well-drained soils that have a clayey subsoil; very high potential productivity. Davidson: DaB2, DaC2, DaD2. Dyke: DkB, DkC2, DkE2. Fauquier: FaB.	Upland oaks Yellow-poplar Loblolly pine Virginia pine Shortleaf pine	85+ 95+ 85+ 75-85 75-85	Moderate for DaD2 and DkE2, slight for the rest.	Severe for DaD2 and DkE2, moderate for the rest.
Group 1w: Soils limited by wetness or flooding; high to very high potential productivity. Baile: BaB. Chewacla: Cm. Codorus, cobbly subsoil variant: Cn. Roanoke: Rk.	Upland oaks Yellow-poplar Pin oak Loblolly pine Virginia pine	85+ 95+ 85+ 85-95 65-75	Slight	Severe for Rk, moderate for the rest.
Group 2o: Mainly well-drained, gently sloping and sloping soils; high potential productivity. Altavista, clayey subsoil variant: AlA, AlB. Braddock: BcB, BcC. Buncombe: Bu. Chester: CkB, CkC, CkC2. Glenelg: GlC2. Hiwassee: HsB, HsB2, HsC2. Manassas: MnB. Manor: MoC. Meadowville: MvB, MvC. Porters: PoC. Wickham, clayey subsoil variant: WhB, WhC2.	Upland oaks Loblolly pine Yellow-poplar Virginia pine Shortleaf pine	75-85 85-95 85-95 75-85 75-85	Slight	Moderate for Bu, slight for the rest.

soil-related limitations

Seedling mortality	Plant competition		Windthrow hazard	Species to be favored in existing stands	Species suitable for planting
	Conifers	Hardwoods			
Slight	Severe	Moderate	Slight	Northern red oak, white oak, yellow-poplar, black walnut, Virginia pine, shortleaf pine, black cherry.	Loblolly pine, eastern white pine, yellow-poplar, black walnut.
Slight	Severe	Moderate	Slight	Upland oaks, yellow-poplar, loblolly pine, Virginia pine, black cherry, black walnut.	Loblolly pine, yellow-poplar, black walnut.
Slight	Severe	Severe	Slight	Upland oaks, yellow-poplar, red maple, loblolly pine, Virginia pine, pin oak.	Loblolly pine, eastern white pine, yellow-poplar, pin oak, Virginia pine.
Moderate for Bu, slight for the rest.	Moderate for Bu, severe for the rest.	Slight for Bu, moderate for the rest.	Slight	White oak, northern red oak, yellow-poplar, Virginia pine, sweetgum, black walnut, shortleaf pine.	Loblolly pine, yellow-poplar, black walnut, eastern white pine.

TABLE 3.—*Wood crops and*

Woodland group, map symbols, and descriptions of soils	Principal species	Estimated site index	Erosion hazard	Equipment restriction
Group 2r: Well-drained soils that are moderately steep or steeper; high potential productivity. Braddock: BcD2. Chester: CkD. Glenelg: GlD2. Hiwassee: HsD2. Porters: PoD, PoF. Tusquitee: TuD, TuE. Unison: UnD, UsD.	Upland oaks Yellow-poplar Loblolly pine Virginia pine Shortleaf pine	75-85 85-95 85-95 75-85 75-85	Moderate	Slight
Group 2c: Well-drained soils that have a clayey subsoil; high potential productivity. Elioak: ElB, ElB2, ElC, ElC2, ElD2, EmB, EmB2, EmC2, EmD2, EnC3, EnD3. Rapidan: RdB.	Upland oaks Yellow-poplar Virginia pine Shortleaf pine	65-75 85-95 70-80 65-75	Moderate for ElD2. EmD2, EnD3; slight for the rest.	Severe for ElD2, EmD2, and EnD3; moderate for the rest.
Group 2w: Deep, seasonally wet soils; high potential productivity. Augusta, clayey subsoil variant: Au. Colfax: CoC. Worsham: WmB.	Upland oaks Loblolly pine Sweetgum Yellow-poplar Virginia pine	75-85 85-95 85-95 85-95 75-85	Slight	Severe for WmB, moderate for the rest.
Group 3o: Mainly deep, well-drained, gently sloping or sloping soils; few or no limitations for trees; moderate potential productivity. Appling: ApB, ApC, ApD2, ArB. Bucks: BsB, BsC2. Cecil: CeB, CeB2, CeC, CeC2, CfB, ChC, ChC2. Eubanks: EsB, EsC, EsC2, EtB, EtC2, EyB, EyB2, EyC, EyC2. Lloyd: LfB, LfC2, LlB, LlB2, LlC2. Lloyd, thin solum variant: LmB2, LmC2. Mayodan: MuB, MuC2. Penn: PnC. Trego: TrC. Zion: ZoB, ZoC.	Upland oaks Loblolly pine Yellow-poplar Virginia pine Shortleaf pine	65-75 75-85 80-90 65-75 65-75	Slight	Slight

soil-related limitations—Continued

Seedling mortality	Plant competition		Windthrow hazard	Species to be favored in existing stands	Species suitable for planting
	Conifers	Hardwoods			
Slight	Severe	Moderate	Slight	White oak, northern red oak, yellow-poplar, Virginia pine, sweetgum, black walnut, shortleaf pine.	Loblolly pine, yellow-poplar, black walnut, eastern white pine.
Moderate for EnD3, slight for the rest.	Severe	Moderate	Slight	Northern red oak, white oak, shortleaf pine, Virginia pine, yellow-poplar, black walnut.	Loblolly pine, black walnut, yellow-poplar.
Severe for WmB, slight for the rest.	Severe	Severe	Slight	Northern red oak, yellow-poplar, Virginia pine, sycamore, loblolly pine, sweetgum.	Loblolly pine, yellow-poplar.
Slight	Moderate	Slight	Slight	White oak, northern red oak, yellow-poplar, loblolly pine, Virginia pine, shortleaf pine.	Loblolly pine.

549-665 O - 75 - 5

TABLE 3.—*Wood crops and*

Woodland group, map symbols, and descriptions of soils	Principal species	Estimated site index	Erosion hazard	Equipment restriction
Group 3r: Moderately deep or deep, mainly well-drained soils that are moderately steep or steeper; moderate potential productivity. Cecil: CeD2. Eubanks: EtD2, EyD2. Lewisberry: LeD. Lloyd: LfD2. Lloyd, thin solum variant: LmD2. Myersville: MyD, MyE. Penn: PnD.	Upland oaks Loblolly pine Yellow-poplar Virginia pine Shortleaf pine	65-75 75-85 80-90 65-75 65-75	Moderate	Slight
Group 3c: Well-drained soils that have a high clay content; moderate potential productivity. Cecil: CgC3. Fauquier: FcB2, FcC2, FcD2. Lloyd: LnC3, LnD3. Rapidan: ReC2.	Shortleaf pine Loblolly pine Virginia pine	65-75 75-85 65-75	Moderate for FcD2 and LnD3, slight for the rest.	Severe for FcD2 and LnD3, moderate for the rest.
Group 3w: Soils that are seasonally wet for long periods or are subject to flooding; moderate potential productivity. Calverton: CbB. Wehadkee: We.	Upland oaks Shortleaf pine Virginia pine	65-75 65-75 65-75	Slight	Severe for We, moderate for the rest.
Group 3d: Shallow soils that tend to be droughty; moderate potential productivity. Bremo: BrC, BrE. Louisburg: LoC, LoD, LoF.	Virginia pine Shortleaf pine Upland oaks	65-75 65-70 65-75	Moderate for BrE and LoD, severe for LoF, slight for the rest.	Moderate
Group 3f: Droughty soils that have a high percentage of coarse fragments throughout; moderate potential productivity. Brandywine: BdC, BdD, BeC, BeD, BeF, BnD, BnF.	Upland oaks Yellow-poplar Virginia pine Shortleaf pine	65-75 70-80 65-75 65-75	Moderate for BdD, BeD, BeF, BnD, and BnF; slight for the rest.	Moderate for BdD, BeD, BeF, and BnF; slight for the rest.
Group 4c: Severely eroded soils; moderately low potential productivity. Eubanks: EuC3, EuD3, EuE3.	Upland oaks Shortleaf pine Virginia pine	55-65 55-65 55-65	Moderate	Slight

soil-related limitations–Continued

Seedling mortality	Plant competition		Windthrow hazard	Species to be favored in existing stands	Species suitable for planting
	Conifers	Hardwoods			
Slight	Moderate	Slight	Slight	White oak, northern red oak, yellow-poplar, loblolly pine, Virginia pine, shortleaf pine.	Loblolly pine.
Moderate	Moderate for FcD2 and LnD3, slight for the rest.	Slight	Slight	Virginia pine, shortleaf pine, loblolly pine.	Loblolly pine.
Slight for We, moderate for the rest.	Moderate for We, severe for the rest.	Slight for We, moderate for the rest.	Moderate	Upland oaks, yellow-poplar, red maple.	Loblolly pine.
Moderate	Moderate	Slight	Moderate	Virginia pine, shortleaf pine, loblolly pine.	Loblolly pine, Virginia pine.
Moderate	Moderate	Slight	Slight	Upland oaks, shortleaf pine, Virginia pine.	Loblolly pine.
Slight	Moderate	Slight	Slight	Shortleaf pine, Virginia pine, loblolly pine.	Loblolly pine, Virginia pine.

TABLE 3.—*Wood crops and*

Woodland group, map symbols, and descriptions of soils	Principal species	Estimated site index	Erosion hazard	Equipment restriction
Group 4w: Soils that are wet and sticky for long periods and have a plastic clay subsoil; moderately low potential productivity. Albano: Ab. Elbert: Eb. Iredell: IrB.	Upland oaks . . . . . . Virginia pine	55-65 55-65	Slight	Severe for Eb and IrB, moderate for the rest.
Group 4d: Shallow, droughty soils that have a restricted root zone. Catoctin: CcC, CcE, and Catoctin part of MyC. Hazel: HaC, HaD, HaF. Watt: WaC, WaE.	Upland oaks . . . . . . Virginia pine	55-65 55-65	Slight for CcC, HaC, and MyC; moderate for CcE, HaD, and WaC; severe for HaF and WaE.	Severe for HaF and WaE, moderate for the rest.
Group 5: Miscellaneous land types; material too variable to rate for commercial tree production. Alluvial land: Ac, Ad. Colluvial land: Cr, Cu. Made land: Ma. Riverwash: Rh. Rock land: Rn, Ro, RrD, RrE, RtD, RtE. Rock outcrop: Ru.				

soil-related limitations–Continued

Seedling mortality	Plant competition		Windthrow hazard	Species to be favored in existing stands	Species suitable for planting
	Conifers	Hardwoods			
Severe	Severe	Severe	Moderate	Virginia pine	Loblolly pine.
Severe for WaC and WaE, moderate for the rest.	Slight	Slight	Moderate for WaC and WaE; slight for the rest.	Virginia pine	Virginia pine, loblolly pine.

TABLE 4.—*Potential of the soils for elements of*

Soil series and map symbols	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants
Albano: Ab	Poor	Fair	Fair
Altavista, clayey subsoil variant: AlA, AlB	Good	Good	Good
Appling:			
ApB, ArB	Good	Good	Good
ApC	Fair	Good	Good
ApD2	Poor	Good	Good
Augusta, clayey subsoil variant: Au	Fair	Good	Good
Baile: BaB	Poor	Good	Good
Braddock:			
BcB	Good	Good	Good
BcC	Fair	Good	Good
BcD2	Poor	Fair	Good
Brandywine:			
BdC, BeC	Poor	Fair	Good
BdD, BeD, BeF, BnD, BnF	Very poor.	Fair	Good
Bremo:			
BrC	Poor	Poor	Fair
BrE	Very poor.	Fair	Fair
Bucks:			
BsB	Good	Good	Good
BsC2	Fair	Fair	Good
Buncombe: Bu	Fair	Fair	Fair
Calverton: CbB	Fair	Good	Good
Catoctin:			
CcC	Poor	Fair	Fair
CcE	Very poor.	Poor	Fair
Cecil:			
CeB, CeB2, CfB	Good	Good	Good
CeC, CeC2, ChC, ChC2, CgC3	Fair	Good	Good
CeD2	Poor	Fair	Good
Chester:			
CkB			
Chester part	Fair	Good	Good
Brandywine part	Fair	Fair	Good
CkC, CkC2	Fair	Good	Good
For Brandywine part, see Brandywine units BdC, BeC.			
CkD	Poor	Fair	Good
For Brandywine part, see Brandywine units BdD, BeD, BeF, BnD, BnF.			
Chewacla: Cm	Poor	Fair	Fair
Codorus, cobbly subsoil variant:			
Cn	Poor	Fair	Fair
Colfax: CoC	Fair	Good	Good
Congaree: Cv, Cw	Good	Good	Good
Creedmoor: Mapped only with Calverton soils.			
Davidson:			
DaB2	Fair	Good	Good
DaC2	Poor	Fair	Good
DaD2	Very poor.	Fair	Good
Dyke:			
DkB	Good	Good	Good
DkC2	Fair	Good	Good
DkE2	Very poor.	Good	Good
Elbert: Eb	Poor	Fair	Fair
Elioak:			
ElB, ElB2, EmB, EmB2	Good	Good	Good
ElC, ElC2, EmC2, EnC3	Fair	Good	Good
ElD2, EmD2, EnD3	Poor	Good	Good

wildlife habitat and kinds of wildlife

Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Kinds of wildlife		
				Openland	Woodland	Wetland
Fair	Fair	Good	Good	Fair	Good	Good.
Good	Good	Good	Very poor.	Good	Good	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Good	Good	Good	Good	Good.
Good	Good	Good	Good	Fair	Good	Good.
Good	Good	Poor	Poor	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Good	Good	Good	Good	Poor.
Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Fair	Fair	Fair	Fair	Fair.
Good	Good	Fair	Poor	Fair	Fair	Poor.
Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Poor	Very poor.	Very poor.	Good	Good	Very poor.
Good	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Fair	Fair	Good	Good	Poor	Fair	Good.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

TABLE 4.–*Potential of the soils for elements of*

Soil series and map symbols	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants
Eubanks:			
EsB, EtB, EyB, EyB2	Good	Good	Good
EsC, EsC2, EtC2, EyC, EyC2	Fair	Good	Good
EtD2, EuC3, EuD3, EuE3, EyD2	Very poor.	Fair	Good
Fauquier:			
FaB, FcB2	Good	Good	Good
FcC2	Fair	Good	Good
FcD2	Poor	Good	Good
Glenelg:			
GlC2	Fair	Good	Good
GlD2	Poor	Fair	Good
Hazel:			
HaC	Poor	Poor	Fair
HaD, HaF	Very poor.	Poor	Fair
Hiwassee:			
HsB, HsB2	Fair	Good	Good
HsC2	Poor	Fair	Good
HsD2	Very poor.	Poor	Fair
Iredell: IrB	Fair	Good	Good
Lewisberry: LeD	Poor	Fair	Good
Lloyd:			
LfB, LlB, LlB2	Good	Good	Good
LfC2, LlC2, CnC3	Fair	Good	Good
LfD2, LnD3	Poor	Fair	Good
Lloyd, thin solum variant:			
LmB2	Good	Good	Good
LmC2	Fair	Good	Good
LmD2	Poor	Fair	Good
Louisburg:			
LoC	Fair	Fair	Fair
LoD, LoF	Very poor.	Poor	Fair
Manassas: MnB	Fair	Good	Good
Manor: MoC	Fair	Fair	Fair
Mayodan:			
MuB	Fair	Good	Good
MuC2	Good	Good	Good
Meadowville:			
MvB	Good	Good	Good
MvC	Fair	Good	Good
Myersville: MyC, MyD, MyE	Very poor.	Poor	Good
For Catoctin part of MyC, see Catoctin unit CcC. For Catoctin part of MyD and MyE, see Catoctin unit CcE.			
Penn:			
PnC	Fair	Fair	Good
PnD	Poor	Fair	Good
Porters: PoC, PoD, PoF	Very poor.	Poor	Good
Rapidan:			
RdB	Fair	Good	Good
ReC2	Poor	Fair	Good
Roanoke: Rk	Poor	Fair	Good
Starr: SrC	Fair	Good	Good
Thurmont: Mapped only with Braddock soils.			
Trego: TrC	Fair	Good	Good
Tusquitee:			
TuB, TuC, TuD	Poor	Fair	Good
TuE	Very poor.	Fair	Good

wildlife habitat and kinds of wildlife - Continued

Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Kinds of wildlife		
				Openland	Woodland	Wetland
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

TABLE 4.–*Potential of the soils for elements of*

Soil series and map symbols	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants
Unison:			
UnB	Good	Good	Good
UnC, UsC	Fair	Good	Good
UnD, UsD	Poor	Fair	Good
Watt:			
WaC	Poor	Poor	Fair
WaE	Very poor.	Poor	Fair
Wehadkee: We	Very poor.	Poor	Poor
Wickham, clayey subsoil variant:			
WhB	Good	Good	Good
WhC2	Fair	Good	Good
Worsham: WmB	Poor	Fair	Fair
Zion:			
ZoB	Fair	Good	Good
ZoC	Fair	Good	Good

wildlife habitat and kinds of wildlife–Continued

Hardwood woody plants	Coniferous woody plants	Wetland plants	Shallow water developments	Kinds of wildlife		
				Openland	Woodland	Wetland
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Fair	Fair	Good	Good	Poor	Fair	Good.
Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.
Good	Good	Very poor.	Very poor.	Good	Fair	Very poor.
Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
Good	Good	Poor	Very poor.	Good	Good	Very poor.
Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

Wetland plants are herbaceous plants that grow in marshes or swamps and that produce valuable food and cover for wetland forms of wildlife. Examples are smartweed, barnyardgrass, wildrice, rice cutgrass, rush, sedge, burreed, arrowhead, and millet.

Shallow water developments are impoundments or excavations in which the water level can be controlled. In these areas the water table can be raised up to 3 feet above ground level. Examples are low dikes and levees, shallow dugouts, level ditches, and marshy drainageways or channels.

Kinds of wildlife.—The three kinds of wildlife listed in table 4 are defined in the following paragraphs.

Openland wildlife are birds and mammals commonly found in open fields, meadows or pastures, and brushy, idle land. Examples are cottontail rabbit, bobwhite, ringneck pheasant, mourning dove, field sparrow, meadowlark, and killdeer.

Woodland wildlife are birds and mammals commonly found in wooded areas, either large forests or small farm woodlots. Examples are white-tailed deer, gray squirrel, fox squirrel, raccoon, ruffed grouse, wood thrush, vireos, warblers, and woodpeckers.

Wetland wildlife are birds and mammals commonly found in marshes, swamps, and shallow ponds. Examples are ducks, geese, snipe, rails, coots, herons, muskrat, mink, and beaver.

Engineering Uses of the Soils[5]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissions, town and city managers, land developers, engineers, contractors, and farmers.

Among the properties of soil highly important in engineering are permeability, strength, compaction characteristics, soil drainage, shrink-swell potential, grain size, plasticity, and soil reaction. Also important are depth to the water table, depth to bedrock, and slope. These properties, in varying degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.
4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate the performance of structures already built with the properties of the soil on which they are built, for the purpose of predicting the performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 5, 6, and 7, which show, respectively, estimates of soil properties significant in engineering, interpretations for various engineering uses, and results of engineering laboratory tests on soil samples.

This information, along with the soil map and other parts of this publication, can be used to make interpretations in addition to those given in tables 5 and 7. It can also be used to make other useful maps.

This information, however, does not eliminate the need for further investigation at sites selected for engineering works, especially those that involve heavy loads or require excavation to depths greater than those shown in the tables, generally greater than 6 feet. Also, inspection of sites, especially small ones, is needed because many areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for engineering.

Some of the terms used in this soil survey have special meaning in soil science that may not be familiar to engineers. The Glossary defines many terms commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying samples of soils for engineering are the Unified system (*11*) used by SCS engineers, the Department of Defense, and others, and the AASHO system adopted by the American Association of State Highway Officials (*1*).

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic-matter content. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes, for example, ML-CL.

The AASHO system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system, a soil is assigned to one of seven basic groups ranging from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A-1 are gravelly soils, which have high bearing strength and are the best soils for subgrade or foundation. At the other extreme, in group A-7, are clay soils, which have low strength when wet and are the poorest soils for subgrade. Where laboratory data are available to justify a further breakdown, the A-1, A-2, and A-7 groups are divided as follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As additional refinement, the engineering value of a soil material can be indicated by a group index number. Group indexes range from 0 for the best material to 20 or more for the poorest. Table 7 shows the AASHO classification for tested soils and the group index numbers. Table 5 shows the estimated classification of all soils mapped in the county.

Soil scientists use the USDA system of classification. In this, texture is determined by the relative proportion 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.

Estimated properties of soils

Estimates of soil properties significant in engineering are shown in table 5. They are made for typical soil profiles, by layers that differ sufficiently to differ significantly in soil engineering. The estimates are based on field observations made in the course of mapping, on test data for these and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of some of the columns in table 5.

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

[5] LOUIS S. BUTTON, JR., State conservation engineer, Soil Conservation Service, helped prepare this section.

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

Permeability is the quality that enables a soil to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. Lateral seepage, plowpans, and surface crusts were not considered in the estimates.

Available water capacity is the ability of a soil to hold water for use by most plants. It is commonly defined as the difference between the amount of water in the soil at field capacity and the amount at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is the relative change in volume to be expected of soil material with changes in moisture content, that is, the extent to which the soil shrinks as it dries out or swells when it is wet. The amount of shrinking and swelling is influenced by the amount and kind of clay in the soil. Shrinking and swelling of soils cause much damage to building foundations, roads, and other structures. A *high* shrink-swell potential indicates a hazard to maintenance of structures built in, on, or with material having this rating.

Engineering interpretations

The information in table 6 is based on the estimates of engineering properties shown in table 5, on test data for soils in the county and other nearby or adjoining counties, and on the experience of engineers and soil scientists with the soils of Madison County. In table 6, the suitability of a soil for specified purposes is expressed as *good, fair, poor,* and *unsuited.* Also in table 6 are those soil features not to be overlooked in planning, installing, and maintaining drainage of cropland and pasture, reservoir areas, and embankments, dikes, and levees.

Following are explanations of some of the columns in table 6.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. Suitability is affected mainly by ease of working and spreading the soil material, as in preparing a seedbed; by natural fertility of the material or the response of plants when fertilizer is applied; and by absence of substances toxic to plants. Texture of the soil material and content of stone fragments are characteristics that affect suitability. Also considered in the ratings is damage that results at the area from which topsoil is taken.

Sand and gravel are used in great quantities in many kinds of construction. The ratings in table 6 provide guidance about where to look for probable sources of these materials. A soil rated as a *good* or *fair* source of sand or gravel generally has a layer at least 3 feet thick, the top of which is within a depth of 6 feet. Thickness of the overburden, depth of the water table, other factors that affect mining of the materials, and quality of the deposit were not considered in the ratings.

Road fill is soil material used in embankments for roads. The ratings reflect the predicted performance of a soil after it has been placed in an embankment that has been properly compacted and adequately drained and the relative ease of excavating the material at the borrow area.

Pond reservoirs hold water behind a dam or embankment. Suitable soils have low seepage, which is related to permeability and depth to fractured or permeable bedrock or other permeable material.

Embankments and dikes require soil material that is resistant to seepage and piping and has favorable stability, shrink-swell potential, shear strength, and compactibility. Stones and organic material are among factors that are unfavorable.

Drainage of crops and pasture is affected by permeability, texture, and structure; depth to claypan, rock, or other layers that influence rate of water movement; depth to the water table; slope; stability in ditch banks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Engineering test data

Table 7 shows engineering test data for ten soil samples representing nine soil series in Madison County. The tests were made to help evaluate the soils for engineering purposes. The engineering classifications are based on data obtained by mechanical analyses and by tests to determine liquid and plastic limits. The mechanical analysis was made by combined sieve and hydrometer methods.

Compaction, or moisture-density, data are important in earthwork. If a soil material is compacted at successively higher moisture content, assuming that the compactive effort remains constant, the density of the compacted material increases until the *optimum moisture content* is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed *maximum dry density.* As a rule, maximum strength of earthwork is obtained if the soil is compacted to a maximum dry density.

Liquid limit and plasticity index indicate the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a solid to a semisolid to plastic. If the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the soil material changes from a semisolid to a plastic. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which soil material is plastic.

Town and Country Planning

Population and competition for land and various land uses are increasing within the Commonwealth of Virginia. Within the county, there is increasing demand for land to be used for homesites, recreation developments, roads, industry, and other uses and an increasing need for knowledge of soil properties and the behavior of soils under various uses.

This section provides information about the properties of soils that affect selected town and country uses. It can help community planners, developers, and individuals to determine the most suitable land use for a particular area. To be considered in the planning of a particular area are the possible effects of increased runoff and the hazards of increased erosion and siltation.

Table 8 shows the estimated degree of limitation and the kinds of limitation for selected uses. Other useful information can be found on the soil maps and in other parts of this publication, particularly in the sections "Descriptions of the Soils" and "Engineering Uses of the Soils."

Limitations are expressed as *slight, moderate,* and *severe.* A *slight* limitation means that soil properties are generally favorable for the specified use or limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means that soil properties are so unfavorable and so difficult to correct or overcome that major soil reclamation, special design, or intensive maintenance is required.

TABLE 5.—*Estimates of soil*

[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 soil in such mapping appear in the first column of this table. The

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Albano: Ab	0-1	3½-5	0-8	Silt loam	ML, ML-CL
			8-32	Silty clay, silty clay loam.	CL, ML-CL, CH
			32-48	Shaly silty clay loam.	SC, CL
			48	Shale bedrock.	
Alluvial land: Ac, Ad. No valid estimates can be made; material too variable.					
Altavista, clayey subsoil variant: AlA, AlB	2-3	5->10	0-11	Loam, fine sandy loam, silt loam.	SM, ML ML-CL
			11-36	Clay, heavy clay loam	CL, CH
			36-48	Clay loam	CL, ML-CL
			48-72	Fine sandy loam to gravelly and cobbly sandy loam.	SM
Appling: ApB, ApC, ApD2, ArB	>5	>5	0-9	Fine sandy loam, sandy loam.	SM, ML, ML-CL
			9-48	Clay, sandy clay loam, clay loam.	MH, MH-CH
			48-74	Fine sandy loam, sandy loam.	SM, ML
Augusta, clayey subsoil variant: Au	1-2	5->10	0-9	Silt loam, loam, fine sandy loam.	ML
			9-47	Silty clay loam, clay	CL, CH
			47-64	Gravelly clay loam	SM, SC, CL
Baile: BaB	0-1	4-10	0-9	Stony silt loam, loam	ML
			9-36	Silty clay loam, heavy silt loam	ML, CL
			36-72	Loam	ML, CL
*Braddock: BcB, BcC, BcD2 For Thurmont part, see Thurmont series.	>5	6-30	0-9	Loam, fine sandy loam	CL, SM
			9-48	Clay loam, clay	MH, CH, CL
			48-85	Loam (saprolite)	SM, ML
Brandywine: BdC, BdD, BeC, BeD, BeF, BnD, BnF.	>5	4->10	0-11	Loam, gravelly loam, stony loam.	SM, ML
			11-16	Loam, gravelly loam	SM
			16-54	Gravelly loamy sand	SM
Bremo: BrC, BrE	>5	1½-3½	0-7	Silt loam, loam, gravelly loam.	ML, SM
			7-12	Gravelly silt loam	ML, SM
			12-26	Gravelly to very gravelly silt loam.	SM, GM
			26	Hornblende-gabbro rock.	

properties significant in engineering

units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for referring to other series that symbol > means more than; < means less than]

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	–	100	90-100	75-90	65-90	0.6-2.0	0.17-0.20	5.1-5.5	Low.
A-6, A-7	–	100	90-100	80-100	75-95	0.2-0.6	0.12-0.15	5.1-5.5	Moderate.
A-6	10-20	85-100	50-75	40-60	40-60	0.06-0.2	0.10-0.13	5.1-5.5	Low.
A-2, A-4	–	95-100	90-100	60-95	30-55	2.0-6.3	0.15-0.20	5.1-5.5	Low.
A-6, A-7	–	100	100	90-100	70-80	0.6-2.0	0.12-0.15	5.1-5.5	Moderate.
A-6	–	100	90-100	80-100	75-90	0.6-2.0	0.12-0.15	5.1-5.5	Moderate.
A-4, A-2	10-25	75-90	50-90	40-80	20-40	2.0-6.3	0.08-0.10	5.1-5.5	Low.
A-4	0	100	90-100	70-85	40-55	2.0-6.3	0.10-0.15	5.1-5.5	Low.
A-7	0	100	90-100	80-95	65-90	0.6-2.0	0.12-0.15	5.1-5.5	Moderate.
A-4, A-5	0	100	85-100	70-85	40-55	0.6->2.0	0.08-0.12	5.1-5.5	Low.
A-4	0	100	85-100	80-100	65-90	0.6->2.0	0.14-0.20	5.1-5.5	Low.
A-6, A-7	0	100	85-100	80-100	65-90	0.6-2.0	0.15-0.19	5.1-5.5	Moderate.
A-4, A-6	0-5	90-100	40-100	40-100	36-60	0.6-2.0	0.08-0.15	5.1-5.5	Moderate.
A-4	20	80-100	80-100	65-80	60-75	0.6-2.0	0.15-0.20	4.5-5.5	Low.
A-6	20	80-100	80-100	65-80	60-75	0.06-0.6	0.15-0.20	4.5-5.5	Moderate.
A-4, A-6	20	80-100	80-100	65-80	55-70	0.2-0.6	0.15-0.20	4.5-5.5	Low.
A-4	0	85-100	75-95	60-85	36-65	0.6-6.0	0.14-0.19	4.5-5.5	Low.
A-7	0-20	75-95	60-90	55-90	55-80	0.6-2.0	0.14-0.19	4.5-5.5	Moderate.
A-2, A-4, A-6	0	100	90-100	60-90	35-70	0.6-6.0	0.06-0.12	4.5-5.5	Low.
A-2, A-4	0-20	65-100	50-100	40-85	25-60	2.0-6.0	0.10-0.20	4.5-5.5	Low.
A-2, A-4	0-15	65-100	50-100	40-85	25-50	2.0-6.0	0.10-0.15	4.5-5.5	Low.
A-2	0-10	70-100	50-100	40-80	25-35	2.0-6.0	0.06-0.10	4.5-5.5	Low.
A-2, A-4	0	70-90	55-100	40-95	30-90	2.0->6.0	0.12-0.18	5.1-5.5	Low.
A-2, A-4	0	70-90	55-75	40-70	30-60	2.0->6.0	0.12-0.15	5.1-5.5	Low.
A-1, A-2, A-4	0-5	50-80	25-60	20-50	12-40	2.0->6.0	0.06-0.10	5.1-5.5	Low.
	0								

TABLE 5.–*Estimates of soil properties*

Soil series and map symbols	Depth to–		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Bucks: BsB, BsC2	>5	5-15	0-9	Loam, sandy loam	ML
			9-36	Clay loam, silty clay loam.	CL, ML-CL, CH
			36-70	Loamy material mixed with coarse fragments of shale and sandstone conglomerate.	SM, ML
Buncombe: Bu	[1]>5	10-30	0-43	Loamy fine sand	SM
			43-54	Fine sandy loam	SM, ML
			54-66	Stratified gravel and coarse sand.	GW, SW, GM, SM
*Calverton: CbB For Creedmoor part, see Creedmoor series.	1-2	3½->5	0-8	Silt loam, loam	ML, CL
			8-24	Silty clay loam	CL, ML-CL
			24-44	Silt loam	ML, CL
			44-62	Weathered shale and silty clay loam.	SC, CL, CH
Catoctin: CcC, CcE	>5	1½-3	0-6	Silt loam	ML, ML-CL
			6-12	Silty clay loam	CL, ML-CL
			12-27	Weathered greenstone schist and silt loam.	ML, SM-SC, SP-SM
*Cecil: CeB, CeB2, CeC, CeC2, CeD2, CfB, CgC3, ChC, ChC2. For Appling part of units ChC and ChC2, see Appling series.	>5	4-15	0-10	Fine sandy loam	SM, ML, ML-CL
			10-51	Clay, sandy clay loam	MH, CH
			51-92	Fine sandy loam	SM, ML
*Chester: CkB, CkC, CkC2, CkD For Brandywine part, see Brandywine series.	>5	10-40	0-7	Loam, silt loam, fine sandy loam.	ML
			7-30	Clay loam, loam	ML, CL
			30-65	Loam (saprolite)	SM, ML
Chewacla: Cm	[1]1½-2	>10	0-49	Silt loam	ML, ML-CL
			49-80	Fine sandy loam	SM, ML
Codorus, cobbly subsoil variant: Cn	([1])	3->10	0-21	Loam	ML
			21-50	Very cobbly sandy loam	SM
Colfax: CoC	1½-2	4->10	0-9	Fine sandy loam	SM, ML
			9-26	Sandy clay loam	SC, CL
			26-49	Fine sandy loam, sandy clay.	SM, SC, CL
			49-69	Fine sandy loam and weathered sandstone.	SM, SC

significant in engineering—Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve—(less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	0	100	80-100	65-85	60-75	0.6->6.0	0.17-0.20	5.1-5.5	Low.
A-6, A-7	0	100	80-100	70-80	50-70	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-2, A-4	10-25	85-100	60-90	45-80	20-60	2.0-20.0	0.08-0.14	5.1-5.5	Low.
A-2	0	100	100	50-75	15-30	>6.0	0.6-0.8	5.6-6.0	Low.
A-4	0	100	100	70-85	40-55	>6.0	0.6-0.8	5.6-6.0	Low.
A-1, A-2	0	50-100	20-100	5-20	2-15	>6.0	0.6-0.8	5.6-6.0	Low.
A-4	0	100	100	90-100	85-100	0.6->2.0	0.17-0.20	5.1-5.5	Low.
A-6, A-7	0	100	100	85-100	80-100	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-4, A-6	0	100	95-100	85-95	70-95	0.06-0.2	0.08-0.10	5.1-5.5	Low.
A-6, A-7	0	75-85	50-70	40-60	40-60	0.06-0.2	0.06-0.08	5.1-5.5	Low.
A-4, A-6	0	90-100	75-100	65-90	55-90	2.0-6.0	0.17-0.20	5.6-6.5	Low.
A-6, A-7	0	80-100	60-90	55-90	75-85	2.0-6.0	0.10-0.15	5.6-6.5	Moderate.
A-4, A-2	0	60-100	30-70	20-70	10-60	2.0-6.0	0.08-0.10	5.6-6.5	Low.
A-4	0	85-100	80-100	75-90	40-65	0.6->2.0	0.10-0.15	5.1-5.5	Low.
A-7	0	90-100	90-100	80-95	65-80	0.6-2.0	0.12-0.15	5.1-5.5	Moderate.
A-4, A-5, A-7	0	90-100	90-100	80-90	45-65	0.6->2.0	0.10-0.15	5.1-5.5	Low.
A-4	0	90-100	90-100	70-90	55-75	0.6->2.0	0.14-0.17	5.1-5.5	Low.
A-6, A-7	0	100	100	80-95	65-90	0.6-2.0	0.16-0.19	5.1-5.5	Low.
A-4, A-5	0	100	100	70-85	40-70	0.6->2.0	0.08-0.14	5.1-5.5	Low.
A-4, A-6, A-7	0	100	100	90-100	70-90	0.6-2.0	0.17-0.20	5.1-6.0	Low.
A-4, A-6	0	100	100	60-90	40-55	0.6->2.0	0.10-0.15	5.1-6.0	Low.
A-4	0-10	100	90-100	70-95	60-85	0.6-2.0	0.14-0.17	5.1-5.5	Low.
A-2, A-1	30-60	65-100	55-75	30-55	15-30	2.0->6.0	0.06-0.10	5.1-5.5	Low.
A-4	0	100	80-100	60-85	40-55	0.6-2.0	0.10-0.15	4.5-5.0	Low.
A-6	0	100	80-100	60-85	45-60	0.6-2.0	0.13-0.16	4.5-5.0	Low.
A-6	0	90-100	80-100	55-75	40-55	0.06-0.2	0.06-0.10	4.5-5.0	Low.
A-2, A-4	0	100	100	45-65	25-45	0.06-0.2	0.06-0.10	4.5-5.0	Low.

TABLE 5.–*Estimates of soil properties*

Soil series and map symbols	Depth to–		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Colluvial land: Cr, Cu. No valid estimates can be made; material too variable.					
Congaree: Cv, Cw	>5	>6	0-72	Loam, silt loam, fine sandy loam.	SM, ML
Creedmoor: Mapped only with Calverton soil	2-2½	>5	0-8	Silt loam, loam	SM, ML
			8-23	Silty clay loam, silty clay.	CL, ML-CL
			23-46	Clay, silty clay	MH, CH
			46-62	Silt loam	SM, ML
Davidson: DaB2, DaC2, DaD2	>5	>6	0-7	Clay loam	CL, ML-CL
			7-62	Clay	MH, MH-CH
			62-74	Silty clay loam	MH, CL
Dyke: DkB, DkC2, DkE2	>5	4->20	0-8	Loam, clay loam	ML, CL
			8-48	Clay	MH, CH
			48-84	Very cobbly clay loam	MH, CH, SC
Elbert: Eb	0-½	3½-6	0-11	Silt loam, loam	ML, CL
			11-56	Clay, silty clay loam	CH, MH-CH
			56-80	Silty clay loam	CL, ML-CL
Elioak: ElB, ElB2, ElC, ElC2, ElD2, EmB, EmB2, EmC2, EmD2, EnC3, EnD3.	>5	10->40	0-7	Silty clay loam (EmC2, EmD3).	CL, ML-CL, MH
			0-8	Fine sandy loam, loam	SM, ML-CL, ML
			8-40	Clay loam, sandy clay loam.	MH, MH-CH
			40-85	Fine sandy loam	ML
*Eubanks: EsB, EsC, EsC2, EtB, EtC2, EtD2, EuC3, EuD3, EuE3, EyB, EyB2, EyC, EyC2, EyD2. For Lloyd part of EuC3, EuD3, EuE3, EyB, EyB2, EyC, EyC2, and EyD2, see Lloyd series.	>5	5->10	0-6	Clay loam (EuC3, EuD3, EuE3).	CL
			0-9	Fine gravelly loam, loam.	SM, ML ML-CL
			9-45	Fine gravelly clay loam	SC, CL, MH
			45-76	Fine gravelly sandy loam.	SM, ML
Fauquier: FaB, FcB2, FcC2, FcD2	>5	3->5	0-12	Silt loam, silty clay loam	ML, CL
			12-27	Silty clay	MH, MH-CH
			27-69	Silty clay loam	MH
Glenelg: GlC2, GlD2	>5	8->30	0-11	Loam, silt loam	ML
			11-33	Silty clay loam, loam, clay loam.	ML, CL
			33-65	Loam	ML

significant in engineering–Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	0	100	100	70-100	40-80	0.6-2.0	0.14-0.17	5.6-6.0	Low.
A-4	0	90-100	80-95	60-85	40-55	0.6->2.0	0.17-0.20	4.5-5.5	Low.
A-6, A-7	0	100	90-100	75-90	51-70	0.2-0.6	0.12-0.15	4.5-5.5	Moderate.
A-7	0	100	95-100	85-95	70-85	<0.06	0.12-0.15	4.5-5.5	High.
A-4, A-6	0	90-100	90-100	65-90	45-60	0.2-0.6	0.13-0.18	4.5-5.5	Low.
A-7, A-6	0	90-100	90-100	90-100	70-90	0.6-2.0	0.16-0.19	5.6-6.0	Moderate
A-7	0	90-100	90-100	85-100	80-100	0.6-2.0	0.12-0.15	5.6-6.0	Moderate.
A-6, A-7	0	90-100	90-100	85-100	80-95	0.6-2.0	0.16-0.19	5.6-6.0	Moderate.
A-4, A-6, A-7	0	90-100	90-100	85-95	60-75	2.0-6.0	0.14-0.17	5.1-5.5	Low.
A-7	0	80-95	75-90	80-95	65-80	0.6-2.0	0.12-0.15	5.1-5.5	Moderate.
A-7	35-60	80-100	60-90	45-75	40-60	0.6-2.0	0.10-0.13	5.6-6.0	Moderate.
A-6	0	100	100	85-100	60-90	0.6-2.0	0.17-0.20	4.5-5.5	Low.
A-7	0	100	100	90-100	75-95	0.06-0.2	0.12-0.15	5.6-6.0	Very High.
A-6, A-7	0	100	100	90-100	85-95	0.06-0.2	0.16-0.19	5.6-6.0	High.
A-6, A-7	0	100	100	95-100	85-95	0.2-0.6	0.15-0.18	5.1-5.5	Moderate
A-4	0	90-100	90-100	80-100	50-85	0.6->2.0	0.10-0.15	5.1-5.5	Low.
A-7	0	90-100	90-100	85-100	75-90	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-5, A-7	0	100	100	90-100	55-90	0.6->2.0	0.10-0.15	5.1-5.5	Low.
A-6	0	100	100	90-100	70-80	0.2-2.0	0.14-0.18	5.1-5.5	Moderate.
A-2, A-4	0	80-100	60-100	45-95	30-75	0.6->2.0	0.10-0.16	5.1-5.5	Low.
A-6, A-7	0	80-100	55-75	50-70	40-60	0.6-2.0	0.10-0.14	5.1-5.5	Moderate.
A-2, A-4	0	80-100	55-75	35-70	15-65	2.0->6.0	0.05-0.08	5.1-5.5	Low.
A-4, A-6	0	90-100	80-100	70-80	60-70	0.6-2.0	0.16-0.20	5.6-6.0	Low.
A-7	0	100	80-100	75-85	70-80	0.6-2.0	0.12-0.15	5.6-6.0	Moderate.
A-7	0	90-100	70-90	65-80	55-75	0.6-2.0	0.16-0.19	5.6-6.0	Moderate.
A-4	–	90-100	90-100	85-95	60-75	0.6-2.0	0.14-0.17	5.1-5.5	Low.
A-4, A-6	–	90-100	90-100	90-100	80-95	0.6-2.0	0.13-0.17	5.1-5.5	Low.
A-4, A-5	–	90-100	90-100	85-95	60-85	0.6-2.0	0.08-0.12	5.1-5.5	Low.

TABLE 5.—*Estimates of soil properties*

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Hazel: HaC, HaD, HaF	>5	1½-3	0-14	Loam, silt loam, fine sandy loam.	ML, ML-CL
			14-38	Fine sandy loam, loam	SM, ML
			38	Micaceous sandstone and phyllite.	
Hiwassee: HsB, HsB2, HsC2, HsD2	>5	5->30	0-9	Loam, fine sandy loam	SM, ML
			9-82	Clay, silty clay	MH, MH-CH
			82-96	Clay loam	SC, CL
Iredell: IrB	1½-2	3½-6	0-7	Silt loam, loam	ML, ML-CL
			7-32	Clay, clay loam	CH
			32-66	Loam, silt loam	SC, ML, CL
Lewisberry: LeD	>5	2-5	0-9	Sandy loam	SM
			9-27	Gravelly sandy loam, sandy clay loam.	SC, SM
			27-45	Sandy loam	SM, GM, SW-SM, GW-GM
			45	Triassic conglomerate rock.	
Lloyd: LfB, LfC2, LfD2, LlB, LlB2, LlC2, LnC3, LnD3.	>5	4->15	0-7	Clay loam (LnC3, LnD3).	CL
			0-9	Loam, fine sandy loam	CL, ML, SM
			9-49	Clay, clay loam.	MH, MH-CH
			49-88	Loam	ML
Lloyd, thin solum variant: LmB2, LmC2, LmD2.	>5	>20	0-6	Loam	ML, SM
			6-24	Clay, clay loam	MH, MH-CH
			24-82	Micaceous loam	ML
Louisburg: LoC, LoD, LoF	>5	2-3½	0-12	Sandy loam.	SM
			12-22	Sandy loam.	SM
			22-29	Gravelly sandy loam.	SM
			29	Granite rock.	
Made land: Ma. No valid estimates can be made; material too variable.					
Manassas: MnB	2	3-8	0-10	Silt loam, loam.	ML, ML-CL
			10-47	Silty clay loam, heavy silt loam.	CL, ML-CL
			47-65	Silt loam	ML, ML-CL
Manor: MoC	>5	5-40	0-9	Silt loam	ML
			9-19	Loam	SM, ML
			19-52	Fine sandy loam mixed with mica schist and sandstone.	SM

significant in engineering–Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	0	90-100	85-100	70-80	55-65	2.0-6.0	0.14-0.17	5.1-5.5	Low.
A-2, A-4	0	85-100	60-85	45-65	30-55	2.0-6.0	0.10-0.15	5.1-5.5	Low.
A-4	0	100	90-100	65-80	40-65	0.6->2.0	0.14-0.18	5.1-5.5	Low.
A-7	0	100	95-100	95-100	65-90	0.6-2.0	0.12-0.15	5.1-6.5	Moderate.
A-6, A-7	0	100	75-90	55-80	45-65	0.6-2.0	0.15-0.19	5.1-6.5	Moderate.
A-4	0	100	95-100	80-90	70-80	0.6-2.0	0.17-0.20	5.6-6.0	Low.
A-7	0	100	95-100	90-100	80-90	0.06-0.2	0.12-0.15	6.1-6.5	Very high.
A-4, A-6	0	95-100	90-100	70-80	45-70	0.06-0.2	0.14-0.17	6.1-6.5	Moderate.
A-2	0	90-100	80-95	50-65	25-35	2.0->6.0	0.10-0.14	4.5-5.5	Low.
A-2, A-6	0	60-85	40-70	25-50	12-45	2.0-6.0	0.13-0.16	4.5-5.5	Low.
A-1, A-2	5-1	50-75	30-50	20-30	10-20	2.0->6.0	0.08-0.12	4.5-5.5	Low.
A-6	0	100	100	90-100	70-80	0.2-0.6	0.12-0.15	5.1-5.5	Moderate.
A-4	0	100	100	75-100	45-85	0.6-2.0	0.14-0.17	5.1-5.5	Low.
A-7	0	100	95-100	95-100	65-85	0.6-2.0	0.12-0.15	5.1-6.0	Moderate.
A-5, A-4	0	100	100	85-100	60-75	0.6-2.0	0.14-0.17	5.6-6.0	Low.
A-4	0	100	100	75-100	45-85	0.6-2.0	0.14-0.17	5.1-5.5	Low.
A-7	0	100	95-100	95-100	65-85	0.6-2.0	0.12-0.15	5.1-6.0	Moderate.
A-5, A-4	0	100	100	85-100	60-75	2.0-6.0	0.14-0.17	5.1-6.0	Low.
A-2, A-4	0	100	85-100	55-65	25-40	6.0-20.0	0.08-0.12	4.5-5.0	Low.
A-2, A-4	0	100	85-100	55-65	25-40	6.0-20.0	0.08-0.12	4.5-5.0	Low.
A-2	0	90-100	50-75	40-60	20-30	6.0-20.0	0.06-0.10	4.5-5.0	Low.
A-4	0	90-100	80-100	80-90	65-75	0.6-2.0	0.17-0.20	5.1-5.5	Low.
A-6	0	90-100	80-100	80-90	75-85	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-4, A-6	0	80-95	65-90	60-75	60-70	0.6-2.0	0.12-0.15	5.1-5.5	Low.
A-4	0	90-100	80-100	80-90	55-75	0.6-6.0	0.17-0.20	5.1-5.5	Low.
A-4, A-5	0	90-100	80-100	80-100	50-70	0.6-6.0	0.14-0.17	5.1-5.5	Low.
A-2, A-4, A-5	0	80-95	65-90	40-65	30-50	0.6-6.0	0.10-0.15	5.1-5.5	Low.

TABLE 5.–*Estimates of soil properties*

Soil series and map symbols	Depth to–		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Mayodan: MuB, MuC2	>5	5-10	0-11	Fine sandy loam	SM
			11-55	Sandy clay loam, clay	MH, MH-CH
			55-91	Sandy loam mixed with Triassic sandstone.	SM
Meadowville: MvB, MvC	3-4	4-10	0-14	Loam	ML
			14-46	Loam, silty clay loam	MH, ML-CL
			46-52	Sandy clay loam	SC, CL
			52-76	Fine sandy loam	ML, SM
*Myersville: MyC, MyD, MyE. For Catoctin part, see Catoctin series.	>5	3½-8	0-8	Very stony silt loam	SM, ML
			8-34	Silt loam, silty clay loam	ML, ML-CL
			34-48	Silt loam and weathered greenstone rock.	ML
			48	Hard greenstone schist.	
Penn: PnC, PnD	>5	1½-3½	0-9	Loam	ML
			9-29	Shaly clay loam, loam	ML, CL, SC
			29-36	Loam	GM, SM
			36	Shale and sandstone conglomerate.	
Porters: PoC, PoD, PoF	>5	2-6	0-14	Very stony loam	SM, ML, GM
			14-29	Clay loam	CL, GC
			29-56	Loam, sandy loam	SM, GM
			56	Granodiorite rock.	
Rapidan: RdB, ReC2	>5	4->8	0-6	Silty clay loam (ReC2)	CL
			0-9	Silt loam, loam	ML
			9-36	Clay, heavy clay loam	MH, MH-CH
			36-69	Clay loam	MH
			69	Conglomerate rock.	
Riverwash: Rh. No valid estimates can be made; material too variable.					
Roanoke: Rk	0-1	>10	0-9	Silt loam	ML, ML-CL
			9-46	Silty clay loam, clay	CH, MH
			46-62	Variable strata of sand, clay, and gravel.	SM, CH
*Rock land: Rn, Ro, RrD, RrE, RtD, RtE. No valid estimates can be made; material too variable. For Myersville part of RrD, RrE, see Myersville series; for Catoctin part of RrD, RrE, see Catoctin series; for Porters part of RtD, RtE, see Porters series; for Hazel part of RtD, RtE, see Hazel series.					

significant in engineering–Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	0	100	90-100	65-80	36-50	0.6->2.0	0.10-0.15	4.5-5.5	Low.
A-7	0	100	90-100	75-95	55-80	0.6-2.0	0.12-0.16	4.5-5.5	Moderate.
A-2, A-4	0	90-100	80-100	50-60	25-40	0.6->2.0	0.08-0.12	4.5-5.5	Low.
A-4	0	100	80-100	80-96	55-75	0.6-2.0	0.14-0.17	5.1-6.5	Low.
A-7, A-6	0	100	80-100	75-98	60-85	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-6, A-7	0	100	80-100	70-91	36-55	0.6-2.0	0.13-0.16	5.1-5.5	Moderate.
A-4, A-2	0	100	90-100	65-75	30-55	0.6->2.0	0.10-0.19	5.1-5.5	Low.
A-4, A-5	15-30	90-100	50-75	40-55	36-55	0.6->2.0	0.15-0.18	5.6-6.0	Low.
A-6, A-7	15-30	90-100	50-75	50-60	51-65	0.6-2.0	0.14-0.17	5.6-6.0	Moderate
A-4, A-5	0	90-100	80-90	75-85	70-80	0.6-2.0	0.12-0.15	5.6-6.0	Low.
A-4, A-2	10	95-100	90-100	80-90	60-70	0.6-6.0	0.14-0.17	5.1-5.5	Low.
A-4	15	85-100	50-75	50-60	35-55	0.6-6.0	0.12-0.16	5.1-5.5	Low.
A-2	20	60-75	35-50	35-45	25-35	0.6-6.0	0.10-0.15	5.1-5.5	Low.
A-4	30	70-80	65-75	55-65	40-55	2.0-6.0	0.12-0.15	5.6-6.0	Low.
A-6	30	70-80	65-75	60-70	45-60	2.0-6.0	0.10-0.14	5.6-6.0	Moderate.
A-2, A-4	35	60-70	60-70	50-65	30-40	2.0-6.0	0.06-0.10	5.6-6.0	Low.
A-6	0	100	90-100	85-100	75-90	0.2-0.6	0.14-0.17	5.6-6.0	Moderate.
A-4	0	90-100	85-100	75-90	55-75	0.6-2.0	0.17-0.20	5.6-6.0	Low.
A-7	15	90-100	75-100	70-95	70-90	0.6-2.0	0.12-0.15	5.6-6.0	Moderate.
A-6, A-7	25	80-100	60-100	60-90	55-80	0.6-2.0	0.16-0.19	5.6-6.0	Moderate.
A-4	0	100	100	90-100	60-75	0.6-2.0	0.17-0.20	4.5-5.5	Low.
A-7	0	100	100	90-100	80-95	0.06-0.2	0.12-0.15	4.5-5.5	Moderate.
A-2, A-7	0-10	80-100	50-60	45-60	30-60	0.2-0.6	0.10-0.16	4.5-5.5	Moderate.

TABLE 5.—*Estimates of soil properties*

Soil series and map symbols	Depth to—		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Rock outcrop: Ru. No valid estimates can be made; material too variable.					
Starr: SrC	2-3	>10	0-13	Silt loam	ML, ML-CL
			13-52	Clay loam	MH, MH-CH
			52-72	Silt loam, fine sandy loam.	ML
Thurmont: Mapped only with Braddock soils	>5	4->20	0-9	Loam, sandy loam	ML, SM
			9-48	Clay loam, loam, sandy clay loam.	CL, MH
			48-60	Cobbly sandy loam	SM
			60-70	Granite (saprolite).	
Trego: TrC	1½-2	6-20	0-8	Loam, sandy loam, silt loam.	ML, SM
			8-22	Clay loam, sandy clay loam.	CL, SC
			22-36	Sandy loam	SM
			36-72	Sandy loam and weathered stone and gravel.	SM
Tusquitee: TuB, TuC, TuD, TuE	>5	>6	0-8	Stony loam	ML
			8-45	Loam, clay loam	ML, CL
			45-66	Loam mixed with stones and gravel.	GW-GM, GM, SW-SM, SM
Unison: UnB, UnC, UnD, UsC, UsD[2]	>5	>5	0-9	Loam, silt loam	ML, ML-CL
			9-50	Clay loam, clay	CL, ML-CL
			50-72	Cobbly clay loam	CL, ML
Watt: WaC, WaE	>5	1½-3	0-9	Channery silt loam	SM
			9-26	Channery silt loam	GM, SM
			26	Graphitic schist rock.	
Wehadkee: We	[1]0-1	5->20	0-11	Silt loam	ML
			11-52	Silty clay loam	ML, ML-CL
			52-68	Fine sandy loam	SM, ML
Wickham, clayey subsoil variant: WhB, WhC2	>4	>6	0-10	Loam	ML, ML-CL
			10-50	Clay, heavy clay loam	CL, ML-CL, CH
			50-75	Clay loam	CL
Worsham: WmB	0-1	5-10	0-7	Loam	ML
			7-44	Heavy loam, clay loam	CL, ML-CL
			44-76	Fine sandy loam	SM

significant in engineering–Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch of soil*	*pH*	
A-4	0	100	100	90-100	70-90	2.0-6.0	0.17-0.20	5.6-6.5	Low.
A-6, A-7	0	100	100	90-100	70-80	2.0-6.0	0.16-0.19	5.6-6.5	Moderate.
A-4	0	100	100	75-90	55-85	2.0-6.0	0.15-0.20	5.6-6.5	Low.
A-4	0-5	90-100	90-100	65-85	40-65	0.6->2.0	0.14-0.18	4.5-5.5	Low.
A-6, A-7	5-20	85-95	75-90	70-80	55-65	0.6-2.0	0.16-0.19	4.5-5.5	Moderate.
A-2, A-4	25-50	80-90	60-90	40-50	20-40	6.0-20.0	0.06-0.10	4.5-5.5	Low.
A-4	0	90-100	90-100	80-90	45-70	0.6->2.0	0.12-0.20	5.1-5.5	Low.
A-6	0	90-100	85-95	75-85	45-65	0.6-2.0	0.16-0.19	5.1-5.5	Moderate.
A-2, A-4	0	90-100	80-95	55-65	25-40	0.06-02	0.06-0.10	5.1-5.5	Low.
A-1, A-2, A-4	40-60	80-90	60-70	40-60	20-40	2.0->6.0	0.04-0.08	5.1-5.5	Low.
A-4	10-20	85-100	70-95	65-80	51-60	2.0-6.0	0.10-0.13	5.5-6.0	Low.
A-4, A-6	10-20	85-100	70-95	65-80	51-60	2.0-6.0	0.12-0.15	5.5-6.0	Low.
A-1, A-2	40-60	50-70	30-40	20-30	10-15	6.0	0.04-0.08	5.5-6.0	Low.
A-4, A-6	0-5	85-100	75-100	65-100	51-85	0.6-2.0	0.15-0.20	5.6-6.0	Low.
A-7	5-10	85-100	75-100	65-95	55-90	0.6-2.0	0.12-0.16	5.6-6.0	Moderate.
A-6, A-7	15-25	80-100	65-100	55-85	55-80	0.6-2.0	0.09-0.14	5.6-0.14	Moderate.
A-4	10-20	75-90	50-75	40-60	36-50	0.6-6.0	0.13-0.16	4.5-5.0	Low.
A-2, A-4	20-30	60-70	35-45	25-40	20-35	0.6-6.0	0.10-0.14	4.5-5.0	Low.
A-4	–	100	100	90-100	70-90	2.0-6.0	0.17-0.20	5.6-6.5	Low.
A-6, A-7	–	100	100	90-100	80-90	0.6-2.0	0.17-0.20	5.6-6.5	Low.
A-2, A-4	–	75-100	65-90	45-85	20-70	2.0-6.0	0.08-0.15	5.6-6.5	Low.
A-4, A-6	0	100	90-100	80-95	65-90	2.0-6.3	0.14-0.17	5.1-5.5	Low.
A-6, A-7	0	100	90-100	85-95	75-85	0.6-2.0	0.12-0.16	5.6-6.0	Low.
A-6, A-7	0-15	100	90-100	75-90	60-80	0.6-2.0	0.14-0.16	5.6- 6.0	Low.
A-4	0	100	85-100	75-90	55-70	0.6-2.0	0.14-0.20	4.5-5.5	Low.
A-6	0	100	85-100	80-90	65-90	0.06-0.2	0.10-0.16	4.5-5.5	Moderate.
A-2, A-6	0	100	80-100	60-80	30-50	0.6-2.0	0.08-0.12	4.5-5.5	Low.

TABLE 5.–*Estimates of soil properties*

Soil series and map symbols	Depth to–		Depth from surface (typical profile)	Classification	
	Seasonal high water table	Bedrock		USDA texture	Unified
	Feet	*Feet*	*Inches*		
Zion: ZoB, ZoC	2-4	1½-3½	0-9	Silt loam	ML, ML-CL
			9-18	Silty clay loam	CL, CH
			18-29	Clay	MH, CH
			29	Hornblende-gabbro rock.	

[1]Subject to flooding.

significant in engineering–Continued

Classification (Continued)	Coarse fraction (fragments more than 3 inches in diameter)	Percentage passing sieve– (less than 3 inches)				Permeability	Available water capacity	Reaction	Shrink-swell potential
AASHO		No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.047 mm)	No. 200 (0.074 mm)				
	Percent					*Inches/hour*	*Inches/inch. of soil*	*pH*	
A-4	0	100	90-100	85-95	65-90	0.6-2.0	0.17-0.20	5.1-5.5	Low.
A-6, A-7	0	60-90	40-70	40-55	40-50	0.2-0.6	0.08-0.14	5.6-6.0	Low.
A-7	0	90-100	90-100	90-100	75-95	0.06-0.6	0.12-0.15	6.1-0.15	Moderate.

[2]Units UsC and UsD are very stony; 20 to 40 percent stones and cobbles.

TABLE 6.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or reason it is necessary to follow carefully the instructions for

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Albano: Ab	Poor: poorly drained	Unsuited: no sand or gravel.
Alluvial land:		
Ac	Poor: variable drainage and texture.	Poor: highly variable material; high silt and clay content.
Ad	Poor: coarse fragments	Poor for sand, fair for gravel; cobbles and variable amount of silt and clay.
Altavista, clayey subsoil variant; AlA, AlB	Fair: limited thickness of suitable material.	Poor: high silt and clay content.
Appling: ApB, ApC, ApD2, ArB	Fair: limited thickness of suitable material.	Unsuited: no sand or gravel.
Augusta, clayey subsoil variant: Au	Fair: limited thickness of suitable material.	Poor: high silt and clay content.
Baile: BaB	Poor: poorly drained	Unsuited: no sand or gravel.
Braddock:		
BcB	Fair: limited thickness of suitable material.	Unsuited: no sand or gravel.
BcC	Fair: slope; limited thickness of suitable material.	Unsuited: no sand or gravel.
BcD2	Poor: slope	Unsuited: no sand or gravel.

See footnote at end of table.

interpretations

more kinds of soil. The soils in such mapping units may have different properties and limitations, and for this referring to other series that appear in the first column of this table]

Suitabliity as source of--Con.	Soil features affecting--		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor: poorly drained.	Seasonal high water table; slow permeability.	Medium to low permeability; medium to low strength; fair to poor compaction.	Slow permeability; poorly drained.
Poor: highly variable material.	Highly variable drainage and permeability; flooding.	Highly variable material.	Subject to flooding.
Good: subject to flooding.	Subject to flooding; high seepage.	High permeability; subject to piping.	Subject to flooding; seldom used for crops or pasture.
Fair to poor: low strength. Fair to good below a depth of 48 inches.	High seepage possible in substratum.	Low permeability; medium to low strength; fair to poor compaction.	Moderately well drained; moderate permeability.
Fair:[1] medium strength.	Deep over water table; permeability moderate in subsoil, moderately rapid in substratum.	Low strength; poor compaction; low permeability.	No drainage needed.
Poor: low strength	Seasonal high water table; moderate permeability; high seepage possible.	Medium to low strength; low permeability; fair to poor compaction.	Somewhat poorly drained; moderate permeability.
Poor: poorly drained; medium to low strength.	Seasonal high water table; moderately slow to slow permeability.	Medium to low strength and permeability; fair compaction; stones.	Moderately slow to slow permeability; poorly drained.
Poor: low strength	Deep to water table; moderate permeability in subsoil; high seepage possible in substratum.	Medium to low strength; low permeability; fair to poor compaction.	No drainage needed.
Poor: low strength	Deep over water table; moderate permeability; moderately sloping.	Medium to low strength; low permeability; fair to poor compaction.	No drainage needed
Poor: low strength	Deep over water table; moderate permeability; moderately steep.	Medium to low strength; low permeability; fair to poor compaction.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Brandywine:		
BdC	Poor: coarse fragments	Poor: excessive silt content.
BdD	Poor: coarse fragments; slope.	Poor: excessive silt content.
BeC	Fair: slope	Unsuited: little sand or gravel.
BeD, BeF	Poor: slope	Unsuited: little sand or gravel.
BnD, BnF	Poor: thin and stony	Unsuited: little sand or gravel.
Bremo:		
BrC	Poor: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
BrE	Poor: limited thickness of suitable material.	Unsuited: little sand or gravel.
Bucks:		
BsB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
BsC2	Fair: slope; limited thickness of suitable material.	Unsuited: little sand or gravel.
Buncombe: Bu	Poor: sandy	Poor: excessive silt content; fair to good locally below a depth of 4½ feet.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Good	Moderately rapid permeability; deep over water table; slope.	High to medium strength; low compressibility; subject to piping.	No drainage needed.
Good	Moderately rapid permeability; deep over water table; slope.	High to medium strength; low compressibility; subject to piping.	No drainage needed.
Fair: excessive silt content.	Moderately rapid permeability; deep over water table: slope.	High piping hazard; medium strength; fair to good compaction.	No drainage needed.
Fair to poor: slope	Moderately rapid permeability; deep over water table; slope.	High piping hazard; medium strength; fair to good compaction.	No drainage needed.
Fair to poor: slope.	Moderately rapid permeability; deep over water table; slope.	High to medium strength; low compressibility; subject to piping.	No drainage needed.
Fair to poor: excessive silt content; limited source.	Moderately rapid to rapid permeability; somewhat excessively drained; moderately deep to bedrock.	High piping hazard; medium to low strength and permeability; fair compaction; limited source.	No drainage needed.
Poor: slope	Moderately rapid to rapid permeability; somewhat excessively drained; moderately deep over bedrock; steep.	High piping hazard; medium to low strength and permeability; limited source.	No drainage needed.
Fair to poor:[1] medium strength.	Moderate permeability; deep over water table; high seepage possible in substratum.	Low permeability; medium to low strength; fair compaction.	No drainage needed.
Fair to poor:[1] medium strength.	Moderate permeability; deep over water table; slope; high seepage possible in substratum.	Low permeability; medium to low strength; fair compaction.	No drainage needed.
Fair: excessive silt content.	Rapid permeability; deep over water table; subject to flooding.	Medium to high piping hazard; low to medium compressibility; medium strength; fair to good compaction.	No drainage needed.

TABLE 6.--*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Calverton: CbB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
Catoctin:		
CcC	Poor: thin layer of suitable material.	Unsuited: little sand or gravel.
CcE	Poor: thin layer of suitable material; slope.	Unsuited: little sand or gravel.
*Cecil:		
CeB, CeB2, CfB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
CeC, CeC2, ChC, ChC2 For Appling part of ChC and ChC2, see Appling series.	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
CeD2	Poor: slope	Unsuited: little sand or gravel.
CgC3	Poor: thin layer of suitable material.	Unsuited: little sand or gravel.
*Chester:		
CkB		
Chester part	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
Brandywine part	Good to fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
CkC, CkC2 For Brandywine part, see Brandywine unit BeC.	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel
CkD For Brandywine part, see Brandywine units BeD, BeF.	Poor: slope	Unsuited: little sand or gravel.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor to fair:[1] excessive silt and clay content.	Seasonal high water table; slow to very slow permeability.	Medium to low strength; medium to low permeability; fair compaction.	Moderately well drained; slow to very slow permeability.
Fair: excessive silt and clay content; limited source.	Moderately rapid permeability; moderately deep to rock; slope.	Limited source; medium to low strength; low permeability; fair compaction.	No drainage needed.
Fair: excessive silt and clay content; limited source.	Moderately rapid permeability; moderately deep to rock; steep.	Limited source; medium to low strength; fair compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table.	Low strength; poor compaction; low permeability.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Low strength; poor compaction; low permeability.	No drainage needed.
Fair:[1] medium strength; slope.	Moderate permeability; deep over water table; moderately steep.	Low strength; poor compaction; low permeability.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Low strength; poor compaction; low permeability.	No drainage needed.
Fair: medium strength.	Moderate permeability; deep over water table.	Medium to low strength and permeability; fair compaction.	No drainage needed.
Fair: excessive silt content.	Moderately rapid permeability; deep over water table.	High piping hazard; medium strength; fair to good compaction.	No drainage needed.
Fair: medium strength.	Moderate permeability; deep over water table; slope.	Medium to low strength and permeability; fair compaction.	No drainage needed.
Fair: medium strength.	Moderate permeability; deep over water table; slope.	Medium to low strength and permeability; fair compaction.	No drainage needed.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Chewacla: Cm	Good	Unsuited: little sand or gravel.
Codorus, cobbly subsoil variant: Cn	Good	Poor: excessive silt content.
Colfax: CoC	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
Colluvial land: Cr, Cu	Poor: stony	Poor: highly variable material.
Congaree: Cv, Cw	Good	Poor: excessive silt content.
Creedmoor: Mapped only with Calverton soils.		
Davidson:		
DaB2	Poor: limited thickness of suitable material.	Unsuited: no sand or gravel.
DaC2	Poor: limited thickness of suitable material; slope.	Unsuited: no sand or gravel.
DaD2	Poor: limited thickness of suitable material; slope.	Unsuited: no sand or gravel.
Dyke:		
DkB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
DkC2	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor: low strength	Moderate permeability; seasonal high water table; flooding.	High piping hazard; medium to low strength; fair to poor compaction; medium to low permeability.	Somewhat poorly drained; moderate permeability.
Poor in upper part: medium strength. Good below a depth of 24 inches.	Excessive permeability in substratum; flooding; seasonal high water table.	Medium to high piping hazard; medium strength; fair compaction.	Moderately well drained to somewhat poorly drained; flooding.
Poor to fair: excessive silt and clay content; somewhat poorly drained to moderately well drained.	Slow permeability; seasonal high water table; slope.	Medium to low strength; low permeability; fair compaction.	Somewhat poorly drained to moderately well drained; fragipan.
Poor: highly variable material.	Stones; variable material.	Highly variable	Very stony to extremely stony; variable drainage.
Fair: medium strength	Moderate permeability; flooding.	Low to medium compressibility; medium strength; fair compaction; high piping hazard.	No drainage needed; flooding.
Fair:[1] medium strength.	Moderate permeability; deep over water table.	Medium to low strength; high compressibility; poor compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Medium to low strength; high compressibility; poor compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; moderately steep.	Medium to low strength; high compressibility; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table.	Low permeability; medium to low strength; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope.	Low permeability; medium to low strength; poor compaction.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
DkE2	Poor: slope	Unsuited: little sand or gravel.
Elbert: Eb	Poor: poorly drained	Unsuited: little sand or gravel.
Elioak:		
ElB, ElB2, EmB, EmB2	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
ElC, ElC2, EmC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
ElD2, EmD2	Poor: slope	Unsuited: little sand or gravel.
EnC3	Poor: limited thickness of suitable material.	Unsuited: little or no sand and gravel.
EnD3	Poor: limited thickness of suitable material; slope.	Unsuited: little or no sand and gravel.
*Eubanks:		
EsB	Poor: coarse fragments	Unsuited: little or no sand and gravel.
EsC, EsC2	Poor: coarse fragments	Unsuited: little or no sand and gravel.
EtB, EyB, EyB2 For Lloyd part of EyB and EyB2, see Lloyd units LfB, LlB, LlB2.	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
EtC2, EyC, EyC2 For Lloyd part of EyC and EyC2, see Lloyd units LfC2, LlC2.	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor: low strength	Moderate permeability; deep over water table; moderately steep to steep.	Low permeability; medium to low strength; poor compaction.	No drainage needed.
Poor: low strength; poorly drained; high shrink swell.	Slow permeability; high water table; depth to rock.	Low permeability; low piping hazard; poor compaction; subject to cracking.	Poorly drained; slow permeability; poor workability.
Fair:[1] medium strength.	Moderate permeability; deep over water table.	Fair to poor compaction; medium to low strength and permeability.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Fair to poor compaction; medium to low strength and permeability.	No drainage needed.
Fair:[1] slope; medium strength.	Moderate permeability; deep over water table; moderately steep.	Fair to poor compaction; medium to low strength and permeability.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; moderately steep.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; high seepage possible in substratum.	Low permeability; good compaction; medium to low strength.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope; high seepage possible in substratum.	Low permeability; good compaction; medium to low strength.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; high seepage likely in substratum.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope; high seepage likely in substratum.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
EtD2, EyD2 For Lloyd part of EyD2, see Lloyd unit LfD2.	Poor: slope	Unsuited: little sand or gravel.
EuC3 For Lloyd part, see Lloyd unit LnC3.	Poor: limited thickness of suitable material.	Unsuited: little sand or gravel.
EuD3, EuE3 For Lloyd part, see Lloyd unit LnD3.	Poor: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
Fauquier:		
FaB, FcB2	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
FcC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
FcD2	Poor: slope	Unsuited: little sand or gravel.
Glenelg:		
GlC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
GlD2	Poor: slope	Unsuited: little sand or gravel.
Hazel:		
HaC	Fair: slope	Unsuited: little sand or gravel.
HaD, HaF	Poor: slope	Unsuited: little sand or gravel.
Hiwassee:		
HsB, HsB2	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Roadfill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor: low strength	Moderate permeability; deep over water table; moderately steep; high seepage likely in substratum.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope; high seepage likely in substratum.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; moderately steep to steep; high seepage likely in substratum.	Medium to low strength and permeability; fair to poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table.	Low strength; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope.	Low strength; poor compaction; low permeability.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; moderately steep.	Low strength; poor compaction; low permeability.	No drainage needed.
Fair: medium strength.	Moderate permeability; deep over water table; slope.	Medium to low strength and permeability; fair compaction.	No drainage needed.
Fair: medium strength; slope.	Moderate permeability; deep over water table; moderately steep.	Low strength and permeability; fair compaction.	No drainage needed.
Fair: medium strength; limited source.	Moderately deep to rock; moderately rapid permeability; slope.	Medium to high piping hazard; medium to low strength and permeability; fair compaction.	No drainage needed.
Poor: slope	Moderately deep to rock; moderately rapid permeability; moderately steep to steep.	Medium to high piping hazard; medium to low strength and permeability; fair compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table.	Low strength; poor compaction; low to medium permeability.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
HsC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
HsD2	Poor: slope	Unsuited: little sand or gravel.
Iredell: IrB	Poor: thin layer of suitable material.	Unsuited: little sand or gravel.
Lewisberry: LeD	Poor: slope	Unsuited: little sand or gravel.
Lloyd:		
LfB, LlB, LlB2	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
LfC2, LlC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
LfD2	Poor: slope	Unsuited: little sand or gravel.
LnC3	Poor: limited thickness of suitable material.	Unsuited: little sand or gravel.
LnD3	Poor: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
Lloyd, thin solum variant:		
LmB2	Poor: limited thickness of suitable material.	Unsuited: no sand or gravel.
LmC2	Poor: limited thickness of suitable material.	Unsuited: no sand or gravel.
LmD2	Poor: limited thickness of suitable material; slope.	Unsuited: no sand or gravel.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Low strength; poor compaction; low to medium permeability.	No drainage needed.
Fair:[1] medium strength; slope.	Moderate permeability; deep over water table; moderately steep.	Low strength; poor compaction; low to medium permeability.	No drainage needed.
Poor: high shrink-swell clay.	Slow permeability; seasonal high water table; depth to rock.	Fair to poor compaction; low piping hazard; low permeability; medium to low strength.	Moderately well drained to somewhat poorly drained; slow permeability; plastic clay.
Fair: medium strength. Poor if slope exceeds 25 percent.	Moderately rapid permeability; deep over water table; moderately steep.	Low permeability; good compaction; medium strength.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; moderately steep.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; moderately steep.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; moderately steep.	Low strength and permeability; poor compaction.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Louisburg:		
LoC	Fair: slope	Poor: excessive silt content.
LoD, LoF	Poor: slope	Poor: excessive silt content.
Made land: Ma. No interpretations. Variable material.		
Manassas: MnB	Good	Unsuited: no sand or gravel.
Manor: MoC	Fair: slope	Unsuited: no sand or gravel.
Mayodan:		
MuB	Fair: limited thickness of suitable material.	Unsuited: no sand or gravel.
MuC2	Fair: limited thickness of suitable material.	Unsuited: no sand or gravel.
Meadowville:		
MvB	Good	Unsuited: no sand or gravel.
MvC	Fair: slope	Unsuited: no sand or gravel.
*Myersville:		
MyC. For Catoctin part, see Catoctin unit CcC.	Poor: very stony	Unsuited: no sand or gravel.
MyD, MyE. For Catoctin part, see Catoctin unit CcE.	Poor: very stony; moderately steep to steep.	Unsuited: no sand or gravel.
Penn:		
PnC	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Good	Rapid permeability; depth to rock; slope.	Medium to high piping hazard; medium strength; fair to good compaction.	No drainage needed.
Fair: slope. Poor if slope exceeds 25 percent.	Rapid permeability; depth to rock; moderately steep.	Medium to high piping hazard; medium strength; fair to good compaction.	No drainage needed.
Fair: medium strength.	Seasonal high water table; moderate permeability; depth to rock.	Fair compaction; medium to low strength and permeability.	Well drained to moderately well drained.
Poor to fair: excessive silt content and mica.	Excessive seepage in substratum; deep over water table.	Medium to low strength; high piping hazard; fair compaction.	No drainage needed.
Poor: excessive silt and clay content.	Moderate permeability; deep over water table.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: excessive silt and clay content.	Moderate permeability; deep over water table; slope.	Low strength and permeability; poor compaction.	No drainage needed.
Poor: low strength	Moderate permeability; seasonal high water table.	Low strength and permeability; poor compaction.	Well drained to moderately well drained.
Poor: low strength	Moderate permeability; seasonal high water table; slope.	Low strength and permeability; poor compaction.	Well drained to moderately well drained.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope.	Low to medium strength and permeability; fair compaction.	No drainage needed.
Fair to poor: slope	Moderate permeability; deep over water table; moderately steep to steep.	Low to medium strength and permeability; fair compaction.	No drainage needed.
Poor to fair: excessive silt content.	Moderate to moderately rapid permeability; deep over water table; slope.	Low to medium piping hazard; low to medium strength; limited source.	No drainage needed.

TABLE 6.–*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
PnD	Poor: slope	Unsuited: little sand or gravel.
Porters:		
PoC	Poor: very stony.	Unsuited: no sand or gravel.
PoD, PoF	Poor: very stony; slope	Unsuited: no sand or gravel.
Rapidan:		
RdB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
ReC2	Poor: limited thickness of suitable material.	Unsuited: little sand or gravel.
Riverwash: Rh	Poor: cobbly and stony	Fair: variable size of gravel and cobbles.
Roanoke: Rk	Poor: poorly drained	Unsuited: little sand or gravel.
*Rock land:		
Rn, Ro	Poor: rocky	Unsuited: little sand or gravel.
RrD, RrE For Myersville part, see Myersville series; for Catoctin part, see Catoctin series.	Poor: rocky; slope	Unsuited: little sand or gravel.
RtD, RtE For Porters part, see Porters series; for Hazel part, see Hazel series.	Poor: rocky; slope	Unsuited: little sand or gravel.
Rock outcrop: Ru	Poor: rocky	Unsuited: little sand or gravel.
Starr: SrC	Fair: limited thickness of suitable material.	Unsuited: no sand or gravel.
Thurmont: Mapped only with Braddock soils.		

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Roadfill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor to fair: excessive silt content; slope; limited source.	Moderate to moderately rapid permeability; deep over water table; moderately steep.	Low to medium piping hazard; low to medium strength; limited source.	No drainage needed.
Poor to fair: excessive silt and clay content.	Moderately rapid permeability; deep over water table; slope.	Medium to low strength; low to medium compressibility; good compaction.	No drainage needed.
Poor: slope	Moderately rapid permeability; deep over water table; moderately steep to steep.	Medium to low strength; low to medium compressibility; good compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; depth to rock in places.	Low to medium permeability; low strength; poor compaction.	No drainage needed.
Fair:[1] medium strength.	Moderate permeability; deep over water table; slope; depth to rock in places.	Low to medium permeability; low strength; poor compaction.	No drainage needed.
Good: coarse material; variable silt and clay content.	Subject to frequent flooding.	High permeability and strength; good compaction.	Variable drainage; subject to flooding.
Poor: poorly drained; low strength.	Slow permeability; high water table; nearly level.	Low strength and permeability; poor compaction.	Poorly drained.
Poor: rock outcrop	Shallow over rock	Shallow over rock	Shallow over rock; no drainage needed.
Poor: rocky; moderately steep to steep.	Generally shallow over rock; moderately steep to steep.	Generally shallow over rock.	Generally shallow over rock; no drainage needed.
Poor: rocky; moderately steep to steep.	Generally shallow over rock; moderately steep to steep.	Generally shallow over rock.	Generally shallow over rock; no drainage needed.
Poor: rocky	Rock outcrop	No source	Rock outcrop.
Poor: excessive silt and clay content.	Moderately rapid permeability; deep over water table; slope.	Low strength and permeability; poor compaction.	No drainage needed.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Trego: TrC	Fair: limited thickness of material; slope.	Unsuited: little sand or gravel.
Tusquitee:		
TuB	Good: some stones	Unsuited: little sand or gravel.
TuC	Fair: slope	Unsuited: little sand or gravel.
TuD, TuE	Poor: slope	Unsuited: little sand or gravel.
Unison:		
UnB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
UnC	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel.
UnD	Poor: slope	Unsuited: little sand or gravel.
UsC, UsD	Poor: very stony	Unsuited: little sand or gravel.
Watt:		
WaC	Poor: coarse fragments	Unsuited: little sand or gravel.
WaE	Poor: coarse fragments; slope.	Unsuited: little sand or gravel.
Wehadkee: We	Poor: poorly drained	Unsuited: little sand or gravel; may be fair locally.

See footnote at end of table.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Fair: limited strength.	Slow permeability; excessive seepage in substratum; seasonal high water table; slope.	Low to medium compressibility; medium to low permeability; fair compaction.	Moderately well drained.
Fair: limited strength.	Moderately rapid permeability; deep over water table.	Low to medium strength; low permeability; fair compaction.	No drainage needed.
Fair: limited strength.	Moderately rapid permeability; deep over water table; slope.	Low to medium strength; low permeability; fair compaction.	No drainage needed.
Poor: slope	Moderately rapid permeability; deep over water table; moderately steep to steep.	Low to medium strength; low permeability; fair compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; excessive seepage possible.	Medium to low strength; poor compaction; low permeability.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table; slope; excessive seepage possible.	Medium to low strength; poor compaction; low permeability.	No drainage needed.
Poor: low strength; slope.	Moderate permeability; deep over water table; moderately steep to steep; excessive seepage possible.	Medium to low strength; poor compaction; low permeability.	No drainage needed.
Poor: low strength	Sloping to moderately steep; very stony; excessive seepage in substratum likely.	Very stony; sloping to moderately steep; poor compaction.	No drainage needed.
Fair to poor: excessive silt content; limited source.	Moderately deep to rock; moderate to moderately rapid permeability; slope.	Fair to poor compaction; medium to low permeability; low strength.	No drainage needed.
Poor: slope	Moderately deep to rock; moderate to moderately rapid permeability; steep.	Fair to poor compaction; medium to low permeability; low strength.	No drainage needed.
Poor: poorly drained.	Moderate permeability; high water table; flooding.	High piping hazard; medium to low strength; fair compaction.	Poorly drained; subject to flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of–	
	Topsoil	Sand and gravel
Wickham, clayey subsoil variant:		
WhB	Fair: limited thickness of suitable material.	Unsuited: little or no sand or gravel; may be fair locally.
WhC2	Fair: limited thickness of suitable material; slope.	Unsuited: little sand or gravel; may be fair locally.
Worsham: WmB	Poor: poorly drained	Unsuited: little sand or gravel.
Zion:		
ZoB	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.
ZoC	Fair: limited thickness of suitable material.	Unsuited: little sand or gravel.

[1] Available test data indicates a high AASHO subgroup rating in the subsoil.

interpretations–Continued

Suitability as source of–Con.	Soil features affecting–		
Road fill	Pond reservoir areas	Embankments and dikes	Drainage for crops and pasture
Poor: low strength	Moderate permeability; deep over water table.	Medium to low strength; low permeability; fair compaction.	No drainage needed.
Poor: low strength	Moderate permeability; deep over water table.	Medium to low strength; low permeability; fair compaction.	No drainage needed.
Poor: poorly drained	Slow permeability; seasonal high water table.	Low permeability; fair to good compaction; medium to low strength.	Poorly drained.
Poor: low strength; limited source.	Seasonal high water table; moderately slow to slow permeability; limited depth to rock.	Low strength; poor compaction; low permeability.	Well drained to moderately well drained.
Poor: low strength; limited source.	High water table; moderately slow to slow permeability; slope; limited depth to rock.	Low strength; poor compaction; low permeability.	Well drained to moderately well drained.

549-665 O - 75 - 8

TABLE 7.–*Engineering*

[Tests performed by the Virginia Department of Highways in cooperation with the U.S. Department of Commerce, Bureau of

Soil name and location	Virginia report number SO–	Depth	Horizon	Moisture density[1]		Mechanical analysis[2]					
				Maximum dry density	Optimum moisture	Percentage passing sieve–					
						2-in	1½-in	1-in	¾-in	3/8-in	No. 4 (4.7 mm)
		Inches		*Lb/cu ft*	*Percent*						
Brandywine loam:											
1.25 miles east of Decapolis and	48839	0-12	Ap ---	112	16	---	---	---	---	100	99
300 feet southeast of junction of	48840	12-22	C1 - - -	104	18	---	---	---	---	---	100
Routes 604 and 640.	48841	22-72	C2 ---	102	19	---	---	---	---	---	---
Cecil fine sandy loam:											
2 miles northwest of Brightwood on	48862	1-10	A2 ---	115	13	---	100	98	98	97	96
west side of Route 639.	48863	14-29	B21t- -	102	21	---	---	---	100	99	98
	48864	29-40	B22t- -	93	26	---	---	---	---	---	---
	48865	51-92	C ----	103	19	---	---	---	---	---	100
Elioak loam:											
3 miles northwest of Novum, 1.25	48853	1-9	A2 ---	105	19	---	---	---	---	---	100
miles north of Route 606, and	48854	13-28	B2t- - -	96	25	---	---	---	---	---	100
300 yards west of Route 604.	48855	38-93	C ----	99	23	---	---	---	---	---	---
Elioak fine sandy loam:											
1 mile north of Aroda on west	48850	1-7	A2 ---	116	12	---	---	100	99	99	99
side of Route 616.	48851	11-30	B2t- - -	89	29	---	---	---	---	---	---
	48852	42-85	C ----	103	20	---	---	---	---	---	---
Eubanks loam:											
2 miles southwest of Hood and 100	48859	0-8	Ap ---	108	16	---	---	---	100	98	97
yards southwest of Route 666	48860	12-29	B2t- - -	97	23	---	---	---	---	---	100
on east side of Route 230.	48861	39-75	C1 ---	104	18	---	---	---	---	---	100
Lloyd loam:											
3 miles south of Madison and 50 yards	48846	0-9	Ap ---	110	16	---	---	---	---	---	100
west of Route 29 on south side of	48847	9-22	B21t- -	97	25	---	---	---	---	---	---
Route 230.	48848	22-40	B22t- -	91	29	---	---	---	---	---	100
	48849	49-88	C ----	96	24	---	---	---	---	---	---
Meadowville loam:											
0.25 mile east of Decapolis on north	48856	0-14	Ap ---	99	22	---	---	---	---	---	---
side of Route 604.	48857	22-41	B2t- - -	95	26	---	---	---	---	---	---
	48858	53-77	IIB3t- -	97	24	---	---	---	---	---	---
Rapidan silt loam:											
1,200 feet north of Highway 230 and	48836	0-9	Ap ---	107	18	---	---	---	---	---	100
1,000 feet northeast of brick	48837	9-25	B2t- - -	98	25	---	---	---	---	---	---
house on Rosni Farm.	48838	36-69	C ----	94	28	---	---	---	---	---	100
Tusquitee stony loam:											
4 miles west of Graves Mill and 100	48833	1-10	A2 ---	98	23	---	---	100	99	96	94
feet north of Route 615.	48834	15-30	B2t- - -	108	20	---	100	98	95	94	93
	48835	30-42	B3t- - -	107	20	---	---	---	100	99	98

See footnotes at end of table.

test data

Public Roads, in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analysis[2]–Cont'd.								Liquid limit	Plasticity index	Classification	
Percentage passing sieve–Cont'd.				Percentage smaller than–							
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHO[3]	Unified[4]
97	81	73	56	37	24	13	9	27	[5]NP	A-4(4)	ML.
99	82	72	38	24	12	4	2	29	NP	A-4(1)	SM.
100	79	67	31	19	8	1	2	32	NP	A-2-4(0)	SM.
94	82	72	53	45	34	17	9	23	4	A-4(4)	ML-CL.
97	90	84	72	67	62	53	46	54	25	A-7-6(17)	MH-CH.
100	93	88	77	73	64	56	52	59	16	A-7-5(15)	MH.
99	84	76	55	48	37	27	23	43	7	A-5(5)	ML.
99	97	96	87	75	55	33	22	33	8	A-4(8)	ML-CL.
99	98	97	90	78	67	52	44	57	19	A-7-5(15)	MH.
100	99	99	90	76	57	35	24	47	12	A-7-5(10)	ML.
99	95	87	50	38	29	15	10	19	NP	A-4(3)	SM.
100	98	95	81	78	70	61	55	70	29	A-7-5(20)	MH.
100	95	87	57	50	35	25	22	42	9	A-5(4)	ML.
96	83	78	62	54	42	24	14	32	8	A-4(5)	ML-CL.
99	88	85	77	70	62	51	43	62	24	A-7-5(18)	MH.
99	81	74	59	50	29	14	10	39	NP	A-4(5)	ML.
99	96	94	85	78	72	64	60	28	8	A-4(8)	CL.
100	97	95	85	78	72	61	54	60	29	A-7-5(20)	MH-CH.
99	93	88	69	61	48	29	19	63	18	A-7-5(13)	MH.
100	98	96	71	63	48	32	28	48	7	A-5(7)	ML.
100	96	91	75	58	39	18	9	39	10	A-4(8)	ML.
100	98	96	84	77	66	47	37	55	18	A-7-5(14)	MH.
100	91	83	55	42	32	21	17	39	NP	A-4(4)	ML.
98	87	83	74	65	53	31	20	39	5	A-4(8)	ML.
100	95	93	88	86	79	66	57	62	32	A-7-5(20)	MH-CH.
99	90	86	76	64	52	37	31	56	17	A-7-5(14)	MH.
92	79	73	60	53	41	24	13	40	8	A-4(5)	ML.
90	77	70	59	52	42	29	18	36	9	A-4(5)	ML.
95	80	72	59	51	44	29	19	35	7	A-4(5)	ML.

TABLE 7 —*Engineering*

Soil name and location	Virginia report number SO–	Depth	Horizon	Moisture density[1]		Mechanical analysis[2]					
				Maximum dry density	Optimum moisture	Percentage passing sieve–					
						2-in	1½-in	1-in	3/4-in	3/8-in	No. 4 (4.7 mm)
		Inches		*Lb/cu ft*	*Percent*						
Unison loam:											
1.5 miles north of Graves Mill and	48842	0-9	Ap ---	107	18	---	---	---	---	---	100
100 yards south of tenant house.	48843	12-33	B21t--	106	19	100	98	98	98	97	96
	48844	33-50	B22t--	106	18	---	---	---	---	---	100
	48845	50-72	C ----	106	20	---	---	---	---	---	---

[1] Based on AASHO Designation: T 99-57, Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88-57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

test data–Continued

Mechanical analysis[2]–Cont'd.								Liquid limit	Plasticity index	Classification	
Percentage passing sieve–Cont'd.				Percentage smaller than–							
No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 60 (0.25 mm)	No. 200 (0.074 mm)	0.05 mm	0.02 mm	0.005 mm	0.002 mm			AASHO[3]	Unified[4]
98	85	78	68	58	48	25	13	36	13	A-6(8)	ML-CL.
94	80	73	65	61	57	45	38	46	18	A-7-6(10)	ML-CL.
99	86	78	66	64	59	49	45	44	17	A-7-6(10)	ML-CL.
100	88	80	77	72	54	45	39	43	13	A-7-5(10)	ML.

[3] Based on AASHO Designation: M 145-49 (*1*).

[4] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given to a borderline classification. Examples of borderline classifications obtained by this use are MH-CH and ML-CL.

[5] Nonplastic.

TABLE 8.--*Degree and kind of limitation to*

[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 to other series that appear in

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Albano: Ab	Severe: seasonal high water table; slow permeability.	Moderate: bedrock at a depth of 3½ to 5 feet.	Severe: seasonal high water table; poorly drained.	Severe: seasonal high water table; poorly drained.
Alluvial land:				
Ac	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.
Ad	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.
Altavista, clayey subsoil variant:				
AlA	Severe:[1] seasonal high water table.	Moderate: moderate permeability; seasonal high water table.	Moderate: seasonal high water table; moderately well drained; moderate shrink swell; excessive silt and clay content.	Moderate: seasonal high water table; moderate shrink swell; excessive silt and clay content.
AlB	Severe:[1] seasonal high water table.	Moderate: moderate permeability; seasonal high water table; slope.	Moderate: seasonal high water table; moderately well drained; moderate shrink swell; excessive silt and clay content.	Moderate: seasonal high water table; excessive silt and clay content.
Appling:				
ApB, ArB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
ApC	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
ApD2	Moderate: moderate permeability; slope.	Severe: slope	Moderate to severe:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
Augusta, clayey subsoil variant:				
Au	Severe: seasonal high water table.	Slight	Severe: seasonal high water table; somewhat poorly drained; excessive clay content.	Severe: seasonal high water table; excessive clay content.
Baile: BaB	Severe: seasonal high water table; moderately slow to slow permeability.	Moderate: depth to bedrock.	Severe: seasonal high water table.	Severe: seasonal high water table.

See footnotes at end of table.

be considered in town and country planning

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

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Severe: poorly drained.	Severe: poorly drained; depth to rock.	Severe: hard rock at depth of 3½ to 5 feet; seasonal high water table.	Severe: poorly drained; slow permeability.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.
Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.
Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.
Moderate: seasonal high water table; moderate shrink swell; excessive silt and clay content.	Moderate: seasonal high water table; moderately well drained.	Severe: permeable substratum.	Moderate: wet early in spring.	Moderate: seasonal high water table.	Moderate to severe: seasonal high water table.	Moderate: seasonal high water table.
Moderate: seasonal high water table; moderate shrink swell; excessive silt and clay content.	Moderate: seasonal high water table.	Severe: permeable substratum.	Moderate: wet in spring.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.
Moderate: excessive clay content; moderate shrink swell.	Moderate: clayey subsoil.	Moderate:[3] clayey subsoil.	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: clayey subsoil.	Moderate:[3] slope; clayey subsoil.	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: slope; clayey subsoil.	Moderate: slope; clayey subsoil.	Moderate: slope; thin surface layer.	Moderate: slope. .	Severe: slope . . .	Moderate: slope.
Severe: seasonal high water table; excessive clay content.	Moderate: seasonal high water table.	Severe: clayey subsoil.	Moderate to severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.	Moderate: seasonal high water table.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; depth to rock.	Severe: seasonal high water table; stones.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Braddock:				
BcB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
BcC	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
BcD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Brandywine:				
BdC, BeC	Moderate: slope; hard rock at a depth of 4 feet in places.	Severe: moderately rapid permeability; rock at a depth of 4 feet in places.	Moderate: bedrock at a depth of 4 feet.	Moderate: slope
BdD, BeD, BeF, BnD, BnF	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Bremo:				
BrC	Severe: bedrock at a depth of 1½ to 3 feet.	Severe: rock at a depth of 1½ to 3 feet; slope	Severe: rock at a depth of 1½ to 3 feet.	Severe: rock at a depth of 1½ to 3 feet.
BrE	Severe: bedrock at a depth of 1½ to 3 feet; slope.	Severe: rock at a depth of 1½ to 3 feet; slope	Severe: rock at a depth of 1½ to 3 feet; slope.	Severe: rock at a depth of 1½ to 3 feet; slope.
Bucks:				
BsB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive silt content; moderate shrink swell.	Moderate:[2] excessive silt content; moderate shrink swell.
BsC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; moderate shrink swell.	Moderate:[2] slope; moderate shrink swell.
Buncombe: Bu	Severe: frequent flooding.	Severe: frequent flooding; rapid permeability.	Severe: frequent flooding.	Severe: frequent flooding.
Calverton: CbB	Severe: slow or very slow permeability; seasonal high water table.	Moderate: slope	Severe: seasonal high water table; Creedmoor has high shrink swell.	Severe: seasonal high water table; Creedmoor has high shrink swell.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Severe: excessive clay content.	Severe: clayey subsoil.	Moderate:[3] clayey subsoil.	Slight	Slight	Moderate: slope .	Slight.
Severe: excessive clay content.	Severe: clayey subsoil.	Moderate:[3] clayey subsoil	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope; excessive clay content.	Severe: slope; clayey subsoil.	Severe:[3] slope	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope . . .	Moderate: slope; bedrock at a depth of 4 feet in places.	Severe: bedrock at a depth of 4 feet; moderately rapid permeability.	Severe: droughty.	Moderate: slope; BdC is gravelly.	Severe: slope; BdC is gravelly.	Moderate: slope; BdC is gravelly.
Severe: slope	Severe: slope	Severe: slope; bedrock at a depth of 4 feet.	Severe: slope; droughty.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: rock at a depth of 1½ to 3 feet.	Severe: rock at a depth of 1½ to 3 feet.	Severe: rock at a depth of 1½ to 3 feet; droughty.	Severe: rock at a depth of 1½ to 3 feet; droughty.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: rock at a depth of 1½ to 3 feet; slope.	Severe: rock at a depth of 1½ to 3 feet; slope.	Severe: rock at a depth of 1½ to 3 feet; slope; droughty.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive silt content; moderate shrink swell.	Slight	Slight[3]	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive silt content; moderate shrink swell.	Moderate: slope	Slight[3]	Moderate: slope .	Moderate: slope . .	Severe: slope	Moderate: slope.
Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.	Severe: frequent flooding.
Severe: excessive silt and clay content; Creedmoor has high shrink swell.	Severe: seasonal high water table; Creedmoor has clayey subsoil; Calverton has a fragipan.	Severe: Creedmoor has clayey subsoil; Calverton has a fragipan.	Moderate to severe: seasonal high water table at a depth of 1 foot to 1½ feet.	Moderate to severe: seasonal high water table at a depth of 1 foot to 1½ feet; slow to very slow permeability.	Severe: seasonal high water table; slow to very slow permeability.	Moderate: seasonal high water table at a depth of 1 foot to 1½ feet.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Catoctin:				
CcC	Severe: bedrock at a depth of 1½ to 3 feet.	Severe: bedrock at a depth of 1½ to 3 feet; slope.	Severe: bedrock at a depth of 1½ to 3 feet.	Moderate: rock at a depth of 1½ to 3 feet; slope.
CcE	Severe: bedrock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.
Cecil:				
CeB, CeB2, CfB	Moderate: moderate permeability.	Moderate: slope; moderate permeability.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
CeC, CeC2, ChC, ChC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
CeD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
CgC3	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
*Chester:				
CkB—				
Chester part	Slight	Moderate: slope	Slight	Slight
Brandywine part	Moderate: hard rock at a depth of 4 feet in places.	Severe: moderately rapid permeability.	Moderate: bedrock at a depth of 4 feet in places.	Slight
CkC, CkC2 For Brandywine part, see units BdC, BeC.	Moderate: slope	Severe: slope	Moderate: slope	Moderate: slope
CkD For Brandywine part, see units BdD, BeD, BeF, BnD, BnF.	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Chewacla: Cm	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding.
Codorus, cobbly subsoil variant: Cn	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: bedrock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet; droughty.	Moderate: slope	Severe: slope . . .	Moderate: slope.
Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive clay content; moderate shrink swell.	Moderate: clayey subsoil.	Moderate:[3] clayey subsoil.	Slight	Slight	Moderate	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: clayey subsoil; slope.	Moderate: clayey subsoil.	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope; clayey subsoil.	Severe: slope. . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: slope; clayey subsoil.	Moderate: slope; clayey subsoil.	Severe: slope; clay loam surface layer.	Moderate: slope; clay loam surface layer.	Severe: slope . . .	Moderate: slope; clay loam surface layer.
Moderate: excessive silt content.	Slight	Slight[3]	Slight	Slight	Moderate: slope .	Slight.
Slight	Moderate: bedrock at a depth of 4 feet in places.	Severe: moderately rapid permeability; bedrock at a depth of 4 feet in places.	Severe: droughty .	Slight	Moderate: slope .	Slight.
Moderate: slope	Moderate: slope	Slight[3]	Moderate: slope . .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate:[3] slope. . . .	Severe: slope; droughty.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding;seasonal water table.	Severe: frequent flooding;seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding;seasonal high water table.
Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding;seasonal high water table.	Severe: frequent flooding;seasonal high water table.	Severe: frequent flooding; seasonal high water table.	Severe: frequent flooding;seasonal high water table.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Colfax: CoC	Severe: slow permeability; fragipan; seasonal high water table.	Moderate: slope	Severe: seasonal high water table; fragipan.	Severe: seasonal high water table.
Colluvial land: Cr, Cu	Severe: stones; slope.	Severe: stones; slope.	Moderate to severe: stones; slope.	Moderate for Cr: stones; slope. Severe for Cu: stones; slope.
Congaree: Cv, Cw	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.	Severe: infrequent flooding.
Creedmoor. Mapped only with Calverton soil.				
Davidson:				
DaB2	Slight	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
DaC2	Moderate: slope	Severe: slope	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
DaD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Dyke:				
DkB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate: excessive clay content; moderate shrink swell.	Moderate: excessive clay content; moderate shrink swell.
DkC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: slope; excessive clay content; moderate shrink swell.
DkE2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Elbert: Eb	Severe: slow permeability; seasonal high water table.	Moderate: hard rock at a depth of 3½ to 6 feet.	Severe: seasonal high water table; plastic clay.	Severe: seasonal high water table; plastic clay.
Elioak:				
ElB, ElB2, EmB, EmB2	Moderate: moderate permeability.	Moderate: moderate permeability.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
ElC, ElC2, EmC2	Moderate: slope; moderate permeability.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
ElD2, EmD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: seasonal high water table.	Moderate to severe: seasonal high water table.	Moderate: seasonal high water table.	Severe: seasonal high water table.	Severe: slow permeability; seasonal high water table.	Severe: slow permeability; seasonal high water table; slope.	Moderate: slow permeability; seasonal high water table.
Severe: stones; slope.	Severe: stones; slope.	Severe: stones; slope.	Severe: stones; slope.	Moderate for Cr: stones; slope. Severe for Cu: stones; slope.	Severe: stones; slope. .	Moderate for Cr: stones; slope Severe for CU: stones; slope.
Severe: infrequent flooding.	Severe: infrequent flooding; seasonal high water table.	Severe: infrequent flooding; seasonal high water table.	Slight to moderate: infrequent flooding.	Severe: flooding .	Moderate to severe: infrequent flooding.	Slight to moderate: infrequent flooding.
Moderate: excessive clay content; moderate shrink swell.	Moderate: clay subsoil.	Severe: clay subsoil.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: slope; clay loam surface layer.	Moderate: clay loam surface layer.
Moderate: excessive clay content; moderate shrink swell.	Moderate: slope; clay subsoil.	Severe: clay subsoil.	Moderate: slope; clay loam surface layer.	Moderate: slope; clay loam surface layer.	Severe: slope . . .	Moderate: slope; clay loam surface layer.
Severe: slope	Severe: slope	Severe: clay subsoil.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive clay content; moderate shrink swell.	Severe: sticky clay . .	Severe: sticky clay . .	Slight	Slight	Moderate: slope .	Slight.
Moderate: excessive clay content; moderate shrink swell.	Severe: sticky clay . .	Severe: sticky clay . .	Moderate: slope; thin surface layer.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: sticky clay; slope.	Severe: sticky clay . .	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Severe: seasonal high water table; plastic clay.	Severe: seasonal high water table; plastic clay.	Severe: seasonal high water table; plastic clay.	Severe: seasonal high water table; plastic clay.	Severe: seasonal high water table.	Severe: seasonal high water table; plastic clay; slow permeability.	Severe: poorly drained plastic clay; seasonal high water table.
Moderate: excessive clay content; moderate shrink swell.	Moderate: texture. . .	Moderate:[3] clayey subsoil.	Slight	Slight	Moderate: slope .	Slight.
Moderate: excessive clay content; moderate shrink swell.	Moderate: slope; texture.	Moderate:[3] clayey subsoil.	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate:[3] slope; clayey subsoil.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
EnC3	Moderate: slope; moderate permeability.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
EnD3	Severe: slope	Severe: slope	Severe: slope	Severe: slope
*Eubanks:				
EsB, EtB, EyB, EyB2. For Lloyd part of EyB, EyB2, see Lloyd units LfB, LlB, LlB2.	Slight	Severe: permeable substratum.	Moderate:[2] excessive silt and clay content; moderate shrink swell.	Moderate:[2] excessive silt and clay content; moderate shrink swell.
EsC, EsC2, EtC2, EyC, EyC2. For Lloyd part of EyC, EyC2, see Lloyd units LlB, LlB, LlB2.	Moderate: slope	Severe: slope; permeable substratum.	Moderate:[2] excessive silt and clay content; moderate shrink swell; slope.	Moderate:[2] slope; excessive silt and clay content; moderate shrink swell.
EtD2, EyD2. For Lloyd part of EyD2, see Lloyd unit LfD2.	Severe: slope	Severe: slope; permeable substratum.	Severe: slope	Severe: slope
EuC3. For Lloyd part, see Lloyd unit LnC3.	Moderate: slope	Severe: slope; permeable substratum.	Moderate:[2] slope; excessive silt and clay content; moderate shrink swell.	Moderate:[2] slope; excessive silt and clay content; moderate shrink swell.
EuD3, EuE3. For Lloyd part, see Lloyd unit LnD3.	Severe: slope	Severe: slope; permeable substratum.	Severe: slope	Severe: slope
Fauquier:				
FaB	Moderate: moderate permeability; rock at a depth of 3½ to 5 feet.	Moderate: moderate permeability; slope; depth to rock.	Moderate:[2] hard rock at a depth of 3½ to 5 feet; excessive silt and clay content; moderate shrink swell.	Moderate:[2] excessive silt and clay content; moderate shrink swell.
FcB2	Moderate: moderate permeability; rock at a depth of 3½ to 5 feet.	Moderate: moderate permeability; slope; depth to rock.	Moderate:[2] hard rock at a depth of 3½ to 5 feet; excessive silt and clay content; moderate shrink swell.	Moderate:[2] excessive silt and clay content; moderate shrink swell
FcC2	Moderate: moderate permeability; rock at a depth of 3½ to 5 feet; slope.	Severe: slope	Moderate:[2] rock at a depth of 3½ to 5 feet; slope; excessive silt and clay content; moderate shrink swell.	Moderate:[2] slope; excessive silt and clay content; moderate shrink swell.
FcD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: excessive clay content; moderate shrink swell.	Moderate: slope; texture.	Moderate:[3] clayey subsoil.	Moderate: slope; silty clay loam texture.	Moderate: slope; surface texture.	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate:[3] slope; clayey subsoil.	Severe: slope; silty clay loam surface layer.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive silt and clay content; moderate shrink swell.	Moderate: texture. . .	Severe: permeable substratum.	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive silt and clay content; moderate shrink swell.	Moderate: texture; slope.	Severe: permeable substratum.	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Severe: permeable substratum.	Severe: slope; thin surface layer.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; excessive silt and clay content; moderate shrink swell.	Moderate: slope; texture.	Severe: permeable substratum.	Moderate: slope; clay loam surface layer.	Moderate: slope; clay loam surface layer.	Severe: slope . . .	Moderate: slope; clay loam surface layer.
Severe: slope	Severe: slope	Severe: slope; permeable substratum.	Severe: slope; clay loam surface layer.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive silt and clay content; moderate shrink swell.	Moderate: hard rock at a depth of 3½ to 5 feet; clayey subsoil.	Severe: hard rock at a depth of 3½ to 5 feet.	Slight	Slight	Moderate: slope .	Slight.
Moderate: excessive silt and clay content; moderate shrink swell.	Moderate: hard rock at a depth of 3½ to 5 feet; clayey subsoil.	Severe: hard rock at a depth of 3½ to 5 feet.	Moderate: silty clay loam surface layer.	Slight	Moderate: slope; silty clay loam surface layer.	Slight.
Moderate: excessive silt and clay content; moderate shrink swell.	Moderate: slope; rock at a depth of 3½ to 5 feet; clayey subsoil.	Severe: hard rock at a depth of 3½ to 5 feet.	Moderate: slope; silty clay loam surface layer.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Severe: hard rock at a depth of 3½ to 5 feet.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Glenelg:				
GlC2	Moderate: slope	Severe: slope	Moderate: slope; excessive silt content.	Moderate: slope; excessive silt content.
GlD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Hazel:				
HaC	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet.	Moderate: hard rock at a depth of 1½ to 3 feet; slope.
HaD, HaF	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: slope
Hiwassee:				
HsB, HsB2	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
HsC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
HsD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Iredell:				
IrB	Severe: slow permeability; depth to rock.	Moderate: slope; depth to rock.	Severe: plastic clay; high shrink swell; excessive clay content.	Severe: plastic clay; high shrink swell; excessive clay content.
Lewisberry:				
LeD	Severe: depth to rock; slope.	Severe: slope; moderately rapid permeability.	Moderate to severe: bedrock at a depth of 2 to 5 feet; slope.	Moderate to severe: slope; bedrock at a depth of 2 to 5 feet.
Lloyd:				
LfB, LlB, LlB2	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
LfC2, LlC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.
LfD2	Severe: slope	Severe: slope	Severe: slope	Severe: slope
LnC3	Moderate: slope; moderate permeability.	Severe: slope	Moderate:[2] slope; excessive clay content; moderate shrink swell.	Moderate:[2] slope; excessive clay content; moderate shrink swell.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: excessive silt content; slope.	Moderate: slope	Slight[3]	Moderate: slope . .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate:[3] slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: hard rock at a depth of 1½ to 3 feet.	Moderate: slope is 7 to 15 percent; droughty.	Moderate: slope .	Severe: slope; hard rock at a depth of 1½ to 3 feet.	Moderate: slope.
Severe: hard rock at a depth of 1½ to 3 feet; slope.	Severe: hard rock at a depth of 1½ to 3 feet.	Severe: slope; hard rock at a depth of 1½ to 3 feet.	Severe: slope is 15 to 25 percent; droughty.	Severe: slope . . .	Severe: slope; hard rock at a depth of 1½ to 3 feet.	Severe: slope.
Moderate: excessive clay content; moderate shrink swell.	Severe: sticky clay subsoil.	Severe: sticky clay . .	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Severe: slope; sticky clay subsoil.	Severe: sticky clay . .	Moderate: slope; thin surface layer.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope; sticky clay subsoil.	Severe: sticky clay . .	Severe: slope is 15 to 25 percent; thin surface layer.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Severe: plastic clay; high shrink swell.	Severe: very plastic clay.	Severe: seasonal high water table; very plastic clay; depth to rock.	Severe: seasonal high water table; plastic clay subsoil.	Severe: slow permeability.	Severe: slow permeability; high shrink swell; clay.	Moderate: slow permeability.
Moderate to severe: slope.	Severe: bedrock at a depth of 2 to 5 feet.	Severe: bedrock at a depth of 2 to 5 feet.	Severe: slope; droughty.	Moderate to severe: slope.	Severe: slope . . .	Moderate to severe: slope.
Moderate: excessive clay content; moderate shrink swell.	Moderate: clay subsoil.	Moderate: clay subsoil.	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: slope; clay subsoil.	Moderate: clay subsoil.	Moderate: slope; thin surface layer.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Moderate: slope; clay subsoil.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive clay content; slope; moderate shrink swell.	Moderate: slope; clay subsoil.	Moderate: clay subsoil.	Moderate: clay loam surface layer; slope.	Moderate: slope; clay loam surface layer.	Severe: slope . . .	Moderate: slope; clay loam surface layer.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
LnD3	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Lloyd, thin solum variant:				
LmB2	Slight	Severe: permeable substratum.	Slight	Slight
LmC2	Moderate: slope	Severe: permeable substratum; slope.	Moderate: slope	Moderate: slope
LmD2	Severe: slope	Severe: permeable substratum; slope.	Severe: slope	Severe: slope
Louisburg:				
LoC	Severe: hard rock at a depth of 2 to 3½ feet.	Severe: hard rock at a depth of 2 to 3½ feet; slope.	Severe: hard rock at a depth of 2 to 3½ feet.	Moderate: slope
LoD, LoF	Severe: hard rock at a depth of 2 to 3½ feet; slope.	Severe: hard rock at a depth of 2 to 3½ feet; slope.	Severe: hard rock at a depth of 2 to 3½ feet; slope.	Severe: slope
Made land: Ma. Properties are too variable to rate.				
Manassas: MnB	Severe: seasonal high water table; runoff from higher lying soils.	Moderate: slope; moderate permeability.	Severe: seasonal high water table; seepage from adjacent slopes.	Moderate: seasonal high water table; moderate shrink-swell.
Manor: MoC	Moderate to severe: slope.	Severe: moderate to moderately rapid permeability; slope.	Moderate: slope	Moderate: slope
Mayodan:				
MuB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate:[2] excessive clay content; moderate shrink swell.	Moderate:[2] excessive clay content; moderate shrink swell.
MuC2	Moderate: moderate permeability; slope.	Severe: slope	Moderate:[2] slope; moderate shrink swell.	Moderate:[2] slope; moderate shrink swell.
Meadowville:				
MvB	Moderate : seasonal high water table.	Moderate: moderate permeability; slope.	Moderate: seasonal high water table; seepage from adjacent areas; moderate shrink swell.	Moderate: moderate shrink swell.
MvC	Moderate: seasonal high water table; slope.	Severe: slope	Moderate: seasonal high water table; slope; moderate shrink swell.	Moderate: slope; moderate shrink swell.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Severe: slope	Severe: slope	Moderate: slope; clay subsoil.	Severe: clay loam surface layer; slope.	Severe: slope	Severe: slope	Severe: slope.
Moderate: excessive clay content.	Slight	Severe: permeable substratum.	Slight	Slight	Moderate: slope.	Slight.
Moderate: slope; excessive clay content.	Moderate: slope	Severe: permeable substratum.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
Severe: slope	Severe: slope	Severe: permeable substratum.	Severe: slope	Severe: slope	Severe: slope	Severe: slope.
Severe: hard rock at a depth of 2 to 3½ feet.	Severe: hard rock at a depth of 2 to 3½ feet.	Severe: rock at a depth of 2 to 3½ feet.	Severe: droughty	Moderate: slope.	Severe: rock at a depth of 2 to 3½ feet.	Moderate: slope.
Severe: slope; rock at a depth of 2 to 3½ feet.	Severe: hard rock at a depth of 2 to 3½ feet; slope.	Severe: rock at a depth of 2 to 3½ feet; slope.	Severe: droughty; slope.	Severe: slope	Severe: slope	Severe: slope.
Moderate: seasonal high water table; excessive silt content; moderate shrink swell.	Moderate: seasonal high water table.	Moderate: seasonal high water table; seepage from adjacent soils; moderate permeability.	Slight	Moderate: seasonal high water table.	Moderate: seasonal high water table; slope.	Slight.
Moderate to severe: slope; mica content.	Moderate: slope	Severe: moderate to moderately rapid permeability.	Severe: droughty	Moderate: slope.	Severe: slope	Moderate: slope.
Moderate: excessive clay content; moderate shrink swell.	Slight	Moderate: rock at a depth of 5 to 10 feet.	Slight	Slight	Moderate: slope.	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: slope	Moderate: rock at a depth of 5 to 10 feet.	Moderate: slope.	Moderate: slope.	Severe: slope	Moderate: slope.
Moderate: excessive clay content; moderate shrink swell.	Moderate: seasonal high water table.	Severe: depth to bedrock.	Slight	Moderate; seasonal high water table; seepage.	Moderate: seasonal high water table; slope.	Slight.
Moderate: excessive clay content; slope; moderate shrink swell.	Moderate: seasonal high water table; slope.	Severe: depth to bedrock.	Moderate: slope.	Moderate: slope; seasonal high water table.	Severe: slope	Moderate: slope.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
*Myersville:				
MyC For Catoctin part, see Catoctin unit CcC.	Moderate: stones; slope.	Severe: stones; slope.	Moderate:[2] stones; slope; moderate shrink swell.	Moderate:[2] stones; slope; moderate shrink swell.
MyD, MyE For Catoctin part, see Catoctin unit CcE.	Severe: slope	Severe: high stone content; slope.	Severe: slope	Severe: slope
Penn:				
PnC	Severe: depth to rock.	Severe: slope; moderate to moderately rapid permeability.	Moderate: slope; rippable bedrock.	Moderate: slope; rippable bedrock.
PnD	Severe: slope; depth to rock.	Severe: slope; moderate to moderately rapid permeability.	Severe: slope	Severe: slope
Porters:				
PoC	Severe: rock within a depth of 4 feet in places.	Severe: high stone content; slope.	Moderate: high stone content; slope; moderate shrink swell.	Moderate: high stone content; slope; moderate shrink swell.
PoD, PoF	Severe: slope; rock within a depth of 4 feet in places.	Severe: slope; high stone content.	Severe: slope	Severe: slope
Rapidan:				
RdB	Moderate: moderate permeability; depth to rock.	Moderate: moderate permeability; depth to rock.	Moderate:[2] moderate shrink swell; excessive clay content.	Moderate:[2] moderate shrink swell; excessive clay content.
ReC2	Moderate: moderate permeability; slope; depth to rock.	Severe: slope	Moderate:[2] slope; moderate shrink swell; excessive clay content.	Moderate:[2] slope; moderate shrink swell; excessive clay content.
Riverwash: Rh	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Roanoke: Rk	Severe: seasonal water table at a depth of 0 to 1 foot; slow permeability.	Slight	Severe: infrequent flooding; seasonal high water table.	Severe: infrequent flooding; seasonal high water table.
Rock land: Rn, Ro, RrD, RrE, RtD, RtE.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock.
Rock outcrop: Ru	Severe: bedrock outcrop.	Severe: bedrock outcrop; slope.	Severe: stone content; bedrock outcrop; slope.	Severe: bedrock outcrop; slope.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: slope; moderate shrink swell.	Moderate: stones; slope; hard rock at a depth of 3½ to 8 feet.	Severe: hard rock at a depth of 3½ to 8 feet.	Severe: high stone content; slope.	Moderate: high stone content; slope.	Severe: slope . . .	Moderate: high stone content; slope.
Severe: slope	Severe: slope	Severe: rock at a depth of 3½ to 8 feet.	Severe: high stone content; slope.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; excessive silt content; depth to rock.	Moderate: rippable bedrock; slope.	Severe: rippable rock at a depth of 1½ to 3½ feet; moderate to moderately rapid permeability.	Moderate: slope; droughty.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Severe: rippable rock at a depth of 1½ to 3½ feet; moderate to moderately rapid permeability.	Severe: slope; droughty.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; hard rock at a depth of 2 to 6 feet; moderate shrink swell.	Severe: hard rock at a depth of 2 to 6 feet.	Severe: hard rock at a depth of 2 to 6 feet.	Severe: high stone content.	Moderate: high stone content; slope.	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: rock at a depth of 2 to 6 feet; slope.	Severe: hard rock at a depth of 2 to 6 feet.	Severe: high stone content; slope.	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: excessive clay content; moderate shrink swell.	Moderate: bedrock at a depth of 4 to 8 feet; clay subsoil.	Severe: hard rock at a depth of 4 to 8 feet.	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; excessive clay content; moderate shrink swell.	Moderate: bedrock at a depth of 4 to 8 feet; slope; clay subsoil.	Severe: hard rock at a depth of 4 to 8 feet.	Moderate: slope; silty clay loam surface layer.	Moderate: slope; silty clay loam surface layer.	Severe: slope . . .	Moderate: slope.
Severe: flooding . . .	Severe: flooding . . .	Severe: flooding	Severe: flooding . .	Severe: flooding .	Severe: flooding .	Severe: flooding.
Severe: seasonal high water table; infrequent flooding.	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; infrequent flooding.	Severe: seasonal high water table at a depth of 0 to 1 foot; infrequent flooding.	Severe: seasonal high water table at a depth of 0 to 1 foot; infrequent flooding.	Severe: seasonal high water table; infrequent flooding.	Severe: Seasonal high water table; infrequent flooding.
Severe: shallow to bedrock.	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock.	Severe: shallow to bedrock; slope.	Severe: shallow to bedrock.
Severe: bedrock outcrop; slope.	Severe: bedrock outcrop; slope.	Severe: bedrock outcrop; slope.	Severe: bedrock outcrop; slope.	Severe: bedrock outcrop; slope	Severe: bedrock outcrop; slope.	Severe: bedrock outcrop; slope.

549-665 O - 75 - 10

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Starr: SrC	Moderate: seasonal high water table for short periods.	Severe: seasonal high water table; moderately rapid permeability.	Severe: seasonal high water table; seepage; moderate shrink swell; excessive silt content.	Severe: seasonal high water table; seepage; moderate shrink swell; excessive silt content.
Trego: TrC	Severe: slow permeability; seasonal high water table.	Moderate to severe: slope.	Severe: seasonal high water table.	Moderate: seasonal high water table; slope.
Thurmont: Mapped only with Braddock soils.				
Tusquitee:				
TuB	Slight	Severe: moderately rapid permeability.	Moderate: stones	Moderate: stones
TuC	Moderate: slope	Severe: moderately rapid permeability.	Moderate: stones; slope.	Moderate: stones; slope.
TuD, TuE	Severe: slope	Severe: moderately rapid permeability; slope.	Severe: slope	Severe: slope
Unison:				
UnB	Moderate: moderate permeability.	Moderate: moderate permeability; slope.	Moderate: moderate shrink swell; excessive clay content.	Moderate: moderate shrink swell; excessive clay content.
UnC	Moderate: moderate permeability; slope.	Severe: slope	Moderate: slope; moderate shrink swell; excessive clay content.	Moderate: slope; moderate shrink swell; excessive clay content.
UnD	Severe: slope	Severe: slope	Severe: slope	Severe: slope
UsC	Moderate: moderate permeability; slope; stones.	Severe: slope	Moderate: stones; slope; moderate shrink swell; excessive clay content.	Moderate: stones; slope; moderate shrink swell; excessive clay content.
UsD	Severe: slope	Severe: slope	Severe: slope	Severe: slope
Watt:				
WaC	Severe: bedrock at a depth of 1½ to 3 feet.	Severe: slope; bedrock at a depth of 1½ to 3 feet.	Severe: bedrock at a depth of 1½ to 3 feet.	Moderate: slope; bedrock at a depth of 1½ to 3 feet.
WaE	Severe: slope; bedrock at a depth of 1½ to 3 feet.	Severe: slope; bedrock at a depth of 1½ to 3 feet.	Severe: slope; bedrock at a depth of 1½ to 3 feet.	Severe: slope
Wehadkee: We	Severe: flooding; poorly drained.	Severe: flooding; seasonal high water table.	Severe: flooding; high water table.	Severe: flooding; high water table.

See footnotes at end of table.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)
Moderate: seasonal high water table; seepage; moderate shrink swell; excessive silt content.	Moderate: seasonal high water table; clay loam subsoil.	Severe: moderately rapid permeability.	Slight	Moderate: seasonal high water table.	Moderate to severe: seasonal high water table; slope.	Moderate: seasonal high water table; seepage from adjacent slopes.
Moderate: seasonal high water table; seepage on fragipan.	Moderate: seasonal high water table; fragipan.	Severe: high seepage on fragipan; pervious substratum.	Moderate: seasonal high water table.	Moderate: seasonal high water table; slow permeability.	Moderate to severe: seasonal high water table; slope.	Moderate: seasonal high water table.
Moderate: stones . . .	Slight	Severe: moderately rapid permeability.	Moderate: stones	Slight	Moderate: stones; slope.	Slight.
Moderate: stones; slope.	Moderate: slope . . .	Severe: moderately rapid permeability.	Moderate: stones; slope.	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope	Severe: moderately rapid permeability.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: moderate shrink swell; excessive clay content.	Severe: clay subsoil.	Severe: clay subsoil.	Slight	Slight	Moderate: slope .	Slight.
Moderate: slope; moderate shrink swell; excessive clay content.	Severe: clay subsoil.	Severe: clay subsoil.	Moderate: slope .	Moderate: slope .	Severe: slope . . .	Moderate: slope.
Severe: slope	Severe: slope; clay subsoil.	Severe: clay subsoil.	Severe: slope . . .	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; moderate shrink swell; excessive clay content.	Severe: clay subsoil; stones.	Severe: stones; clay subsoil.	Moderate: slope .	Moderate: slope .	Moderate: slope .	Moderate: slope.
Severe: slope	Severe: clay subsoil; stones; slope.	Severe: stones; clay subsoil.	Severe: slope	Severe: slope . . .	Severe: slope . . .	Severe: slope.
Moderate: slope; bedrock at a depth of 1½ to 3 feet.	Severe: bedrock at a depth of 1½ to 3 feet.	Severe: bedrock at a depth of 1½ to 3 feet.	Severe: slope; droughty.	Moderate: slope; coarse fragments.	Severe: slope; coarse fragments.	Moderate: slope; coarse fragments.
Severe: slope	Severe: bedrock at a depth of 1½ to 3 feet; slope.	Severe: bedrock at a depth of 1½ to 3 feet; slope.	Severe: slope; droughty.	Severe: slope . . .	Severe: slope; coarse fragments.	Severe: slope.
Severe: flooding; high water table.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.	Severe: high water table; flooding.

TABLE 8.—*Degree and kind of limitation to be*

Soil series and map symbols	Septic tank absorption fields	Sewage lagoons	Dwellings or buildings 3 stories or less	
			With basement	Without basement
Wickham, clayey subsoil variant: WhB	Slight	Moderate: moderate permeability.	Moderate:[2] moderate shrink swell; water table at a depth of 40 inches. Severe if subject to flooding.	Moderate:[2] moderate shrink swell. Severe if subject to flooding.
WhC2	Moderate: slope; moderate permeability.	Severe: slope	Moderate:[2] moderate shrink swell; slope. Severe if subject to flooding.	Moderate:[2] moderate shrink swell; slope. Severe if subject to flooding.
Worsham: WmB	Severe: high water table; some flooding.	Slight. Severe if subject to flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.
Zion: ZoB	Severe: moderately slow to slow permeability.	Severe: rock at a depth of 1½ to 3½ feet.	Severe: seasonal water table; rock at a depth of 1½ to 3 feet; plastic clay; high shrink swell.	Severe: plastic clay; high shrink swell.
ZoC	Severe: moderately slow to slow permeability.	Severe: slope; rock at a depth of 1½ to 3½ feet.	Severe: seasonal high water table; rock at depth of 1½ to 3½ feet; plastic clay; high shrink swell.	Severe: plastic clay; high shrink swell.

[1] Seasonal high water table is a severe limitation for short periods.
[2] Field observation indicates that moderate shrink swell imposes no real limitation for conventionally accepted foundation design.

considered in town and country planning–Continued

Streets and local roads	Shallow excavations	Sanitary landfills (trench)	Vegetables and flower gardens	Tents and small camp trailers	Athletic fields	Picnic areas (extensive)[3]
Moderate: moderate shrink swell. Severe if subject to flooding.	Moderate: clayey subsoil.	Moderate: clayey subsoil.	Slight	Slight. Severe if subject to flooding.	Moderate: slope . .	Slight.
Moderate: slope; moderate shrink swell. Severe if subject to flooding.	Moderate: slope; clayey subsoil.	Moderate: clayey subsoil.	Moderate: slope .	Moderate: slope. Severe if subject to flooding.	Severe: slope . . .	Moderate: slope.
Severe: high water table; some flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.	Severe: high water table; some flooding.
Severe: plastic clay; high shrink swell.	Severe: plastic clay; rock at a depth of 1½ to 3½ feet.	Severe: plastic clay; rock at a depth of 1½ to 3½ feet.	Severe: moderately slow to slow permeability.	Severe: slow permeability.	Severe: slow permeability; plastic clay.	Moderate: seasonal wetness.
Severe: plastic clay; high shrink swell.	Severe: plastic clay; rock at a depth of 1½ to 3½ feet.	Severe: plastic clay; rock at a depth of 1½ to 3½ feet.	Severe: moderately slow to slow permeability.	Severe: slow permeability.	Severe: slow permeability; slope.	Moderate: seasonal wetness; slope.

[3] Severe hazard of ground water pollution in areas where the substratum is readily permeable.

Following are explanations of some of the columns in table 8.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material is evaluated from a depth of 18 inches to 6 feet. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to water table or bedrock, and susceptibility to flooding. Slope affects layout and construction and increases the risk of soil erosion, lateral seepage, and downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold sewage within a depth of 2 to 5 feet long enough for bacteria to decompose the solids. A lagoon has a nearly level floor. The sides or embankments are compacted soil material. It is assumed that the embankment is compacted to medium density and the pond is protected from flooding. Properties to be considered are those that affect the pond floor and the embankment. Those that affect the pond floor are permeability, organic-matter content, and slope. If leveling is needed, the depth of bedrock and the condition of the bedrock must be considered. Properties that affect the embankment are permeability, piping potential, shrink-swell potential, and the number of stones, if any, that influence the ease of excavation and compaction of the embankment material.

Dwellings, as rated in table 8, are no more than three stories high and are supported by foundation footings placed in undisturbed soil. Features that affect the suitability of a soil for dwellings are those that relate to the capacity of a soil to support a load and resist settlement and to the ease of excavation. Properties to be considered are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock, and content of stones and rocks.

Streets and local roads, as rated in table 8, have an all-weather surface and are expected to carry automobile traffic all year. They have a subgrade of underlying soil material; a base consisting of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. They are graded to shed water and have ordinary provisions for drainage. They are built mainly from soil at hand. Most cuts and fills are less than 6 feet deep.

Soil properties that most affect the design and construction of roads and streets are load-supporting capacity, stability of the subgrade, and the workability and quantity of available cut and fill material. The AASHO and Unified classifications of the soil material and the shrink-swell potential indicate traffic-supporting capacity. Wetness and flooding affect the stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect the ease of excavation and the amount of cut and fill needed for an even grade.

Shallow excavations require digging or trenching to a depth of less than 6 feet, for example, excavations for pipelines, sewer lines, phone and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, no rock outcrop or big stones, no flood hazard, and no high water table.

Sanitary landfill is a method of disposing of refuse. The waste is spread in thin layers, compacted, and covered with soil. Landfill areas are subject to heavy vehicular traffic. Soil properties that affect suitability for landfill are the ease of excavation, the hazard of polluting ground water, and trafficability. The best soils have moderately slow permeability, withstand heavy traffic, and are friable and easy to excavate. Unless otherwise stated, the ratings in table 8 apply only to a depth of about 6 feet. Therefore, a limitation of *slight* or *moderate* may not be valid if trenches are to be much deeper. For some soils, reliable predictions can be made to a depth of 10 or 15 feet, but each site should be investigated before it is selected.

Vegetable and flower gardens are affected by wetness, flooding, depth to bedrock, and slope.

Camp areas are used intensively for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tents and parking areas. Camp areas are subject to heavy foot traffic and limited vehicular traffic. The best soils have gentle slopes and good drainage and are not subject to flooding during periods of heavy use. They have a surface that is free of rocks and coarse fragments and is firm after rains but not dusty when dry.

Athletic fields are used for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a surface that is free of coarse fragments and rock outcrop and is firm after rains but not dusty when dry. They have good drainage and are not subject to flooding during periods of heavy use. If grading and leveling are required, depth to rock must be considered.

Picnic areas are attractive natural or landscaped tracts used mainly for preparing and eating meals outdoors. These areas are subject to heavy foot traffic. Most of the vehicular traffic is confined to access roads. The best soils are firm when wet but not dusty when dry, are not subject to flooding during the season of use, and do not have slopes or stones that greatly increase the cost of leveling sites or building access roads.

Formation and Classification of the Soils

This section describes the factors of soil formation, tells how these factors have affected the soils of Madison County, and defines the current system of soil classification.

Factors of Soil Formation

The five factors considered in the formation of soils are parent material, relief, climate, plants and animals, and time. Each of these factors modifies the effect of the other four. Significant differences in one of the factors result in differences in soil characteristics.

Climate and vegetation are the active forces in soil formation. Relief, mainly by its influence on runoff, erosion, and temperature, modifies the effects of climate and vegetation. The parent material also affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into soil.

Parent material

The soils of Madison County formed in residual and transported parent material. Residual parent material weathers in place from the underlying rock. Transported parent material, colluvium and alluvium, is carried by water or moved by gravity and laid down as unconsolidated deposits of sand, silt, clay, gravel, or large rock fragments. The residual parent material is directly related to the underlying rocks. The transported material is related to the rocks or soils from which it originated. It may have rolled or washed for many miles before it was deposited.

Rocks in Madison County are of the Precambrian, Cambrian, and Triassic Systems, but for the most part Precambrian. The

three main rock types, igneous, sedimentary, and metamorphic, occur in the county.

The igneous rocks—granite, basalt, diorite, diabase, and amphibolite—are largely sources of parent material for Eubanks, Lloyd, Bremo, Zion, Elbert, Davidson, and Iredell soils.

The metamorphic rocks—gneiss, schist, phyllite, and quartzite—are largely sources of parent material for Appling, Cecil Louisburg, Chester, Brandywine, Myersville, Catoctin, Elioak, Glenelg, Manor, Hazel, Watt, Fauquier, and Porters soils.

The sedimentary rocks are shale, sandstone, and conglomerate. Penn, Bucks, Calverton, Creedmoor, and Rapidan soils formed in parent material derived from these rocks.

Congaree, Chewacla, Codorus, and Wehadkee soils on first bottoms or flood plains formed in transported parent material. Hiwassee, Wickham, Altavista, Augusta, and Roanoke soils are older soils that formed in alluvial material on river terraces. Tusquitee, Unison, Braddock, Thurmont, and Dyke soils formed in colluvial material that washed or rolled from steep mountainous areas. Meadowville, Starr, Manassas, and Worsham soils formed in colluvial material that washed from nearby or adjacent slopes.

Rock characteristics strongly influence the changes that take place in weathering. Brandywine fine gravelly loam, for example, formed in material weathered from Old Rag Granite, which is highly resistant to weathering. In contrast, Brandywine loam, very deep, formed in material weathered from gneiss, which is much more easily weathered than granite. In places the gneiss is at a depth of 40 feet or more.

Differences in rock are also reflected in the texture, fertility, color, and drainage of soils and in the content and kind of clay. Appling, and Cecil soils have a fine sandy loam surface layer because the quartz grains in the granitic parent rock are resistant to weathering. These soils are also high in potash because the content of potassium feldspar is high in granitic rock. Iredell soils formed in material weathered from diabase. They are higher in natural fertility than Appling soils. Slope and the shape of the landscape are also influenced by the kind of parent rock.

Relief

Relief, or lay of the land, affects internal drainage, runoff, and geologic erosion and, in turn, affects the formation of soils. As a result, it is possible for several kinds of soil to form in the same kind of parent material.

Madison County ranges from nearly level to very steep. In nearly level areas where runoff is not excessive, the deep Cecil and Eubanks soils formed. Where slopes are steep, runoff is excessive, and soil material is removed almost as fast as it forms, the shallower Hazel and Penn soils formed.

Where relief allows most of the rainfall to percolate through the soil, soluble material is leached deeply into the profile. Clay particles are also carried downward by percolating water and form a thick clayey subsoil. In steeper areas a large amount of rainfall runs off the surface and does not enter the soil. In these areas the profile in thinner. Hiwassee soils, for example, formed in nearly level areas and have a thick clayey subsoil. In contrast, Bremo soils, which formed in steeper areas, have a thin subsoil.

In low areas or depressions where little water drains from the surface, the soil remains wet for long periods. The poorly drained Roanoke and Worsham soils formed in these areas. Prolonged wetness makes the soil gray because iron is reduced or is almost entirely leached out. Red soils occur only where the soil is well aerated and the iron is well oxidized.

Climate

At the lower elevations, Madison County has warm summers, moderate winters, and adequate precipitation. At the higher elevations in the Blue Ridge Mountains, winters are considerably colder, summers are cooler, and precipitation is somewhat greater. The differences in climate account for several differences among the soils. In the cooler areas organic matter decomposes at a slower rate; hence, the surface layer is thicker and nearly black. This thick, nearly black surface layer is characteristic of Porters soils, especially on northerly slopes. In the warmer areas, the surface layer is pale or light colored because the decomposition of organic matter is almost complete each year. A thin A1 horizon, for example, is evident in Elioak and Glenelg soils.

Because rainfall is abundant, calcium carbonate and other soluble material are constantly leached from the soils. As a result, all the soils are acid. Lime is needed at frequent intervals to neutralize the acidity and supply the calcium and magnesium required for plant growth and reproduction. Considerable loss through leaching is evident also of potash, phosphate, nitrogen, and other plant nutrients.

Soil climate differs locally from northerly to southerly exposures, from level areas to concave or convex slopes, and from windward to leeward slopes.

Plants and animals

The influence of trees, grasses, shrubs, worms, microbes, and larger animals also is apparent in the many changes in parent material and in the processes of soil formation. Tree roots grow deeply into the soil and penetrate into the crevices of the parent rock. Grasses have a shallow but extensive fibrous root system that is constantly granulating the surface layer. Plants also absorb large quantities of nutrients from a great depth, which in turn are returned to the soil when the plant dies. Many plant nutrients that would otherwise be leached into the ground water are recycled in this way.

Earthworms consume, digest, and return to the soil enormous amounts of soil material. Worms also move from deep in the soil to the surface, constantly mixing one layer with another. Large animals dig and burrow, opening channels and transporting mineral and organic matter to different layers in the profile. Millions of microbes inhabit the soil and no doubt play a large part in the many processes of soil formation. Man also influences soil formation by changing the vegetation and by introducing chemicals into the soil through liming and fertilizing.

Time

Time is needed for the formation of a well-defined soil profile. The alluvial parent material on flood plains, for example, has been in place for a relatively short period, and new sediments are laid down during each flood. Consequently, soils on flood plains have a weakly defined subsoil. They have not been in place long enough for the formation of a clayey horizon. Examples are Congaree and Chewacla soils.

Soils on river terraces are derived from similar alluvial parent material, but they have been in place longer. Since this material was deposited, the stream valleys have cut deeper and a clayey subsoil has formed. Wickham and Altavista soils are good examples of such soils. Soils on the older, higher river terraces, Hiwassee soils, for example, have a much thicker profile and solum.

Geologic erosion removes soil material from steep slopes almost as fast as it forms. As a result, the soils are generally thin and horizons are weakly defined. An example is Louisburg soils.

Classification of the Soils

The purpose of soil classification is to help us remember the significant characteristics of soils, assemble our knowledge about the soils, see their relationship to one another and to the whole

environment, and develop principles relating to their behavior and their response to manipulation. First through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; and in planning engineering projects. The broad categories of classification facilitate study and comparison in large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965. In this system the criteria used as a basis for classification are soil properties that are observable and measurable. The properties chosen are those that result in the grouping of soils of similar genesis, or mode of origin. Because this system is under continual study, readers interested in development of the current system should search the latest literature available (*10*).

The current system of classification has six categories. Beginning with the broadest, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. In table 9, the soil series of Madison County are classified in three categories of the current system. The six categories are briefly defined in the following paragraphs.

ORDER. Ten soil orders are recognized: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate orders are those that tend to give broad climatic groupings of soils. Two exceptions to this generalization are the Entisols and Histosols, both of which occur in many different climates. The names of orders have three or four syllables and end in *sols*. Entisols is an example. Four of the ten orders are represented in Madison County: Alfisols, Entisols, Inceptisols, and Ultisols.

SUBORDER. Each order is divided into suborders on the basis of soil characteristics that result in grouping soils according to genetic similarity. The broad climatic range is narrower than that of the order. The properties considered are mainly those that reflect either the presence or absence of waterlogging or the soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Aquult (*Aqu*, meaning water or wet, and *ult*, from Ultisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of similarity in the kind and sequence of the major horizons and in major soil properties. The horizons considered are those in which clay, iron, or humus have accululated; those in which pans that interfere with the growth of roots and the movement of water have formed; and those in which thick, dark-colored surface horizons have formed. The properties used are soil temperature, chemical composition (mainly content of calcium, magnesium, sodium, and potassium), and the like. The name of a great group has three or four syllables. A prefix is added to the name of the suborder. An example is Ochraquults (*Ochr*, meaning light-colored surface horizons, *aqu* for wetness or water, and *ult*, from Ultisols).

SUBGROUP. Each great group is divided into subgroups, one representing the central (typic) concept of the group, and others, called intergrades, having properties of the group and also one or more properties of another great group, suborder, or order. Subgroups are also established if soil properties intergrade outside the range of any great group, suborder, or order. The names of subgroups are derived from the name of the great group. An example is Typic Ochraquults (a typical Ochraquult).

FAMILY. Families are established within each subgroup, primarily on the basis of properties important to the growth of plants or on the behavior of soils when used in engineering structures. Among the properties considered are texture, mineral composition, reaction, temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. An example is the clayey, kaolinitic, thermic family of Typic Hapludults.

SERIES. A series is a group of soils that formed in a particular kind of parent material and have genetic horizons that, except for texture of the surface layer, are similar in characteristics and in arrangement of layers in the soil profile. Among the characteristics are color, structure, reaction, consistence, and mineral and chemical composition.

General Nature of the County

Madison County, named for James Madison, the fourth President of the United States, was formed in 1793 from Culpeper County. The early settlers were largely of German and English ancestry.

Since settlement of the county, farming and forestry have been the principal enterprises. About 60 percent of the county is forest and farm woodland. Approximately 40 percent is cleared and used for crops and pasture. Beef and dairy cattle, peach and apple orchards, and general farming are the chief sources of farm income. Wood furniture, chicken coops, oak flooring, lumber, and grain mills are significant manufacturing industries (*2*).

U.S. Highways 29 and 15 cross the county in a north-south direction. State highways provide easy access to the central and eastern parts of the county. The Skyline Drive follows the crest of the Blue Ridge Mountains along the western margin of the county in the Shenandoah National Park. No railroads cross the county. Excellent commercial airport facilities are available at Charlottesville, 27 miles south of Madison.

Physiography, Geology, and Drainage

Madison County lies within the Piedmont and the Blue Ridge physiographic provinces. Elevations range from 298 feet at the junction of the Robinson and Rapidan Rivers to 4,049 feet at the summit of Hawksbill Mountain (*3*, *7*).

The Piedmont province makes up about 70 percent of the county. It is well dissected by many small streams and rivers that flow in narrow, meandering valleys. The landscape is mostly gently sloping to strongly sloping, but in places is steep. Outlying mountains, such as Thoroughfare, Lost Banks, Gaar, Mitchell, Dulaney, and Carpenter, as well as Blakey and German Ridges, break the usual pattern of slopes in the Piedmont. Most of the soils are well drained, but a few poorly drained soils occur along streams, on toe slopes, and in a few saddles. Elevations range from about 300 feet to approximately 1,000 feet.

The Blue Ridge province makes up most of the western part of the county and about 30 percent of the total land area. It is strongly dissected by many intermittent and permanent streams that have cut deep, narrow valleys bordered by steep rocky slopes and narrow ridges. Slopes are moderately steep to very steep. Elevations range from about 1,000 feet to approximately 4,000 feet. The soils are rocky, shallow to deep, and mostly well drained.

The rocks of Madison County are igneous, sedimentary, and metamorphic. Seven major geologic formations occur in the county. These formations, from west to east, are the Catoctin, which is greenstone basalt and schist; the Pedlar, which is granodiorite, granite, and granite gneiss; the Old Rag, a coarse-grained granite; the Lovingston, which is dark-colored biotite granite and gneiss; the Robertson River, a light-colored, acidic

TABLE 9.—*Soil series classified according to the current system of classification*

Series	Family	Subgroup	Order
Albano	Fine, mixed, mesic	Typic Ochraqualfs	Alfisols.
Altavista, clayey subsoil variant[1]	Clayey, mixed, mesic	Aquic Hapludults	Ultisols.
Appling[1]	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Augusta, clayey subsoil variant[1]	Clayey, mixed, mesic	Aeric Ochraquults	Ultisols.
Baile[2]	Fine-loamy, mixed, mesic	Typic Ochraquults	Ultisols.
Braddock	Clayey, mixed, mesic	Typic Hapludults	Ultisols.
Brandywine	Sandy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Bremo[1]	Loamy-skeletal, mixed, thermic	Typic Dystrochrepts	Inceptisols.
Bucks	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Buncombe[1]	Mixed, thermic	Typic Udipsamments	Entisols.
Calverton	Fine-loamy, mixed, mesic	Aquic Fragiudults	Ultisols.
Catoctin	Loamy-skeletal, mixed, mesic	Ruptic-Alfic Dystrochrepts	Inceptisols.
Cecil[1]	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Chester	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Chewacla[1]	Fine-loamy, mixed, thermic	Fluvaquentic Dystrochrepts	Inceptisols.
Codorus, cobbly subsoil variant	Coarse-loamy, mixed, mesic	Fluvaquentic Dystrochrepts	Inceptisols.
Colfax[1]	Fine-loamy, mixed, thermic	Aquic Fragiudults	Ultisols.
Congaree[1]	Fine-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Creedmoor	Clayey, mixed, thermic	Aquic Hapludults	Ultisols.
Davidson[1]	Clayey, kaolinitic, thermic	Rhodic Paledults	Ultisols.
Dyke	Clayey, mixed, mesic	Typic Rhodudults	Ultisols.
Elbert	Fine, montmorillonitic, mesic	Typic Ochraqualfs	Alfisols.
Elioak[3]	Clayey, kaolinitic, mesic	Typic Hapludults	Ultisols.
Eubanks	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Fauquier	Fine, mixed, mesic	Ultic Hapludalfs	Alfisols.
Glenelg[4]	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Hazel	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Hiwassee[1]	Clayey, kaolinitic, thermic	Typic Rhodudults	Ultisols.
Iredell[1]	Fine, montmorillonitic, thermic	Vertic Hapludalfs	Alfisols.
Lewisberry[5]	Coarse-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Lloyd[1]	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Lloyd, thin solum variant	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Louisburg	Coarse-loamy, siliceous, thermic	Ruptic-Ultic Dystrochrepts	Inceptisols.
Manassas	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Manor	Coarse-loamy, micaceous, mesic	Typic Dystrochrepts	Inceptisols.
Mayodan[1]	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Meadowville	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Myersville	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Penn	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Porters[6]	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Rapidan	Clayey, kaolinitic, mesic	Typic Rhodudults	Ultisols.
Roanoke[1]	Clayey, mixed, thermic	Typic Ochraquults	Ultisols.
Starr[1]	Fine-loamy, mixed, thermic	Fluventic Dystrochrepts	Inceptisols.
Thurmont	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Trego[7]	Fine-loamy, mixed, mesic	Typic Fragiudults	Ultisols.
Tusquitee	Fine-loamy, mixed, mesic	Humic Hapludults	Ultisols.
Unison	Clayey, mixed, mesic	Typic Hapludults	Ultisols.
Watt	Loamy-skeletal, mixed, mesic	Umbric Dystrochrepts	Inceptisols.
Wehadkee[1]	Fine-loamy, mixed, nonacid, thermic	Typic Fluvaquents	Entisols.
Wickham, clayey subsoil variant[8]	Clayey, mixed, mesic	Typic Hapludults	Ultisols.
Worsham[1]	Clayey, mixed, thermic	Typic Ochraquults	Ultisols.
Zion[1]	Fine, mixed, thermic	Ultic Hapludalfs	Alfisols.

[1] These soils are typically thermic, but in Madison County they are on the mesic-thermic borderline.

[2] The Baile soils in Madison County contain more coarse fragments than is typical of the Baile series.

[3] The Elioak soils in Madison County are deeper over bedrock than is typical of the Elioak series.

[4] The Glenelg soils in Madison County have a thicker solum than is typical of the Glenelg series.

[5] The Lewisberry soils in Madison County have a thinner solum than is typical of the Lewisberry series.

[6] The Porters soils in Madison County have a thinner dark-colored surface layer than is typical of the Porters series.

[7] The Trego soils in Madison County have a thinner fragipan than is typical of the Trego series.

[8] Wickham soils are typically fine-loamy and thermic.

granite; the Lunchburg, which is mica schist and graywacke sandstone; and the Newark Group, which is Triassic conglomerate, sandstone, and shale. There are also intrusions of diabase, greenstone, and other basic rocks (*3*, *4*, *8*).

Rocks in the Piedmont province are dominantly metamorphosed rocks of igneous and sedimentary origin. They are largely granite gneiss, mica, schist, and phyllite and partly greenstone schist, sandstone, conglomerate, and shale. Rocks in the Blue Ridge province are dominantly metamorphosed rocks of igneous origin, dominantly greenstone schist, granodiorite, granite, and granite gneiss. There are small inclusions of sandstone.

Madison County is drained by the Hughes, Robinson, Rapidan, and Conway Rivers. The Robinson and Conway Rivers drain into the Rapidan River. The Hughes River forms the boundary between Madison and Rapahannock Counties and flows into the Rapahannock River.

Water Supply

The dominant sources of water in the county are wells, springs, and surface water. The underlying granite, gneiss, and schist range widely in water-supplying capacity, commonly from 1 to 20 gallons per minute in wells 40 to 300 feet deep. The largest accumulation of water is at the contact zones between these rocks. Wells at the contact between metamorphosed graywacke and granite commonly yield about 40 gallons per minute. Wells at the contact between igneous rocks and Triassic sedimentary rocks, in the eastern part of the county, yield about 12 to 35 gallons per minute.

Supplies of surface water are plentiful. Surface water can be obtained from the Robinson, Rapidan, Conway, and Hughes Rivers and other small streams in the county. This water is usually soft.

Climate[6]

Madison County has warm summers, moderate winters, and generally adequate rainfall. At the higher elevations in and near the Shenandoah National Park, winters are considerably colder, summers are cooler, and precipitation is somewhat more plentiful. The county is well inland from oceanic areas, but is in the path of warm, moist air currents moving northward, and cold, dry air currents moving southeastward. These alternating air currents frequently bring sharp changes in the daily weather and add greatly to the variations in climate from one season to another.

The altitude, which ranges from below 300 feet along the Rapidan River on the southeastern border to 3,000 and 4,000 feet along the northwestern border, causes a significant difference in climate. Temperatures drop approximately 3°F. per thousand feet increase in altitude and vary by as much as 10° across the county. Rainfall is considerably higher in the mountains. The climatic information in tables 10 and 11 was derived from observations representative of the lower elevations. For elevations above approximately 1,000 feet, temperatures are lower and, in general, rainfall is higher.

Temperature.—The mean annual temperature varies slightly from year to year, but is commonly 54° to 59° at the lower elevations and 45° to 50° along the Skyline Drive. Temperatures above 95° or below 0° are infrequent, and prolonged periods of very warm or very cold weather are unusual. Some mild spells occur in winter, and occasional periods of dry, mild weather relieve stretches of warm, humid weather in summer.

Seasonal changes in temperature are shown by the monthly averages of daily maximum and minimum temperatures in table 10. The average temperature is about the same for December, January, and February and for June, July, and August. Conversely, temperatures rise in March, April, and May and drop in September, October, and November. September, however, is usually warm, and mild temperatures often extend well into November.

The growing season, defined as the period between the average dates of the last freezing temperature in the spring and the first freezing temperature in the fall, is 184 days. It is long enough to allow proper maturity of a large variety of crops. The pasture season is slightly longer, but the winter months are cold enough that feed and shelter are needed for livestock. The probabilities of freezing temperatures shown in table 11 apply to most areas of the county. At the higher elevations freezing temperatures ordinarily occur later in spring and earlier in fall.

Precipitation.—Annual precipitation ranges from about 42 inches in the southeastern part of the county to more than 51 inches atop the Blue Ridge Mountains. Amounts vary greatly from year to year.

Monthly precipitation ranges from more than 4 inches in summer to about 3 inches in fall. The amount varies greatly from year to year for any given month. Occasionally rainfall is very light in all months of the year, and occasionally it is excessive. Although rainfall is heaviest in summer, it is often insufficient because the need for moisture is greatest and evaporation is highest. In summer rainfall occurs mainly as thundershowers, some of which are heavy and result in considerable runoff. The heaviest rains, usually lasting 2 to 3 days, are associated with hurricanes that have passed inland across the Atlantic coast. Such storms are relatively infrequent.

The county is subject to heavy local rains, occasionally 4 inches and sometimes more than 5 inches in a few hours. These heavy rains cause considerable erosion and leaching of soils and occasionally cause flash floods in small streams.

Drought in the county is mainly a result of irregularities in rainfall. Prolonged dry spells occur in many years, and soil moisture is insufficient at one or more times during the growing season. Occasionally, several dry years occur in succession and drought is serious, for example, in the early 1930's and more recently in the 1960's.

Severe storms.—Severe storms have been infrequent in Madison County. Only one tornado has been reported in the county. It caused no personal injuries, but it destroyed a few buildings and damaged others. Minor windstorms, often associated with thunderstorms, cause scattered local damage a few times each year.

Thunderstorms occur at a given locality on about 40 days per year, and sometimes cause minor lightning damage. Damaging hailstorms occur, but are infrequent. Hurricanes that reach the county have diminished wind velocities and cause little damage but can cause torrential rainfall. Snowstorms are fairly common. Heavy snowstorms, which cause some damage and much inconvenience, occur every few years.

Humidity, wind, and clouds.—The average annual relative humidity in Madison County, estimated from surrounding weather stations, is approximately 65 to 70 percent. Average monthly relative humidity ranges from about 60 percent in spring to about 75 percent late in summer. Relative humidity throughout the day usually varies inversely with the temperature. It is, therefore, highest early in the morning and lowest early in the afternoon.

In general, southerly and northwesterly winds are about equally frequent over the county. Northwesterly winds prevail in winter, and southerly winds in summer. The wind direction varies; it

[6]By M. H. BAILEY, State climatologist, National Weather Service, U.S. Department of Commerce.

TABLE 10.—*Temperature and precipitation data*

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Number of days with snow cover of 1 inch or more	Average depth of snow on days with snow cover
			Maximum equal to or higher than—	Minimum equal to or lower than—		Less than—	More than—		
	°F	°F	°F	°F	*Inches*	*Inches*	*Inches*		*Inches*
January	47	27	64	20	3.3	1.2	4.6	7	4
February	48	27	64	20	3.1	1.2	5.2	6	5
March	58	33	73	25	3.6	1.4	5.6	3	6
April	69	43	84	34	3.5	2.0	4.9	([1])	2
May	78	53	89	46	4.4	1.3	7.0	0	0
June	85	61	93	54	4.3	1.8	7.2	0	0
July	88	65	95	60	4.4	1.3	6.1	0	0
August	86	64	95	59	3.9	1.3	11.1	0	0
September	80	57	92	48	3.5	.9	7.7	0	0
October	70	45	83	39	3.0	1.0	5.4	0	0
November	58	35	71	25	2.7	.8	6.9	([1])	2
December	47	27	64	16	3.0	.7	4.6	4	2
Year	68	45	[2]97	[3]3	42.7	33.3	54.2	20	4

[1] Less than 0.5 day.

[2] Average annual highest temperature.

[3] Average annual lowest temperature.

TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall*

Probability	Dates for given probability and temperature				
	32° F or lower	28° F or lower	24° F or lower	20° F or lower	16° F or lower
Spring:					
1 year in 10 later than	May 4	April 21	April 8	March 28	March 23
2 years in 10 later than	April 29	April 15	April 1	March 21	March 15
5 years in 10 later than	April 21	April 4	March 20	March 8	March 1
Fall:					
1 year in 10 earlier than	October 9	October 18	November 1	November 8	November 25
2 years in 10 earlier than	October 13	October 23	November 6	November 14	November 30
5 years in 10 earlier than	October 22	November 2	November 16	November 26	December 9

is from any one direction only a small fraction of the time. The average monthly windspeed ranges from about 7 miles per hour in August to about 11 miles per hour in March. Winds are usually lightest early in the morning and strongest early in the afternoon.

On the average clouds cover about 0.6 of the sky between sunrise and sunset. Cloud cover is least in fall and greatest in winter. Overcast days are much less frequent during the summer when most clouds are of the cumulus type. Less cloudiness and long hours of daylight allow abundant sunshine during the growing season.

Literature Cited

(1) American Association of State Highway Officials.
1961. Standard Specifications for Highway Materials and Methods of Sampling and Testing. Ed. 8, 2 v., illus.

(2) Commonwealth of Virginia.
1960. Industrial Sites and Economic Data—Madison County, Virginia. Dept. of Conserv. and Econ. Devlpmt., Div. of Indus. Devlpmt. and Planning.

(3) ———
1963. Geologic Map of Virginia. Dept. of Conserv. and Econ. Devlpmt., Div. of Mineral Resources, 1 p.

(4) ———
1963. Geology and Mineral Resources of Green and Madison Counties. Dept. of Conserv. and Econ. Devlpmt., Div. of Mineral Resources Bul. 78, 102 pp., illus.

(5) Cooperative Extension Service.
1966. A Handbook of Agronomy. Va. Polytechnic Inst. Bul. 97, revised, 177 pp., illus.

(6) ———
1966. Soil Fertility Guides for the Piedmont Region of Virginia. Va. Polytechnic Inst. Bul. 298, 33 pp.

(7) Fenneman, Nevin M.
1938. Physiography of Eastern United States. 714 pp., illus. New York and London.

(8) Steidtmann, Edward.
1945. Commercial Granites and Other Crystalline Rocks of Virginia. Va. Geol. Surv. Bul. 64, 152 pp., illus.

(9) United States Department of Agriculture.
1951. Soil Survey Manual. U.S. Dept. Agr. Handbook No. 18, 503 pp., illus.

(10) ———
1960. Soil Classification, a Comprehensive System, 7th Approximation. 265 pp., illus. [Supplements issued in March 1967 and September 1968]

(11) United States Department of Defense.
1968. Unified Soil Classification for Roads, Airfields, Embankments and Foundations. MIL-STD-619B, 30 pp., illus.

Glossary

Acidity. See Reaction, soil.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

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

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

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

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as light, moisture, temperature, and the physical condition of the soil, are favorable.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many;* size—*fine*, *medium*, and *coarse;* and contrast—*faint*, *distinct*, and *prominent*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Munsell notation. A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus.

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline.	9.1 and higher

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. For complete information about a capability unit, read both the introduction "Management for Crops and Pasture" and the description of the capability unit in this section. Other information is given in tables as follows:

Acreage and extent, table 1, page 9.
Estimated yields, table 2, page 54.
Woodland, table 3, pages 60 through 67.
Engineering, tables 5, 6, and 7, pages 76 through 115.
Town and country planning, table 8, page 116.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
Ab	Albano silt loam	11	Vw-1	51	4w
Ac	Alluvial land, mixed	11	IIIw-1	50	5
Ad	Alluvial land, cobbly	11	VIs-1	52	5
AlA	Altavista loam, clayey subsoil variant, 0 to 2 percent slopes	11	IIw-2	50	2o
AlB	Altavista loam, clayey subsoil variant, 2 to 7 percent slopes	12	IIe-1	50	2o
ApB	Appling fine sandy loam, 2 to 7 percent slopes	12	IIe-1	50	3o
ApC	Appling fine sandy loam, 7 to 15 percent slopes	12	IIIe-1	50	3o
ApD2	Appling fine sandy loam, 7 to 20 percent slopes, eroded	12	IIIe-1	50	3o
ArB	Appling fine sandy loam, very deep, 2 to 7 percent slopes	12	IIe-1	50	3o
Au	Augusta silt loam, clayey subsoil variant	13	IIIw-2	50	2w
BaB	Baile stony silt loam, 2 to 7 percent slopes	13	IVw-1	51	1w
BcB	Braddock and Thurmont loams, 2 to 7 percent slopes	14	IIe-1	50	2o
BcC	Braddock and Thurmont loams, 7 to 15 percent slopes	14	IIIe-1	50	2o
BcD2	Braddock and Thurmont loams, 15 to 25 percent slopes, eroded	14	IVe-1	51	2r
BdC	Brandywine fine gravelly loam, 7 to 15 percent slopes	15	IVe-2	51	3f
BdD	Brandywine fine gravelly loam, 15 to 25 percent slopes	15	VIe-2	52	3f
BeC	Brandywine loam, very deep, 5 to 15 percent slopes	15	IVe-2	51	3f
BeD	Brandywine loam, very deep, 15 to 25 percent slopes	15	VIe-2	52	3f
BeF	Brandywine loam, very deep, 25 to 45 percent slopes	15	VIIe-1	52	3f
BnD	Brandywine stony loam, very deep, 7 to 25 percent slopes	15	VIe-2	52	3f
BnF	Brandywine stony loam, very deep, 25 to 50 percent slopes	15	VIIe-1	52	3f
BrC	Bremo silt loam, 7 to 15 percent slopes	16	IVe-2	51	3d
BrE	Bremo silt loam, 15 to 35 percent slopes	16	VIe-2	52	3d
BsB	Bucks loam, permeable substratum, 2 to 7 percent slopes	16	IIe-1	50	3o
BsC2	Bucks loam, permeable substratum, 7 to 15 percent slopes, eroded	17	IIIe-1	50	3o
Bu	Buncombe loamy fine sand	17	IIIs-1	51	2o
CbB	Calverton and Creedmoor silt loams, 0 to 7 percent slopes	17	IIIw-2	50	3w
CcC	Catoctin silt loam, 7 to 15 percent slopes	18	IVe-2	51	4d
CcE	Catoctin silt loam, 15 to 45 percent slopes	18	VIIe-1	52	4d
CeB	Cecil fine sandy loam, 2 to 7 percent slopes	19	IIe-1	50	3o
CeB2	Cecil fine sandy loam, 2 to 7 percent slopes, eroded	19	IIe-1	50	3o
CeC	Cecil fine sandy loam, 7 to 15 percent slopes	19	IIIe-1	50	3o
CeC2	Cecil fine sandy loam, 7 to 15 percent slopes, eroded	19	IIIe-1	50	3o
CeD2	Cecil fine sandy loam, 15 to 25 percent slopes, eroded	19	IVe-1	51	3r
CfB	Cecil fine sandy loam, very deep, 2 to 7 percent slopes	19	IIe-1	50	3o
CgC3	Cecil clay loam, 7 to 15 percent slopes, severely eroded	19	IVe-3	51	3c
ChC	Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes	19	IIIe-1	50	3o
ChC2	Cecil and Appling fine sandy loams, very deep, 7 to 15 percent slopes, eroded	19	IIIe-1	50	3o
CkB	Chester-Brandywine loams, very deep, 2 to 7 percent slopes	20	IIe-1	50	2o
CkC	Chester-Brandywine loams, very deep, 7 to 15 percent slopes	20	IIIe-1	50	2o
CkC2	Chester-Brandywine loams, very deep, 7 to 15 percent slopes, eroded	20	IIIe-1	50	2o
CkD	Chester-Brandywine loams, very deep, 15 to 25 percent slopes	20	IVe-1	51	2r
Cm	Chewacla silt loam	21	IIIw-1	50	1w
Cn	Codorus loam, cobbly subsoil variant	21	IIIw-1	50	1w
CoC	Colfax fine sandy loam, 2 to 10 percent slopes	22	IIIw-2	50	2w
Cr	Colluvial land, very stony	22	VIs-1	52	5
Cu	Colluvial land, extremely stony	23	VIIs-1	52	5
Cv	Congaree fine sandy loam	23	IIw-1	50	1o
Cw	Congaree loam	23	IIw-1	50	1o

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
DaB2	Davidson clay loam, 2 to 7 percent slopes, eroded	24	IIe-1	50	1c
DaC2	Davidson clay loam, 7 to 15 percent slopes, eroded	24	IIIe-1	50	1c
DaD2	Davidson clay loam, 15 to 25 percent slopes, eroded	24	IVe-1	51	1c
DkB	Dyke loam, 2 to 7 percent slopes	25	IIe-1	50	1c
DkC2	Dyke loam, 7 to 15 percent slopes, eroded	25	IIIe-1	50	1c
DkE2	Dyke loam, 15 to 35 percent slopes, eroded	25	IVe-1	51	1c
Eb	Elbert silt loam	25	Vw-1	51	4w
ElB	Elioak fine sandy loam, 2 to 7 percent slopes	26	IIe-1	50	2c
ElB2	Elioak fine sandy loam, 2 to 7 percent slopes, eroded	26	IIe-1	50	2c
ElC	Elioak fine sandy loam, 7 to 15 percent slopes	26	IIIe-1	50	2c
ElC2	Elioak fine sandy loam, 7 to 15 percent slopes, eroded	26	IIIe-1	50	2c
ElD2	Elioak fine sandy loam, 15 to 25 percent slopes, eroded	26	IVe-1	51	2c
EmB	Elioak loam, 2 to 7 percent slopes	26	IIe-1	50	2c
EmB2	Elioak loam, 2 to 7 percent slopes, eroded	26	IIe-1	50	2c
EmC2	Elioak loam, 7 to 15 percent slopes, eroded	26	IIIe-1	50	2c
EmD2	Elioak loam, 15 to 25 percent slopes, eroded	27	IVe-1	51	2c
EnC3	Elioak silty clay loam, 7 to 15 percent slopes, severely eroded	27	IVe-3	51	2c
EnD3	Elioak silty clay loam, 15 to 25 percent slopes, severely eroded	27	VIe-1	51	2c
EsB	Eubanks fine gravelly loam, 2 to 7 percent slopes	27	IIe-1	50	3o
EsC	Eubanks fine gravelly loam, 7 to 15 percent slopes	27	IIIe-1	50	3o
EsC2	Eubanks fine gravelly loam, 7 to 15 percent slopes, eroded	27	IIIe-1	50	3o
EtB	Eubanks loam, very deep, 2 to 7 percent slopes	28	IIe-1	50	3o
EtC2	Eubanks loam, very deep, 7 to 15 percent slopes, eroded	28	IIIe-1	50	3o
EtD2	Eubanks loam, very deep, 15 to 25 percent slopes, eroded	28	IVe-1	51	3r
EuC3	Eubanks-Lloyd clay loams, 7 to 15 percent slopes, severely eroded	28	IVe-3	51	4c
EuD3	Eubanks-Lloyd clay loams, 15 to 25 percent slopes, severely eroded	28	VIe-1	51	4c
EuE3	Eubanks-Lloyd clay loams, 25 to 45 percent slopes, severely eroded	28	VIIe-1	52	4c
EyB	Eubanks-Lloyd loams, 2 to 7 percent slopes	28	IIe-1	50	3o
EyB2	Eubanks-Lloyd loams, 2 to 7 percent slopes, eroded	28	IIe-1	50	3o
EyC	Eubanks-Lloyd loams, 7 to 15 percent slopes	28	IIIe-1	50	3o
EyC2	Eubanks-Lloyd loams, 7 to 15 percent slopes, eroded	29	IIIe-1	50	3o
EyD2	Eubanks-Lloyd loams, 15 to 25 percent slopes, eroded	29	IVe-1	51	3r
FaB	Fauquier silt loam, 2 to 7 percent slopes	29	IIe-1	50	1c
FcB2	Fauquier silty clay loam, 2 to 7 percent slopes, eroded	29	IIe-1	50	3c
FcC2	Fauquier silty clay loam, 7 to 15 percent slopes, eroded	29	IIIe-1	50	3c
FcD2	Fauquier silty clay loam, 15 to 25 percent slopes, eroded	29	IVe-1	51	3c
GlC2	Glenelg loam, 5 to 15 percent slopes, eroded	30	IIIe-1	50	2o
GlD2	Glenelg loam, 15 to 25 percent slopes, eroded	30	IVe-1	51	2r
HaC	Hazel loam, 7 to 15 percent slopes	30	IVe-2	51	4d
HaD	Hazel loam, 15 to 25 percent slopes	31	VIe-2	52	4d
HaF	Hazel loam, 25 to 55 percent slopes	31	VIIe-1	52	4d
HsB	Hiwassee loam, 2 to 7 percent slopes	31	IIe-1	50	2o
HsB2	Hiwassee loam, 2 to 7 percent slopes, eroded	31	IIe-1	50	2o
HsC2	Hiwassee loam, 7 to 15 percent slopes, eroded	31	IIIe-1	50	2o
HsD2	Hiwassee loam, 15 to 25 percent slopes, eroded	31	IVe-1	51	2r
IrB	Iredell silt loam, 2 to 7 percent slopes	32	IIIe-2	50	4w
LeD	Lewisberry sandy loam, 10 to 25 percent slopes	32	IVe-1	51	3r
LfB	Lloyd fine sandy loam, 2 to 7 percent slopes	33	IIe-1	50	3o
LfC2	Lloyd fine sandy loam, 7 to 15 percent slopes, eroded	33	IIIe-1	50	3o
LfD2	Lloyd fine sandy loam, 15 to 25 percent slopes, eroded	33	IVe-1	51	3r
LlB	Lloyd loam, 2 to 7 percent slopes	33	IIe-1	50	3o
LlB2	Lloyd loam, 2 to 7 percent slopes, eroded	33	IIe-1	50	3o
LlC2	Lloyd loam, 7 to 15 percent slopes, eroded	33	IIIe-1	50	3o
LmB2	Lloyd loam, thin solum variant, 2 to 7 percent slopes, eroded	34	IIe-1	50	3o
LmC2	Lloyd loam, thin solum variant, 7 to 15 percent slopes, eroded	34	IIIe-1	50	3o
LmD2	Lloyd loam, thin solum variant, 15 to 25 percent slopes, eroded	34	IVe-1	51	3r
LnC3	Lloyd clay loam, 7 to 15 percent slopes, severely eroded	33	IVe-3	51	3c
LnD3	Lloyd clay loam, 15 to 25 percent slopes, severely eroded	34	VIe-1	51	3c
LoC	Louisburg sandy loam, 5 to 15 percent slopes	34	IVe-2	51	3d
LoD	Louisburg sandy loam, 15 to 25 percent slopes	35	VIe-2	52	3d

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
LoF	Louisburg sandy loam, 25 to 55 percent slopes	35	VIIe-1	52	3d
Ma	Made land	35	Not rated	----	5
MnB	Manassas silt loam, 2 to 7 percent slopes	35	IIe-1	50	2o
MoC	Manor silt loam, 7 to 20 percent slopes	36	IVe-2	51	2o
MuB	Mayodan fine sandy loam, 2 to 7 percent slopes	36	IIe-1	50	3o
MuC2	Mayodan fine sandy loam, 7 to 15 percent slopes, eroded	36	IIIe-1	50	3o
MvB	Meadowville loam, 2 to 7 percent slopes	37	IIe-1	50	2o
MvC	Meadowville loam, 7 to 15 percent slopes	37	IIIe-1	50	2o
MyC	Myersville-Catoctin very stony silt loams, 7 to 15 percent slopes	37	VIs-1	52	------
	Myersville part	----	------	----	1o
	Catoctin part	----	------	----	4d
MyD	Myersville-Catoctin very stony silt loams, 15 to 25 percent slopes	38	VIs-1	52	3r
MyE	Myersville-Catoctin very stony silt loams, 25 to 45 percent slopes	38	VIIs-1	52	3r
PnC	Penn loam, 5 to 15 percent slopes	38	IIIe-1	50	3o
PnD	Penn loam, 15 to 25 percent slopes	38	IVe-1	51	3r
PoC	Porters very stony loam, 7 to 15 percent slopes	39	VIs-1	52	2o
PoD	Porters very stony loam, 15 to 25 percent slopes	39	VIs-1	52	2r
PoF	Porters very stony loam, 25 to 50 percent slopes	39	VIIs-1	52	2r
RdB	Rapidan silt loam, 2 to 7 percent slopes	39	IIe-1	50	2c
ReC2	Rapidan silty clay loam, 7 to 15 percent slopes, eroded	39	IIIe-1	50	3c
Rh	Riverwash	40	VIIIs-1	52	5
Rk	Roanoke silt loam	41	Vw-1	51	1w
Rn	Rock land, acidic	41	VIIs-1	52	5
Ro	Rock land, basic	41	VIIs-1	52	5
RrD	Rock land, Myersville and Catoctin materials, moderately steep	41	VIIs-1	52	5
RrE	Rock land, Myersville and Catoctin materials, steep	41	VIIs-1	52	5
RtD	Rock land, Porters and Hazel materials, moderately steep	41	VIIs-1	52	5
RtE	Rock land, Porters and Hazel materials, steep	41	VIIs-1	52	5
Ru	Rock outcrop	41	VIIIs-1	52	5
SrC	Starr silt loam, 2 to 10 percent slopes	42	IIe-1	50	1o
TrC	Trego loam, 2 to 10 percent slopes	43	IIIw-2	50	3o
TuB	Tusquitee stony loam, 2 to 7 percent slopes	43	IIe-1	50	1o
TuC	Tusquitee stony loam, 7 to 15 percent slopes	43	IIIe-1	50	1o
TuD	Tusquitee stony loam, 15 to 25 percent slopes	44	IVe-1	51	2r
TuE	Tusquitee stony loam, 25 to 45 percent slopes	44	VIe-1	51	2r
UnB	Unison loam, 2 to 7 percent slopes	45	IIe-1	50	1o
UnC	Unison loam, 7 to 15 percent slopes	45	IIIe-1	50	1o
UnD	Unison loam, 15 to 25 percent slopes	45	IVe-1	51	2r
UsC	Unison very stony silt loam, 7 to 15 percent slopes	45	VIs-1	52	1o
UsD	Unison very stony silt loam, 15 to 25 percent slopes	45	VIs-1	52	2r
WaC	Watt channery silt loam, 5 to 15 percent slopes	46	IVe-2	51	4d
WaE	Watt channery silt loam, 15 to 35 percent slopes	46	VIe-2	52	4d
We	Wehadkee silt loam	46	IVw-1	51	3w
WhB	Wickham loam, clayey subsoil variant, 2 to 7 percent slopes	47	IIe-1	50	2o
WhC2	Wickham loam, clayey subsoil variant, 7 to 15 percent slopes, eroded	47	IIIe-1	50	2o
WmB	Worsham loam, 2 to 7 percent slopes	47	Vw-1	51	2w
ZoB	Zion silt loam, 2 to 7 percent slopes	48	IIe-2	50	3o
ZoC	Zion silt loam, 7 to 15 percent slopes	48	IIIe-2	50	3o

U. S. GOVERNMENT PRINTING OFFICE : 1975 O - 549-665

Accessibility Statement

The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

The USDA Target Center can convert USDA information and documents into alternative formats, including Braille, large print, video description, diskette, and audiotape. For more information, visit the TARGET Center's Web site (http://www.targetcenter.dm.usda.gov/) or call (202) 720-2600 (Voice/TTY).

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).