SOIL SURVEY OF

Transylvania County, North Carolina

United States Department of Agriculture
Soil Conservation Service and
Forest Service
In cooperation with
North Carolina Agricultural Experiment Station

Issued January 1974

Major fieldwork for this soil survey was done in the period 1962–67. Soil names and descriptions were approved in 1968. 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, the Forest Service, and the North Carolina Agricultural Experiment Station. It is part of the technical assistance furnished to the Transylvania Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Transylvania County 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, recreation, and other uses.

Locating Soils

All the soils of Transylvania County are shown on the detailed map at the back of this soil survey. 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 shows the page where each kind of soil is described. It also gives the page for the capability unit and the woodland suitability group in which the soil has been placed.

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 limitations 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 discussion of the capability units.

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

Game managers, sportsmen, and others concerned with wildlife can find information about soils and wildlife in the section "Use of the Soils for Wildlife."

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 were formed and how they are classified in the section "Formation and Classification of Soils."

Newcomers to Transylvania 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 given in the section "General Nature of the County."

Cover picture: Irish potatoes harvested on Transylvania silt loam, which is on flood plains.

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Issued January 1974

SOIL SURVEY OF TRANSYLVANIA COUNTY, NORTH CAROLINA

BY JOHN M. KING AND JOHN W. TURPIN, SOIL CONSERVATION SERVICE, AND DANIEL D. BACON, FOREST SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, IN COOPERATION WITH THE NORTH CAROLINA AGRICULTURAL EXPERIMENT STATION

TRANSYLVANIA COUNTY is in the southwestern part of North Carolina (fig. 1). Brevard, the county seat, is near the center of the county. The county has an

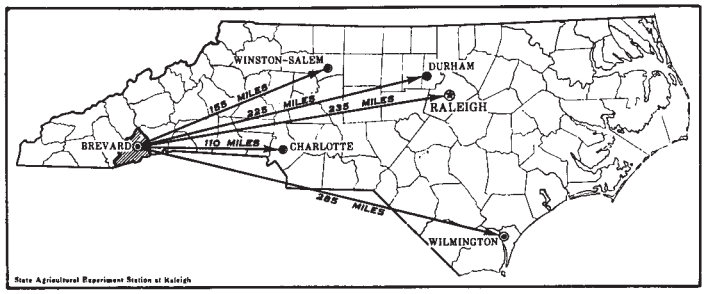

Figure 1.—**Location of Transylvania County in North Carolina.**

area of 379 square miles, or 242,560 acres. The 1960 census showed a population of 16,372 for the county and 4,857 for Brevard.

Transylvania County is in the Appalachian Mountains. The elevation of the county ranges from 1,265 feet to 6,043 feet. The elevation at Brevard is 2,230 feet. The western and northern boundaries are formed by a chain of mountains embracing Tanasee and Pisgah Ridges, which have the highest peaks in the county. The Blue Ridge mountain chain is in the southern part of the county.

Transylvania County is well balanced economically among industry, farming, and tourism. Farming is limited by the small amount of nearly level and gently sloping soils. Most of the soils suitable for farming are on flood plains and are subject to infrequent or very frequent flooding. Other soils that are suitable for cultivation are in areas that are scattered and too small to permit efficient use of machinery. The chief crops grown in the county are corn, truck crops, gladiolus, and hay and pasture plants.

According to the 1966 U.S. Department of Agriculture Farm Census Summary, soil use is divided approximately as follows: cropland, 8,800 acres; pasture 9,500 acres; woodland, 216,400 acres; and other uses, 7,800 acres.

The U.S. Forest Service is responsible for managing 83,400 acres of federally owned land in the Pisgah and Nantahala National Forests.

The soils of Transylvania County have less than 35 percent base saturation and mostly are strongly acid or very strongly acid in reaction below the surface layer. Most of the crops grown on these soils respond well to applications of lime and fertilizer. Most of the soils are low to medium in natural fertility and organic-matter content.

In their natural state, the major soils of Transylvania County are low in calcium and high in exchangeable aluminum. They are very low to low in phosphorus and medium to high in potassium. Approximately one-fourth of the soils have stones in the surface layer that interfere with tillage or limit use.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Transylvania County, where they are located, and how they can be used. They went into the county knowing they were likely to find many soils they had already seen and perhaps some they had not. They observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored 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 plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series and the soil phase are the categories of soil classification most used in a local survey (*9*).[1]

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. Hayesville and Porters, for example, are the names of two soil series. All the soils in the United States that have the same

[1] Italic numbers in parentheses refer to Literature Cited, p. 69.

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, Hayesville fine sandy loam, 6 to 15 percent slopes, is one of four phases within the Hayesville series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this survey 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. One such kind of mapping unit, the undifferentiated group, is shown on the soil map of Transylvania County.

An undifferentiated group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Ashe and Edneyville soils, 6 to 15 percent slopes, is an example.

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

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

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

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Transylvania 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 farming or other land use. Such a map is useful as a 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.

The soil associations in Transylvania County are discussed in the following pages.

1. Rosman-Toxaway-Transylvania association

Well-drained to very poorly drained, nearly level soils that are underlain by loam and fine sandy loam or that have a subsoil dominantly of silty clay loam; on flood plains

This association occupies about 8 percent of the county. It is mainly along the French Broad River and its larger tributaries. The association is characterized by nearly level stream flood plains that are subject to very frequent flooding of very brief duration.

Rosman soils make up about 32 percent of this association and are well drained to moderately well drained. They mainly occupy slightly elevated positions on flood plains near the stream. These soils have a thick, very dark grayish-brown to dark-brown fine sandy loam or loam surface layer that is underlain by dark yellowish-brown to brown fine sandy loam or loam.

Toxaway soils make up about 27 percent of this association and are very poorly drained. They occupy low places and depressions on flood plains that are away from the stream in most places. These soils have a thick, black to very dark gray or very dark grayish-brown silt loam surface layer and a very dark grayish-brown to grayish-brown loam, silt loam, or silty clay loam subsoil. Unless

artificially drained, the seasonally high water table stays near the surface much of the year.

Transylvania soils make up about 8 percent of this association and are well drained and moderately well drained. They are in slightly depressional areas on flood plains and near the stream. These soils have a thick, very dark brown to very dark grayish-brown silt loam surface layer and a yellowish-brown to brown silty clay loam, silt loam, or loam subsoil.

Minor soils make up 33 percent of this association. They are mainly the Augusta and Delanco soils on stream terraces, the Ponzer and Suncook soils on flood plains, and the Brevard soils on toe slopes, in coves, and on stream terraces.

Most of the acreage in this association has been cleared for farming (fig. 2). The rest is in forest, mainly yellow-poplar, red maple, sycamore, white pine, and river birch. A few large commercial farms are in this association, but most of the farms are small and are operated by part-time farmers. The principal crops grown are corn, truck crops, gladiolus, and pasture and hay. These soils can be farmed intensively and, with proper artificial drainage and a measure of flood control, are well suited to most locally grown crops. They are generally not suitable for residential or industrial development, because of the flood hazard.

Depth to seasonally high water table and very frequent flooding are the chief limitations of these soils.

2. *Chester-Edneyville-Hayesville association*

Well-drained, rolling to steep soils that have a subsoil of fine sandy loam to clay; on broad, smooth ridgetops and side slopes

This association occupies about 20 percent of the county and is characterized by broad ridgetops and smooth, sloping to steep side slopes.

Chester soils make up about 50 percent of this association. These are well-drained soils that have a very dark grayish-brown to yellowish-brown fine sandy loam or loam surface layer that may contain stones. They have a friable, strong-brown to yellowish-red sandy clay loam to clay loam subsoil.

Figure 2.—Area of Rosman-Toxaway-Transylvania association (foreground), which consists of nearly level soils of the flood plains.

Edneyville soils make up about 10 percent of this association. These are well-drained soils that have a surface layer of very dark grayish-brown to yellowish-brown fine sandy loam or loam that contains stones in places. They have a subsoil of friable, yellowish-brown or brownish-yellow to strong-brown fine sandy loam, loam, sandy clay loam, or clay loam.

Hayesville soils make up about 8 percent of this association. These are well-drained soils that have a dark-brown to reddish-brown fine sandy loam to clay loam surface layer. They have a red to yellowish-red clay loam to clay subsoil.

Minor soils make up about 32 percent of this association. They include Brevard, Tate, Tusquitee, and Ashe soils. The Brevard, Tate, and Tusquitee soils are in coves, on toe slopes, and on stream terraces throughout the association. The Ashe soils are on rougher and steeper areas within the association.

Most of this association is wooded. The more common trees are oaks, hickory, yellow-poplar, and white, shortleaf, and pitch pines. The understory is dogwood, huckleberry, mountain-laurel, and rhododendron. The more gently sloping soils are well suited to most locally grown crops.

The slope and surface stones are the chief limitations of these soils.

3. *Ashe-Edneyville association*

Somewhat excessively drained and well-drained, moderately steep to very steep soils that have a subsoil of sandy loam to clay loam; on mountains

This association occupies about 37 percent of the county and is characterized by narrow ridgetops and rough, steep side slopes.

Ashe soils make up about 35 percent of this association. These are somewhat excessively drained soils that have a surface layer of very dark grayish-brown to olive-gray fine sandy loam or sandy loam that contains stones in places. They have a strong-brown to light olive-brown sandy loam to loam subsoil.

Edneyville soils make up about 12 percent of this association. These are well-drained soils that have a surface layer of very dark grayish-brown to yellowish-brown fine sandy loam or loam that contains stones in places. They have a subsoil of friable, yellowish-brown or brownish-yellow to strong-brown fine sandy loam, loam, sandy clay loam, or clay loam.

Minor soils make up about 53 percent of this association and include the Brevard, Tate, Tusquitee, Chester, and Chandler soils. The Brevard, Tate, and Tusquitee soils are in coves and on toe slopes throughout the association. The Chester soils are on the smoother ridges and side slopes, and the Chandler soils are in areas underlain by mica gneiss.

Practically all of the acreage in this association is in forest, commonly scarlet and chestnut oaks, pitch pine, blackgum, and sourwood trees and an understory of huckleberry and mountain-laurel.

The slope, stoniness, and droughtiness are the chief limitations of these soils.

4. Chandler-Fannin-Watauga association

Somewhat excessively drained and well-drained, rolling to very steep, micaceous soils that have a subsoil of fine sandy loam to clay loam; on narrow ridgetops and side slopes

This association occupies about 21 percent of the county and is characterized by narrow ridgetops and steep side slopes.

Chandler soils make up about 30 percent of this association. These are somewhat excessively drained, micaceous soils that have a very dark brown to brown loam surface layer that contains stones in places. They have a subsoil of yellowish-brown to olive-yellow fine sandy loam, loam, or silt loam.

Fannin soils make up about 25 percent of this association. These are well-drained, micaceous soils that have a very dark grayish-brown to brown loam surface layer and a yellowish-red to red sandy clay loam to clay loam subsoil.

Watauga soils make up about 12 percent of this association. These are well-drained, micaceous soils that have a brown to very dark grayish-brown loam surface layer and a strong-brown to yellowish-brown clay loam to loam subsoil.

Minor soils make up about 33 percent of this association. They include the Brevard, Tate, Tusquitee, Edneyville, and Ashe soils. The Brevard, Tate, and Tusquitee soils are in coves and on toe slopes throughout the area. The Edneyville and Ashe soils are in areas underlain by granite and gneiss.

Practically all of the acreage in this association is wooded. The more common trees are oaks, hickory, and shortleaf and pitch pines. The understory is dogwood, huckleberry, mountain-laurel, and rhododendron. The more moderately sloping soils are fairly well suited to well suited to most locally grown crops.

The slope, stoniness, and droughtiness are the chief limitations of these soils.

5. Brandywine-Porters-Burton association

Well drained and moderately well drained, moderately steep to very steep soils that have a subsoil of sandy loam to clay loam; on the higher mountains

This association occupies about 8 percent of the county and is characterized by narrow ridgetops and steep side slopes, mostly at elevations above 3,500 feet.

Brandywine soils make up about 55 percent of this association. These are well-drained soils that have a stony, very dark grayish-brown to dark-brown loam surface layer. They have a strong-brown, yellowish-brown, or brownish-yellow loam to fine sandy loam subsoil.

Porters soils make up about 25 percent of this association. These are well-drained soils that have a surface layer of very dark grayish-brown to dark-brown loam that contains stones in places. They have a dark yellowish-brown to strong-brown loam to clay loam subsoil.

Burton soils make up about 5 percent of this association. These are well drained or moderately well drained soils that have a surface layer of black to very dark grayish-brown loam that is stony. The subsoil is friable to firm, weakly cemented sandy loam to loam that is very dark brown to brown in the upper part and yellowish brown in the lower part.

Minor soils make up about 15 percent of this association. These include Tusquitee and Haywood soils. Stony land also makes up part of this association. The Tusquitee and Haywood soils are in coves throughout the area, and Stony land is on the roughest mountain sides.

Practically all of the acreage in this association is in forest. The more common trees are oak and beech and, at the highest elevations, red spruce and Fraser fir. Only a limited acreage of this association is suited to cultivation.

The slope, stoniness, and depth to bedrock are the chief limitations of these soils.

6. Talladega-Fletcher-Fannin association

Well-drained, rolling to very steep soils that have a subsoil of channery silt loam to silty clay loam; on ridgetops and side slopes

This association occupies about 6 percent of the county and is characterized by narrow, sloping ridgetops and very steep side slopes.

Talladega soils make up about 45 percent of this association. These are well-drained soils that have a surface layer of dark-brown to dark yellowish-brown silt loam or channery silt loam. They have a subsoil of yellowish-brown to yellowish-red channery silt loam to channery silty clay loam.

Fletcher soils make up about 10 percent of this association. These are well-drained soils that have a surface layer of brown to dark-brown loam and a subsoil of yellowish-red to red silty clay loam to clay loam.

Fannin soils make up about 10 percent of this association. These are well-drained, micaceous soils that have a surface layer of very dark grayish-brown to brown loam and a subsoil of yellowish-red to red sandy clay loam to clay loam.

Minor soils make up about 35 percent of this association. These include Brevard, Tate, and Tusquitee soils. These soils are in coves, on foot slopes, and on stream terraces throughout this association.

Practically all of this association is wooded. The more common trees are oaks, hickory, and shortleaf, pitch, and white pines. There is a heavy understory of mountain-laurel on the ridges and south and west aspects and of rhododendron on the north and east aspects. The more moderately sloping soils are fairly well suited to well suited to most of the locally grown crops.

The slope and, in places, droughtiness and depth to bedrock are the chief limitations of the use of these soils.

Descriptions of the Soils

This section describes, in detail, the soils of Transylvania County. The soil series are described, and then the mapping units in that series. Thus, to get full information on any mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which it belongs.

Each series description contains a short narrative description of a soil profile considered representative of the series and a more detailed description of the same pro-

file that can be used in making highly technical interpretations. Many of the terms used in describing soil series and mapping units are defined in the Glossary, and others are defined in the section "How This Survey Was Made."

The approximate acreage and proportionate extent of the soils are shown in table 1. The "Guide to Mapping Units" lists the mapping units of the county and shows the capability unit, woodland suitability group, and wildlife suitability group that each mapping unit is in and the page where some of these are described.

Ashe Series

The Ashe series consists of somewhat excessively drained, sloping to very steep soils on narrow, convex ridgetops and uneven side slopes. These soils formed under forest vegetation in residuum derived from gneiss or granite. Depth to bedrock is generally 2½ to 6 feet. The seasonally high water table remains below a depth of 5 feet.

In a typical profile, these soils have a fine sandy loam surface layer about 7 inches thick that is very dark grayish brown in the upper part and brown in the lower part. The subsoil is yellowish-brown sandy loam about 18 inches thick. Below this layer, to a depth of about 30 inches, is yellowish-brown sandy loam mixed with weathered, coarse gneiss fragments.

Ashe soils are low in natural fertility and available water capacity, and low to medium in organic-matter content. They have moderately rapid permeability, a moderately deep effective root zone, and low shrink-swell potential.

Practically all areas of these soils are in forest. Slope, droughtiness, stoniness, and depth to bedrock are the major limitations in the use of these soils.

Representative profile of Ashe fine sandy loam, 15 to 25 percent slopes, 12 miles west of Rosman and 3.2 miles south of U.S. Highway No. 64 on State Road 1152, in a wooded area, 30 feet east of road:

O2—1 inch to 0, loose leaves and partly decomposed organic matter.

A11—0 to 3 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium and coarse, granular structure; very friable; many small and medium roots; few quartz pebbles; very strongly acid; abrupt, smooth boundary.

A12—3 to 7 inches, brown (10YR 4/3) sandy loam; weak, medium, granular structure; very friable; many small and medium roots; few quartz pebbles; strongly acid; clear, smooth boundary.

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

Soil	Acres	Percent	Soil	Acres	Percent
Ashe fine sandy loam, 6 to 15 percent slopes	958	0.4	Hayesville fine sandy loam, 15 to 25 percent slopes	1,713	0.7
Ashe fine sandy loam, 15 to 25 percent slopes	5,021	2.1	Hayesville fine sandy loam, 25 to 50 percent slopes	988	.4
Ashe fine sandy loam, 25 to 45 percent slopes	11,626	4.8	Hayesville clay loam, 10 to 25 percent slopes, severely eroded	859	.4
Ashe stony sandy loam, 15 to 45 percent slopes	2,480	1.0	Haywood stony loam, 15 to 25 percent slopes	806	.3
Ashe stony sandy loam, 45 to 70 percent slopes	16,347	6.7	Haywood stony loam, 25 to 50 percent slopes	1,281	.5
Ashe and Edneyville soils, 6 to 15 percent slopes	1,111	.5	Ponzer muck, cool variant	328	.1
Ashe and Edneyville soils, 15 to 25 percent slopes	7,013	2.9	Porters loam, 15 to 25 percent slopes	953	.4
Ashe and Edneyville soils, 25 to 45 percent slopes	22,878	9.5	Porters loam, 25 to 45 percent slopes	1,278	.5
Augusta fine sandy loam, cool variant, 1 to 4 percent slopes	849	.4	Porters stony loam, 15 to 45 percent slopes	3,601	1.5
Brandywine stony soils, 15 to 45 percent slopes	1,339	.6	Rock outcrop	764	.3
Brandywine stony soils, 45 to 80 percent slopes	11,032	4.5	Rosman fine sandy loam	5,906	2.4
Brevard loam, 2 to 6 percent slopes	1,489	.6	Rosman soils	1,094	.5
Brevard loam, 6 to 10 percent slopes	1,977	.8	Stony colluvial land	1,573	.6
Brevard loam, 10 to 25 percent slopes	4,551	1.9	Stony land	6,628	2.7
Brevard loam, 25 to 45 percent slopes	1,657	.7	Suncook loamy sand	202	.1
Burton stony loam, 25 to 60 percent slopes	1,135	.5	Talladega silt loam, 25 to 45 percent slopes	4,054	1.7
Chandler loam, 15 to 25 percent slopes	816	.3	Talladega channery silt loam, 45 to 70 percent slopes	2,809	1.2
Chandler stony loam, 45 to 70 percent slopes	11,483	4.7	Tate fine sandy loam, 2 to 6 percent slopes	793	.3
Chandler and Fannin soils, 25 to 45 percent slopes	5,041	2.1	Tate fine sandy loam, 6 to 15 percent slopes	3,363	1.4
Chester fine sandy loam, 6 to 15 percent slopes	2,198	.9	Tate fine sandy loam, 15 to 25 percent slopes	963	.4
Chester fine sandy loam, 15 to 25 percent slopes	16,799	7.0	Toxaway silt loam	4,956	2.0
Chester fine sandy loam, 25 to 45 percent slopes	6,877	2.8	Toxaway soils	1,041	.4
Chester stony loam, 15 to 25 percent slopes	1,955	.8	Transylvania silt loam	1,701	.7
Chester stony loam, 25 to 45 percent slopes	5,133	2.1	Tusquitee loam, 6 to 15 percent slopes	3,986	1.6
Delanco fine sandy loam, 2 to 6 percent slopes	1,141	.5	Tusquitee loam, 15 to 25 percent slopes	7,056	2.9
Edneyville stony loam, 45 to 70 percent slopes	1,857	.8	Tusquitee stony loam, 6 to 15 percent slopes	1,259	.5
Fannin loam, 15 to 25 percent slopes	3,063	1.3	Tusquitee stony loam, 15 to 25 percent slopes	5,714	2.4
Fannin loam, 25 to 45 percent slopes	9,565	3.9	Tusquitee stony loam, 25 to 45 percent slopes	6,766	2.8
Fannin loam, 45 to 70 percent slopes	1,877	.8	Watauga loam, 6 to 15 percent slopes	520	.2
Fletcher and Fannin soils, 6 to 15 percent slopes	703	.3	Watauga loam, 15 to 25 percent slopes	2,466	1.0
Fletcher and Fannin soils, 15 to 25 percent slopes	1,848	.8	Watauga loam, 25 to 45 percent slopes	4,475	1.8
Hayesville fine sandy loam, 6 to 15 percent slopes	845	.3	Total	242,560	100.0

B—7 to 25 inches, yellowish-brown (10YR 5/6) sandy loam; weak, medium, granular structure; friable; common small and medium roots; few small rock fragments that give a gritty feel; very strongly acid; clear, wavy boundary.

C—25 to 30 inches, yellowish-brown (10YR 5/4) sandy loam; mixed, weathered, coarse-grained granite gneiss; massive; friable; common small and medium roots; very strongly acid; gradual, wavy boundary.

R—30 inches +, moderately hard, light-colored granite gneiss.

The solum ranges from 14 to 30 inches in thickness. The A horizon is fine sandy loam to sandy loam 4 to 10 inches thick, and it is very dark grayish brown to olive gray. The B horizon ranges from 10 to 20 inches in thickness and from sandy loam to loam in texture. It ranges from strong brown to light olive brown, but it is dominantly yellowish brown. The C horizon consists of weathered gneiss and granite that ranges from sandy loam to loamy sand.

Ashe fine sandy loam, 6 to 15 percent slopes (AeD).—This soil is on narrow or strongly convex ridgetops, generally in long, narrow areas 3 to 15 acres in size.

The surface layer is very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown to light olive-brown sandy loam to loam 10 to 20 inches thick.

Included with this soil in mapping were some areas of soils that have stones on the surface in numbers that seriously interfere with the use of farm equipment. Also included in mapping were areas of Edneyville soils.

Nearly all of this soil is in woods, but a small acreage has been cleared and is chiefly in hay and pasture. This soil is subject to very severe erosion. Intensive management is needed to reduce runoff and limit erosion if the soil is used for cultivated crops. This soil is only moderately well suited to hay and pasture because it is droughty and low in fertility. (Capability unit IVe–2; woodland suitability group 8; wildlife suitability group 2)

Ashe fine sandy loam, 15 to 25 percent slopes (AeE).—This soil is on narrow or strongly convex ridgetops and upper side slopes that have rough topography.

This soil has the profile described as representative for the series. The surface layer is very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is sandy loam to loam 10 to 20 inches thick. The color ranges from strong brown to light olive brown, but it is dominantly yellowish brown.

Included with this soil in mapping were small scattered areas that contain surface stones, gravel, or rock outcrops. Also included were small areas of Edneyville and Chandler soils.

Nearly all of this soil is in forest, primarily low-quality hardwoods. Because of slope and low available water capacity, this soil is unsuited to cultivation. It is moderately well suited to pasture or hay. (Capability unit VIe–2; woodland suitability group 8; wildlife suitability group 2)

Ashe fine sandy loam, 25 to 45 percent slopes (AeF).—This soil is on side slopes that have rough topography. The surface layer is very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is sandy loam to loam 10 to 20 inches thick. The color ranges from strong brown to light olive brown but is dominantly yellowish brown.

Included with this soil in mapping were small scattered areas that have stones, gravel, or rock outcrops at the surface. Also included were areas of Edneyville and Chandler soils.

Nearly all of this soil is in forest, primarily low-quality hardwoods. Because of slope and low available water capacity, this soil is not suited to cultivation or hay, and only fairly well suited to pasture. Intensive management is required to establish and maintain a sod. A good use for this soil is trees. (Capability unit VIIe–1; woodland suitability group 8; wildlife suitability group 2)

Ashe stony sandy loam, 15 to 45 percent slopes (AhF).—This soil is on narrow ridegtops and rough side slopes.

The surface layer is very dark grayish-brown to grayish-brown sandy loam 4 to 10 inches thick. Stones cover 5 to 25 percent of the surface and are throughout the profile. The subsoil is sandy loam 10 to 20 inches thick. The color ranges from strong brown to light olive brown, but it is dominantly yellowish brown.

Included with this soil in mapping were small areas of rock outcrops. Also included were areas of Edneyville and Chandler soils.

Nearly all of this soil is in trees, primarily low-quality hardwoods. Because of slope, low available water capacity, and stoniness, this soil is not suited to cultivated crops or hay. It is poorly suited to pasture. A good use for this soil is trees. (Capability unit VIIs–1; woodland suitability group 8; wildlife suitability group 2)

Ashe stony sandy loam, 45 to 70 percent slopes (AhG).—This soil is on rough side slopes.

The surface layer is very dark grayish-brown to olive-gray sandy loam 4 to 10 inches thick. Stones cover 5 to 25 percent of the surface and are throughout the profile. The subsoil is sandy loam to loam 10 to 20 inches thick. The color ranges from strong brown to light olive brown, but it is dominantly yellowish brown.

Included with this soil in mapping were small areas of rock outcrops. Also included were areas of Edneyville soils.

Nearly all of this soil is in trees, primarily low-quality hardwoods. Because of slope, low available water capacity, and stoniness, this soil is not suited to cultivated crops or pasture. A good use for this soil is trees. (Capability unit VIIs–1; woodland suitability group 8; wildlife suitability group 2)

Ashe and Edneyville soils, 6 to 15 percent slopes (AnD).—These are somewhat excessively drained and well-drained soils on narrow ridgetops and uneven upper side slopes throughout the county. Areas of these soils are irregular in shape and are 5 to 20 acres in size. Any given area may consist of one or the other of these soils, or of both.

The Ashe soil has a surface layer of very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown, yellowish-brown, or light olive-brown sandy loam or loam 10 to 20 inches thick. The Edneyville soil has a surface layer of very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is yellowish-brown, brownish-yellow, or strong-brown fine sandy loam, loam, sandy clay loam, or clay loam 14 to 30 inches thick.

Included with these soils in mapping were small areas of Brevard, Tate, and Tusquitee soils in coves. Also included were areas of Chester soils.

Nearly all the acreage is in woods. Because of slope, there is a severe erosion hazard, and conservation practices are needed to reduce runoff and erosion if the soils are used for cultivation. Another limitation is droughtiness. (Capability unit IIIe–1; Ashe part in woodland suitability group 8 and wildlife suitability group 2; Edneyville part in woodland suitability group 6 and wildlife suitability group 1A)

Ashe and Edneyville soils, 15 to 25 percent slopes (AnE).—These are somewhat excessively drained and well-drained soils on narrow ridges and uneven side slopes. Areas of these soils are irregular in shape and are 6 to 50 acres in size. Any given area may consist of one or the other of these soils, or of both.

The Ashe soil has a surface layer of very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown, yellowish-brown, or light olive-brown sandy loam or loam 10 to 20 inches thick. The Edneyville soil has a surface layer of very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is yellowish-brown, brownish-yellow, or strong-brown fine sandy loam, loam, sandy clay loam, or clay loam 14 to 30 inches thick.

Included with these soils in mapping were small areas of Brevard, Tate, and Tusquitee soils in coves. Also included were small areas of Chester soils.

Nearly all the acreage is in woods. Because of slope, there is a very severe erosion hazard, and intensive conservation practices are needed to reduce runoff and erosion if these soils are used for cultivation. Another limitation is droughtiness. (Capability unit IVe–1; Ashe part in woodland suitability group 8 and wildlife suitability group 2; Edneyville part in woodland suitability group 6 and wildlife suitability group 1A)

Ashe and Edneyville soils, 25 to 45 percent slopes (AnF).—These somewhat excessively drained and well-drained soils occur on mountain side slopes throughout the county. The Edneyville soil has the profile described as representative for the series. Areas of these soils are irregularly shaped and are 10 to 50 acres in size. Any given area may consist of one or the other of these soils, or of both.

The Ashe soil has a surface layer of very dark grayish-brown to olive-gray fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown, yellowish-brown, or light olive-brown sandy loam or loam 10 to 20 inches thick. The Edneyville soil has a surface layer of very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is yellowish-brown, brownish-yellow, or strong-brown fine sandy loam, sandy clay loam, loam or clay loam 14 to 30 inches thick.

Included with these soils in mapping were small areas of Brevard and Tusquitee soils in coves. Also included were small areas of Chester soils.

Nearly all the acreage is in woods. Because of slope, the soils are not suited to cultivation. They are moderately well suited to pasture. The chief limitation to the use of these soils for pasture is droughtiness. (Capability unit VIe–1; Ashe part in woodland suitability group 8 and wildlife suitability group 2; Edneyville part in woodland suitability group 6 and wildlife suitability group 1A)

446–144—72——2

Augusta Series, Cool Variant

This variant of the Augusta series consists of somewhat poorly drained, nearly level to gently sloping soils on stream terraces. These soils are subject to infrequent flooding of very brief duration. They formed under forest vegetation in residuum from old alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at a depth of about 2 feet during the winter.

In a typical profile, the surface layer is dark-brown fine sandy loam about 8 inches thick. The subsoil is friable to firm clay loam about 32 inches thick. It is yellowish brown mottled with brownish gray in the upper part and gray mottled with yellowish brown in the lower part. Below, to a depth of more than 50 inches, is gray clay loam mottled with yellowish brown.

Augusta soils are low to medium in natural fertility and organic-matter content. They have medium available water capacity, moderate permeability, and moderate shrink-swell potential. They have a moderately deep to deep effective root zone.

Most of the acreage of these soils is in crops or pasture, and the rest is chiefly in forest. A seasonally high water table and infrequent flooding are the major limitations in the use of these soils. In most areas artificial drainage is needed. The erosion hazard is slight to moderate in the sloping areas.

Representative profile of Augusta fine sandy loam, cool variant, 1 to 4 percent slopes, in Little River community, in a pasture 500 feet southwest of the intersection of State Roads 1533 and 1528:

Ap—0 to 8 inches, dark-brown (10YR 4/3) fine sandy loam; weak, medium, granular structure; friable; many small roots; strongly acid; abrupt, smooth boundary.

B21t—8 to 16 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; friable; few small roots; thin, continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B22tg—16 to 28 inches, light brownish-gray (10YR 6/2) clay loam; few, fine, distinct, yellowish-brown mottles; moderate, medium, subangular blocky structure; firm; thin, continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B3g—28 to 40 inches, gray (10YR 6/1) clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

Cg—40 to 50 inches, gray (10YR 6/1) clay loam; few, fine, distinct, yellowish-brown mottles; massive; friable; very strongly acid.

The solum ranges from 34 to 50 inches in thickness. The A horizon is 6 to 12 inches thick and is very dark grayish brown to pale brown. The B horizon is gray mottled with yellowish brown, friable to firm sandy clay loam or clay loam that is 28 to 38 inches thick. It has weak and moderate subangular blocky structure. Gravel and cobblestones may occur anywhere throughout the profile. The C horizon is unconsolidated old alluvial deposits that are fine sandy loam to clay loam.

These soils are variants of the Augusta series. They are in a somewhat colder climate than the Augusta series and have a mean annual soil temperature less than 59° F., but are otherwise similar.

Augusta fine sandy loam, cool variant, 1 to 4 percent slopes (AuA).—This soil is subject to infrequent flooding of very brief duration. It is in slightly elevated positions between the first bottoms and the better drained,

higher terraces or uplands. Areas of this soil are variable in shape and are 3 to 20 acres in size. The surface layer is very dark grayish-brown to pale-brown fine sandy loam 6 to 12 inches thick. The subsoil is yellowish brown mottled with gray in the upper part and gray mottled with yellowish brown in the lower part. It is sandy clay loam to clay loam 28 to 38 inches thick.

Included with this soil in mapping were areas of somewhat poorly drained soils that have a finer textured subsoil, as well as some small eroded areas.

This soil is moderately well suited to most pasture, hay, and row crops grown in the county. It is easy to keep in good tilth and can be worked throughout a wide range of moisture content. A seasonally high water table and seepage water, in places, are the major limitations to the use of this soil. Artificial drainage is needed. If the soils are cultivated, there is a hazard of erosion in sloping areas, and conservation practices are needed to control runoh and reduce erosion. (Capability unit IIIw–2; woodland suitability group 4; wildlife suitability group 4)

Brandywine Series

The Brandywine series consists of well-drained, moderately steep to very steep soils on the higher mountains. Elevations are above 3,000 feet. These soils formed under forest vegetation in residuum from gneiss. Depth to bedrock is 2 to 4 feet. The seasonally high water table remains below 5 feet.

In a typical profile, these soils have a very dark grayish-brown loam surface layer about 6 inches thick. The subsoil is brown, very friable loam about 14 inches thick and is about 40 percent angular coarse fragments. Below the subsoil, to a depth of about 33 inches, are weathered and broken fragments of rocks. The fragments are the size of gravel, cobblestones, and stones, and many of them crush easily to a fine sandy loam texture.

Brandywine soils are medium in natural fertility and organic-matter content. They have low available water capacity, moderately rapid permeability, and low shrink-swell potential. They have a moderately deep effective root zone.

Nearly all of the acreage is in forest. The slope, stoniness, droughtiness, and, in places, depth to bedrock are the major limitations in using these soils.

Representative profile of Brandywine loam, from an area of Brandywine stony soils, 45 to 80 percent slopes, about 10 miles north of Brevard, in a wooded area, 100 feet north of the Blue Ridge Parkway and 0.3 mile southwest of Cherry Grove Overlook:

O2—½ inch to 0, very dark brown (10YR 2/2), partly decomposed hardwood litter and moss.

A1—0 to 6 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; many small and medium roots; few fine mica flakes; about 10 percent angular coarse fragments of gravel, cobblestone, and stone size are in the soil and on the surface; very strongly acid; clear, smooth boundary.

B—6 to 20 inches, brown (7.5YR 4/4) loam; weak, medium, subangular blocky structure breaking to weak, medium, granular; very friable; common small roots; common fine mica flakes; about 40 percent angular coarse fragments of gravel, cobblestone, and stone size; medium acid; gradual, wavy boundary.

C—20 to 33 inches, weathered and broken fragments of rock, gravel, cobblestone, and stone size, with fine sandy loam in cracks; some fragments crush easily to a fine sandy loam in texture; medium acid; clear, irregular boundary.

R—33 inches +, dark-colored, moderately hard gneiss.

The solum ranges from 15 to 30 inches in thickness. The A horizon is 3 to 6 inches thick and is very dark grayish brown to dark brown. The B horizon is loam or fine sandy loam 12 to 24 inches thick, and it is more than 35 percent coarse fragments of gravel, cobblestone, and stone size. It is strong brown, yellowish brown, or brownish yellow and has weak subangular blocky or weak granular structure. The C horizon is fine sandy loam to loam and contains many coarse fragments of gravel, cobblestone, and stone size.

Brandywine stony soils, 15 to 45 percent slopes (BrF).—This unit consists dominantly of Brandywine soils that contain many coarse fragments of gravel, cobblestone, and stone size. Soils that are similar to Brandywine soils but contain fewer coarse fragments make up a part of the mapping unit. The soils of this unit are well drained and are on narrow ridgetops and mountain side slopes. The areas are irregular in shape and range from 5 to 20 acres in size.

The Brandywine soils have a very dark grayish-brown to dark-brown loam surface layer 3 to 6 inches thick. Stones cover 5 to 25 percent of the surface. The subsoil contains many coarse fragments of gravel, cobblestone, and stone size; it is strong-brown, yellowish-brown, or brownish-yellow loam or fine sandy loam 12 to 24 inches thick.

Included with these soils in mapping were areas of stony Porters soils. Also included were small areas of Stony land and Rock outcrop.

Nearly all of the acreage is wooded. Because of slope, stoniness, and droughtiness, the soils are not suited to cultivation or hay. They are poorly suited to pasture. A good use for these soils is trees. (Capability unit VIIs–1; woodland suitability group 8; wildlife suitability group 2)

Brandywine stony soils, 45 to 80 percent slopes (BrG).—This unit consists dominantly of Brandywine soils that contain many coarse fragments of gravel, cobblestone, and stone size. Soils that are similar to Brandywine soils but contain fewer coarse fragments make up a part of the mapping unit. The soils of this mapping unit are well drained and are on mountain side slopes. Areas are irregular in shape and range from 5 to 50 acres in size. This soil has the profile described as representative for the series.

The Brandywine soils have a very dark grayish-brown to dark-brown loam surface layer 3 to 6 inches thick. Stones cover 5 to 25 percent of the surface. The subsoil contains many coarse fragments of gravel, cobblestone, and stone size; it is strong-brown, yellowish-brown, or brownish-yellow loam or fine sandy loam 12 to 20 inches thick.

Included with these soils in mapping were areas of Porters and Clifton stony soils. Also included were small areas of Rock outcrop.

Nearly all of the acreage is wooded. Because of slope, stoniness, and droughtiness, the soils are not suited to cultivation, hay, or pasture. A good use for these soils is trees. (Capability unit VIIs–1; woodland suitability group 8; wildlife suitability group 2)

Brevard Series

The Brevard series consists of well-drained, gently sloping to steep soils on toe slopes, on stream terraces, and in coves. These soils formed under forest vegetation in old colluvial or old alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is below 5 feet.

In a typical profile, these soils have a very dark brown and brown loam surface layer about 4 inches thick. The subsoil is yellowish-red and red, friable fine sandy clay loam about 72 inches thick. Below the subsoil, to a depth of more than 82 inches, is angular gravel.

Brevard soils are low to medium in natural fertility and medium in organic-matter content. They have high available water capacity, moderate permeability, and low to moderate shrink-swell potential. They have a deep to very deep effective root zone.

About one-third of the acreage has been cleared and is used for general farming. In the Pisgah National Forest, all of the areas are forested. These soils are well suited to all locally grown crops. Because of slope and runoff, a moderate to very severe erosion hazard is a limitation in using these soils.

Representative profile of Brevard loam, 10 to 25 percent slopes, about 15 miles north of Brevard in Pisgah National Forest, in a wooded area, 300 feet northwest of bridge on Headwater Road at Log Hollow Branch:

O2—2 inches to 0, leaf litter and partly decayed organic matter.

A1—0 to 1 inch, very dark brown (10YR 2/2) loam; moderate, fine and medium, granular structure; very friable; many small and medium roots; few fine mica flakes; strongly acid; abrupt, smooth boundary.

A2—1 to 4 inches, brown (7.5YR 4/4) loam; moderate, coarse, granular structure; very friable; many small and medium roots; few fine mica flakes; strongly acid; clear, smooth boundary.

B1t—4 to 13 inches, yellowish-red (5YR 4/6) fine sandy clay loam; weak, fine, subangular blocky structure; friable; common small and medium roots; few fine mica flakes; thin, discontinuous clay films on faces of peds; strongly acid; gradual, wavy boundary.

B21t—13 to 30 inches, red (2.5YR 4/8) fine sandy clay loam; weak and moderate, medium, subangular blocky structure; friable; common small and medium roots; thin, discontinuous clay films on faces of peds, in cavities, and in root channels; common fine mica flakes; medium acid; gradual, wavy boundary.

B22t—30 to 48 inches, red (2.5YR 4/8) fine sandy clay loam; weak, medium, subangular blocky structure; friable; few small roots; thin, discontinuous clay films on faces of peds, in cavities, and in root channels; common fine mica flakes; medium acid; gradual, wavy boundary.

B3t—48 to 76 inches, red (2.5YR 4/8) fine sandy clay loam; weak, coarse, subangular blocky structure; friable; few small roots; thin, discontinuous clay films on faces of peds; common fine mica flakes; medium acid; abrupt, wavy boundary.

IIC—76 to 82 inches, yellowish-red (5YR 5/6) and gray (N 6/0) coated angular gravel; single grain; loose.

The solum ranges from 40 to more than 80 inches in thickness. The A horizon is 3 to 10 inches thick and is very dark brown to brown. The B horizon is yellowish-red to red fine sandy clay loam to clay loam 36 to more than 76 inches thick. It has weak and moderate, fine and coarse, subangular blocky structure. Typically, the C horizon consists of unconsolidated old colluvial or old alluvial gravel deposits, but in some places the C horizon is sandy loam or loam.

Brevard loam, 2 to 6 percent slopes (BvB).—This soil is on elevated stream terraces and upland toe slopes. The surface layer is very dark brown to brown loam 3 to 10 inches thick. The subsoil is yellowish-red to red fine sandy clay loam, loam, or clay loam 36 to more than 76 inches thick.

Included with this soil in mapping were some eroded areas and small areas that have sufficient surface gravel and cobblestones to interfere with tillage. Also included were areas of a soil that has a finer textured subsoil.

This soil is mostly cleared and used for corn, pasture, hay, or for homesites (fig. 3). The rest is woods. It is well suited to all locally grown crops. If this soil is used for row crops, surface runoff causes a moderate erosion hazard, and conservation practices are needed to control runoff and reduce erosion. (Capability unit IIe–1; woodland suitability group 6; wildlife suitability group 1A)

Brevard loam, 6 to 10 percent slopes (BvC).—This soil is on elevated stream terraces, in upland coves, and on toe slopes. The surface layer is very dark brown to brown loam 3 to 10 inches thick. The subsoil is yellowish-red to red fine sandy clay loam to clay loam 36 to more than 76 inches thick.

Included with this soil in mapping were some eroded areas and small areas that have sufficient surface gravel and cobblestones to interfere with tillage. Also included were areas of a soil that has a finer textured subsoil.

Most of this soil is cleared and used for row crops, pasture, hay, or for homesites. The rest is in woods. It is well suited to all locally grown crops. If this soil is used for row crops, surface runoff causes a severe erosion hazard, and conservation practices are needed to control runoff and reduce erosion. (Capability unit IIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Brevard loam, 10 to 25 percent slopes (BvE).—This soil is on stream terraces, toe slopes, and in upland coves. It has the profile described as representative for the series.

The surface layer is very dark brown to brown loam 3 to 10 inches thick. The subsoil is yellowish-red to red

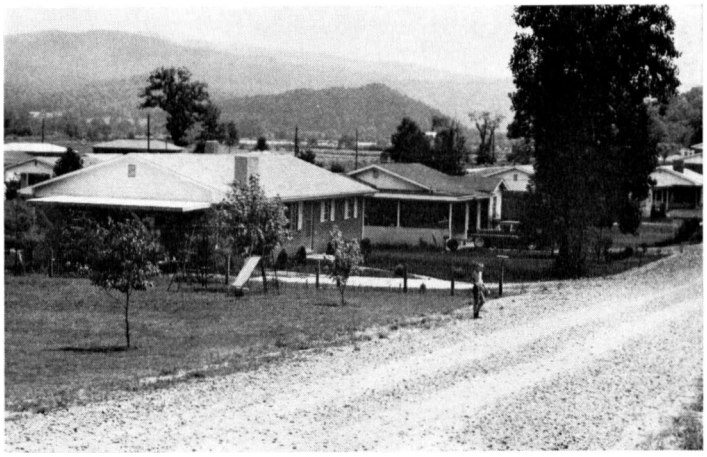

Figure 3.—**Housing development on Brevard loam, 2 to 6 percent slopes.**

fine sandy clay loam to clay loam 36 to more than 76 inches thick.

Included with this soil in mapping were small areas of Tusquitee and Tate soils. Also included were some small eroded areas and a few areas that have sufficient gravel and stones on the surface to interfere with tillage.

Most of this soil is in forest. The rest is chiefly in pasture or hay. It is well suited to locally grown pasture and hay crops. It is only fairly well suited to row crops because of the slope. If this soil is used for row crops, surface runoff causes a very severe erosion hazard, and intensive conservation practices are needed. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Brevard loam, 25 to 45 percent slopes (BvF).—This soil is in upland coves. The surface layer is very dark brown to brown loam 3 to 10 inches thick. The subsoil is yellowish-red to red fine sandy clay loam to clay loam 36 to more than 76 inches thick.

Included with this soil in mapping were a few areas that contain gravel and stones in numbers that interfere with tillage.

Practically all this soil is in forest. Because of slope, this soil is not suited to cultivation or hay. It is moderately well suited to pasture and well suited to trees. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Burton Series

The Burton series consists of well drained or moderately well drained, steep to very steep soils, mostly at elevations above 5,000 feet. Most of these soils formed under spruce and fir forests in residuum from granite and gneiss. Depth to bedrock is 2 to 3 feet. Depth to the seasonally high water table is 2 to 5 feet for about 6 months of the year.

In a typical profile, these soils have a black loam surface layer about 4 inches thick. The subsoil is about 17 inches thick and is very dark brown to brown, weakly cemented sandy loam in the upper part and yellowish-brown friable sandy loam in the lower part. Below this layer, to a depth of about 28 inches, is fine sandy loam containing many hard gneiss fragments.

Burton soils are medium in natural fertility and high in organic-matter content. They have medium available water capacity, moderately rapid permeability, and low shrink-swell potential. They have a moderately deep effective root zone.

Most of the acreage of these soils is along the Blue Ridge Parkway or in the Pisgah National Forest. The forest consists of red spruce, Fraser fir, and a few beech trees. The major limitations to the use of these soils are slope, stoniness, and shallowness to bedrock.

Representative profile of Burton loam, from an area of Burton stony loam, 25 to 60 percent slopes, about 14 miles northwest of Brevard, in a spruce and fir forest, 40 feet north of the Blue Ridge Parkway, 0.3 mile southwest of Black Balsam Road intersection:

O1—2 inches to 0, mat of decomposing needles and twigs laced with many small live roots. (1 to 3 inches thick)

A1—0 to 4 inches, black (10YR 2/1) loam; moderate, medium and coarse, granular structure; very friable; many small and medium roots; few fine mica flakes; about 2 percent angular fragments of gneiss the size of stones and cobblestones; extremely acid; clear, smooth boundary.

B21—4 to 8 inches, very dark brown (10YR 2/2) sandy loam; somewhat massive in place but breaks easily into weak, coarse, subangular blocky structure; weakly cemented but fractures easily under slight pressure; friable or firm; common small and medium roots; few fine mica flakes; about 2 percent angular fragments of gneiss the size of stones and cobblestones; extremely acid; clear, smooth boundary.

B22—8 to 12 inches, dark-brown (10YR 3/3) sandy loam; massive but breaks easily into weak, coarse, subangular blocky structure; weakly cemented but fractures easily under light pressure; friable or firm; common small and medium roots; few fine mica flakes; about 5 percent angular fragments of gneiss the size of cobblestones and stones; extremely acid; clear, smooth boundary.

B23—12 to 16 inches, brown (10YR 4/3) sandy loam; weak, coarse, subangular blocky structure; friable; few small roots; few mica flakes; about 5 percent angular fragments of gneiss the size of cobblestones and stones; very strongly acid; gradual, wavy boundary.

B3—16 to 21 inches, yellowish-brown (10YR 5/6) sandy loam; weak, coarse, subangular blocky structure; friable; few small roots; common fine mica flakes; about 10 percent angular fragments of gneiss the size of cobblestones and stones; very strongly acid; clear, irregular boundary.

C—21 to 28 inches, weathered mica gneiss, crushes to fine sandy loam; massive (rock structure); firm; many fine and medium mica flakes; about 50 percent angular fragments of gneiss; very strongly acid; clear, irregular boundary.

R—28 to 29 inches, slightly weathered gneiss bedrock.

The solum ranges from 18 to 32 inches in thickness. The A horizon is 2 to 4 inches thick and is black to very dark grayish brown. The B horizon ranges from sandy loam to loam 16 to 28 inches thick. It has weak, coarse, subangular blocky structure, or it is massive. It is friable or firm and weakly cemented. The B horizon is 2 to 10 percent stones. The B2 horizon is very dark brown to brown. The C horizon is fine sandy loam or sandy loam.

Burton stony loam, 25 to 60 percent slopes (ByG).—This soil is mostly at elevations above 5,000 feet. The areas range from 25 to 75 acres in size and are irregularly shaped.

The surface layer is black to very dark grayish-brown loam 2 to 4 inches thick, and it contains stones. The subsoil is very dark brown to brown sandy loam to loam 16 to 28 inches thick. It is friable or firm and is dominantly weakly cemented.

This soil stays moist most of the time. Ground water moves downslope along the surface of the underlying bedrock in many places.

Included with this soil in mapping were some burned areas in which the original surface layer had been removed.

Nearly all of this soil is in forest or recreation areas along the Blue Ridge Parkway. Because of slope, stoniness, and shallowness to bedrock, it is suited only to forest, recreation, and wildlife. (Capability unit VIIe–1; woodland suitability group 10; wildlife suitability group 1A)

Chandler Series

The Chandler series consists of micaceous, somewhat excessively drained, moderately steep to very steep soils on narrow ridgetops and side slopes, mostly on southern

and western aspects. These soils formed under forest vegetation in residuum from mica gneiss. Depth to bedrock is more than 4 feet. The seasonally high water table remains below 5 feet.

In a typical profile, these soils have a very dark brown and dark grayish-brown loam surface layer about 4 inches thick. The subsoil is yellowish-brown loam about 19 inches thick. Below this layer, to a depth of more than 80 inches, is loam saprolite that contains many mica flakes.

Chandler soils are low in natural fertility and available water capacity and are medium in organic-matter content. They have moderately rapid permeability, a moderately deep effective root zone, and low shrink-swell potential.

Practically all the acreage of these soils is in forest, primarily low-quality hardwoods and scattered pitch pines. The slope, droughtiness, and, in some places, stoniness are the major limitations in the use of these soils.

Representative profile of Chandler loam, 15 to 25 percent slopes, 11 miles west of Rosman, and 1.5 miles southwest of U.S. Highway No. 64 in a wooded area, 30 feet south of road:

O2—1 inch to 0, mat of decomposing organic material and profuse growth of moss and lichens.

A11—0 to 1 inch, very dark brown (10YR 2/2) loam; weak, fine and medium, granular structure; very friable; many small roots; few fine mica flakes; very strongly acid; abrupt, smooth boundary.

A12—1 to 4 inches, dark grayish-brown (10YR 4/2) loam; weak, fine and medium, granular structure; very friable; many small roots; common fine and medium mica flakes; very strongly acid; clear, smooth boundary.

B—4 to 23 inches, yellowish-brown (10YR 5/8) loam; weak, medium, subangular blocky structure; very friable; common small roots; many fine and medium mica flakes; very strongly acid; gradual, wavy boundary.

C—23 to 80 inches, highly weathered mica gneiss, which crushes to loam; rock structure; very friable; few small roots; very strongly acid.

The solum ranges from 15 to 30 inches in thickness. The A horizon is 3 to 8 inches thick and is very dark brown to brown. The B horizon is fine sandy loam to silt loam 12 to 22 inches thick. It has weak, medium, granular structure to weak, medium, subangular blocky structure. The B horizon ranges from yellowish brown to olive yellow. The content of mica flakes ranges from common to many in the B horizon to many in the C horizon. The C horizon is highly weathered mica gneiss that breaks down to loam or sandy loam.

Chandler loam, 15 to 25 percent slopes (CdE).—This soil is micaceous and is on ridgetops and upper side slopes. The areas occur as long, narrow bands that are 5 to 15 acres in size.

This soil has the profile described as representative for the series. The surface layer is very dark brown to brown loam 3 to 8 inches thick. The subsoil is yellowish-brown to olive-yellow, very friable fine sandy loam to silt loam 12 to 22 inches thick.

Included with this soil in mapping were minor areas of a similar soil that has a redder subsoil. Also included were small areas having stones on the surface that interfere with tillage.

Nearly all of this soil is in forest, mainly low-quality hardwoods and scattered pitch pines. Because of slope and droughtiness, this soil is unsuited to cultivation and only fairly well suited to pasture and hay. A good use for this soil is trees. (Capability unit VIIe–1; woodland suitability group 8; wildlife suitability group 2)

Chandler stony loam, 45 to 70 percent slopes (CeG).—This is a stony, micaceous soil on complex side slopes that mostly have southern and western aspects. The surface layer is very dark brown to brown loam, 3 to 8 inches thick, that contains stones. The subsoil is yellowish-brown to olive-yellow, very friable fine sandy loam to silt loam 12 to 22 inches thick.

Nearly all of this soil is in forest, primarily low-quality hardwoods and scattered pitch pines. Because of slope, stoniness, and droughtiness, this soil is unsuited to cultivation, hay, and pasture. A good use for this soil is trees. (Capability unit VIIs–1; woodland suitability group 8; wildlife suitability group 2)

Chandler and Fannin soils, 25 to 45 percent slopes (CfF).—This unit consists of somewhat excessively drained and well-drained, micaceous soils on mountain side slopes throughout much of the county. The areas are irregular in shape and are 10 to 50 acres in size. Any given area may consist of one or the other of these soils, or of both.

The Chandler soil of this mapping unit has a surface layer of very dark brown to brown loam 3 to 8 inches thick and a subsoil of yellowish-brown to olive-yellow fine sandy loam to silt loam 12 to 22 inches thick. The Fannin soil has a surface layer of very dark grayish-brown to brown loam 3 to 6 inches thick and a subsoil of yellowish-red to red sandy clay loam to clay loam 14 to 34 inches thick.

Included with these soils in mapping were small areas of other soils.

Nearly all of the acreage is in woods. Because of slope, the soils of this unit are not suited to cultivation. Slope and droughtiness are limitations to use for pasture. (Capability unit VIIe–1; Chandler part in woodland suitability group 8 and wildlife suitability group 2; Fannin part in woodland suitability group 6 and wildlife suitability group 1A)

Chester Series

The Chester series consists of well-drained, sloping to steep soils on the broader ridges and smoother parts of the intermountain areas. These soils formed under forest vegetation in residuum from gneiss and granite. Depth to bedrock is more than 5 feet. The seasonally high water table remains below a depth of 5 feet.

In a typical profile, these soils have a dark grayish-brown and yellowish-brown fine sandy loam surface layer about 6 inches thick. The subsoil is about 27 inches thick and is dominantly yellowish red. It is clay loam in the upper part and fine sandy loam in the lower part. Below the subsoil is strong-brown fine sandy loam. Below this layer, to a depth of about 70 inches, is strong-brown fine sandy loam.

Chester soils are low to medium in natural fertility and medium in organic-matter content. They have high available water capacity and a moderately deep to deep effective root zone. Permeability is moderate, and the shrink-swell potential is low to moderate.

Most of the acreage of these soils is in forest that consists of upland hardwoods, and white, pitch, and shortleaf pines. Most of the rest is in pasture and cultivation.

Slope and, in places, stoniness are the chief limitations in using these soils.

Representative profile of Chester fine sandy loam, 6 to 15 percent slopes, in Cedar Mountain community, 500 feet north of U.S. Highway No. 276, in a wooded area on east side of private road in Sherwood Forest development:

O1—½ inch to 0, fresh pine needles.
A1—0 to 2 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, fine, granular structure; very friable; many small roots; strongly acid; abrupt, smooth boundary.
A2—2 to 6 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, granular structure; very friable; many small roots; strongly acid; clear, smooth boundary.
B21t—6 to 9 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; common small roots; thin, discontinuous clay films on faces of peds; strongly acid; clear, wavy boundary.
B22t—9 to 24 inches, yellowish-red (5YR 5/8) clay loam; moderate, medium, subangular blocky structure; friable; few small roots; thin, discontinuous clay films on faces of peds; strongly acid; gradual, wavy boundary.
B3t—24 to 33 inches, yellowish-red (5YR 5/8) fine sandy loam; weak, medium, subangular blocky structure; very friable; thin, discontinuous clay films; few soft feldspar fragments; strongly acid; gradual, wavy boundary.
C—33 to 70 inches, strong-brown (7.5YR 5/8) crushed; weathered gneiss that is fine sandy loam in texture; rock structure; very friable; many soft weathered feldspar and quartz fragments; strongly acid; gradual, wavy boundary.
R—70 inches, weathered gneiss.

The solum ranges from 30 to 46 inches in thickness. The A horizon is very dark grayish-brown to yellowish-brown fine sandy loam or loam 4 to 10 inches thick. The B horizon is strong-brown to yellowish-red, friable clay loam to sandy clay loam 26 to 36 inches thick. It has weak or moderate, fine and medium, subangular blocky structure. The C horizon is weathered gneiss saprolite that crushes to fine sandy loam or loam.

Chester fine sandy loam, 6 to 15 percent slopes (ChD).—This soil is on the broader ridgetops and upper side slopes in the less mountainous areas. The areas are 5 to 20 acres in size.

This soil has the profile described as representative for the series. The surface layer is very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown to yellowish-red, friable clay loam to sandy clay loam 26 to 36 inches thick.

Included with this soil in mapping were some eroded areas where the surface layer is a mixture of the original surface layer and the subsoil. Also included were some areas that had been graded, cut, or filled and then used for school and industrial sites, and some small areas of redder soils that have a stony surface layer.

About one-fourth of this soil is cleared and used for pasture or row crops, and about three-fourths is in forest or other uses. This soil is well suited to most pasture and hay plants, row crops, and trees grown in the county. If this soil is used for row crops, surface runoff is a severe erosion hazard, and erosion control practices are needed. (Capability unit IIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Chester fine sandy loam, 15 to 25 percent slopes (ChE).—This soil is on side slopes bordering the drainageways or between steeper side slopes and ridgetops. It occurs as fairly long, narrow bands that are 8 to 15 acres in size.

The surface layer is very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown to yellowish-red, friable clay loam to sandy clay loam 26 to 36 inches thick.

Included with this soil in mapping were some eroded areas where the surface layer is a mixture of the original surface soil and the subsoil.

This soil is easy to keep in good tilth and, except for the eroded areas, can be worked throughout a wide range of moisture content. The eroded spots clod if they are worked too wet.

Most of this soil is in forest, and the rest is chiefly in pasture. This soil is well suited to all pasture and hay crops and trees grown in the county. Because of slope, it is only fairly well suited to row crops. If this soil is used for row crops, surface runoff causes a very severe erosion hazard, and intensive conservation practices are needed. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Chester fine sandy loam, 25 to 45 percent slopes (ChF).—This soil is on smooth side slopes. The surface layer is very dark grayish-brown to yellowish-brown fine sandy loam 4 to 10 inches thick. The subsoil is strong-brown to yellowish-red clay loam to sandy clay loam 26 to 36 inches thick.

Included with this soil in mapping were some areas of Edneyville soils. Also included were small areas having stones on the surface that interfere with tillage.

Practically all of this soil is in trees. This soil is not suited to cultivation, because of slope. It is moderately well suited to pasture. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Chester stony loam, 15 to 25 percent slopes (CrE).—This stony soil is on fairly broad, smooth ridges and side slopes. The areas are irregular in shape and are 10 to 40 acres in size.

The surface layer is very dark grayish-brown to yellowish-brown loam 4 to 8 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is strong-brown to yellowish-red, friable clay loam to sandy clay loam 26 to 30 inches thick.

Included with this soil in mapping were a few areas of Chester soils that have a stony surface layer. A few rock outcrops are present in places.

Nearly all of the acreage of this soil is in trees. Because of stoniness and slope, this soil is not suited to cultivation. It is moderately well suited to pasture. (Capability unit VIe–2; woodland suitability group 6; wildlife suitability group 1A)

Chester stony loam, 25 to 45 percent slopes (CrF).—This stony soil is on smooth side slopes. The surface layer is very dark grayish-brown to yellowish-brown loam 4 to 8 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is strong-brown to yellowish-red sandy clay loam to clay loam 26 to 30 inches thick.

Included with this soil in mapping were some areas of Edneyville soils and Chester soils that have a stony surface layer. A few rock outcrops are present in places.

Practically all of this soil is in trees. Because of stoniness and slope, it is not suited to cultivation. It is poorly suited to pasture. (Capability unit VIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Delanco Series

The Delanco series consists of moderately well drained, gently sloping soils on stream terraces that are subject to infrequent, very brief flooding on the low-lying areas. These soils formed under forest vegetation in old alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at a depth of about 2½ feet in winter.

In a typical profile, these soils have a brown fine sandy loam surface layer about 6 inches thick. The upper part of the subsoil is yellowish brown to brownish yellow mottled with light gray. The lower part is light gray mottled with brownish yellow. The subsoil is sandy clay loam and clay loam about 39 inches thick. Below the subsoil, to a depth of more than 60 inches, is light-gray fine sandy loam.

Delanco soils are low to medium in natural fertility and organic-matter content. They have medium available water capacity, moderate permeability, and moderate shrink-swell potential. They have a moderately deep to deep effective root zone.

Most of the acreage of these soils is in cultivation or in pasture, and the rest is chiefly in forest. A seasonally high water table, infrequent flooding, and in places a moderate erosion hazard because of slope are the main limitations in use of these soils.

Representative profile of Delanco fine sandy loam, 2 to 6 percent slopes, 6 miles east of Brevard in a cultivated field, 2,000 feet southeast of Penrose School and 1,000 feet north of the French Broad River:

Ap—0 to 6 inches, brown (10YR 5/3) fine sandy loam; weak, medium, granular structure; very friable; neutral; clear, smooth boundary.

B21t—6 to 18 inches, yellowish-brown (10YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; medium acid; gradual, smooth boundary.

B22t—18 to 30 inches, brownish-yellow (10YR 6/8) fine sandy clay loam; few, medium, faint, light-gray (10YR 7/1) mottles at a depth of 22 inches, becoming common and distinct at a depth of 30 inches; moderate, medium, subangular blocky structure; firm; thin, discontinuous clay films; strongly acid; gradual, smooth boundary.

B3g—30 to 45 inches, light-gray (10YR 7/1) sandy clay loam; common, medium, distinct, brownish-yellow (10YR 6/6) mottles; weak, coarse, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

Cg—45 to 60 inches, light-gray (10YR 7/1) fine sandy loam; common, medium, distinct, brownish-yellow (10YR 6/6) mottles; massive; friable; many small pockets of sandy clay; very strongly acid.

The solum ranges from 28 to 48 inches in thickness. The A horizon is 4 to 8 inches thick and is very dark grayish brown to brown. The B horizon is sandy clay loam to clay loam 22 to 40 inches thick. It has moderate to weak, medium to coarse, subangular blocky structure. The B2 horizon is yellowish brown to brownish yellow mottled with gray. The C horizon is unconsolidated old alluvial deposits of fine sandy loam to clay loam. Gravel and cobblestones may occur anywhere throughout the profile.

Delanco fine sandy loam, 2 to 6 percent slopes (DeB).—This soil is on low to intermediate stream terraces that are 3 to 10 feet above the flood plains. It occurs as areas of varying shape that range from 3 to 20 acres in size. This soil is smooth and slopes gently toward the streams. It generally adjoins higher, sloping soils on uplands from which it receives runoff. The additional moisture results in this soil not being well drained.

The surface layer is very dark grayish-brown to brown fine sandy loam 4 to 8 inches thick. The subsoil is yellowish brown to brownish yellow mottled with gray, and it becomes gray in the lower part. It is sandy clay loam to clay loam 22 to 40 inches thick.

Included with this soil in mapping were a few areas of Delanco soils that have a loam surface layer, and areas of Delanco soils that are steeper than this soil. Also included were some eroded areas.

Most of the acreage is in cultivation and pasture. This soil is well suited to most pasture, hay, and row crops grown in the county. A seasonally high water table or seepage water can necessitate artificial drainage to get maximum crop potential. On the sloping areas, this soil has an additional hazard of erosion, and if cultivated, needs management that controls runoff and reduces erosion. (Capability unit IIw–2; woodland suitability group 4; wildlife suitability group 1A)

Edneyville Series

The Edneyville series consists of well-drained, sloping to very steep soils. These soils formed under forest vegetation in residuum from granite and granite gneiss. Depth to bedrock and the seasonally high water table is more than 5 feet.

In a typical profile, these soils have a very dark grayish-brown and yellowish-brown fine sandy loam surface layer about 7 inches thick. The subsoil is yellowish-brown and brownish-yellow, friable, dominantly sandy clay loam about 23 inches thick. Below the subsoil, to a depth of about 40 inches, is yellowish-brown sandy loam.

Edneyville soils are low in natural fertility and low to medium in organic-matter content. They have medium available water capacity and moderate permeability. They have a moderately deep to deep effective root zone and low shrink-swell potential.

Nearly all of the acreage is in forest, and a few small areas are in pasture. The forests consist of mixed upland hardwoods and scattered white, pitch, and shortleaf pines. The major limitations in using these soils are the slope and, in some areas, stoniness.

Representative profile of Edneyville fine sandy loam, from an area of Ashe and Edneyville soils, 25 to 45 percent slopes, 6 miles south of Brevard, 0.5 mile southwest of U.S. Highway No. 276 on State Road 1102, and 50 feet north of road:

O2—2 inches to 0, very dark gray (10YR 3/1) decomposed organic matter and oak leaves; many small fibrous roots.

A1—0 to 4 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, fine, granular structure; very friable; many small and few medium roots; very strongly acid; clear, smooth boundary.

A2—4 to 7 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, medium, granular structure; very fri-

able; many small and few medium roots; very strongly acid; gradual, wavy boundary.
B1—7 to 10 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, medium, subangular blocky structure; friable; common small and few medium roots; very strongly acid; clear, smooth boundary.
B2t—10 to 24 inches, yellowish-brown (10YR 5/8) sandy clay loam; weak, medium, subangular blocky structure; friable; few small roots; thin, discontinuous clay films on pores and in root channels; very strongly acid; gradual, wavy boundary.
B3—24 to 30 inches, brownish-yellow (10YR 6/6) sandy clay loam; weak, medium, subangular blocky structure; friable; few small roots; 10 percent soft gneiss fragments; very strongly acid; gradual, wavy boundary.
C—30 to 40 inches, yellowish-brown (10YR 5/8) weathered granite gneiss that is sandy loam mixed with many pieces of partly weathered granite gneiss; rock structure; very strongly acid.

The solum ranges from 20 to 40 inches in thickness. The A horizon is very dark grayish-brown to yellowish-brown fine sandy loam or loam 4 to 10 inches thick. The B horizon is yellowish-brown or brownish-yellow to strong-brown, friable fine sandy loam, loam, sandy clay loam, or clay loam 14 to 30 inches thick. The B2t horizon is less than 18 inches thick. It has weak, fine and medium, subangular blocky structure. The C horizon is weathered granite and granite gneiss that is sandy loam in texture.

Edneyville stony loam, 45 to 70 percent slopes (EdG).—This stony soil is on areas bordering drainageways. The surface layer is very dark grayish-brown to yellowish-brown loam 4 to 8 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is yellowish-brown or brownish-yellow to strong-brown fine sandy loam, loam, sandy clay loam, or clay loam 14 to 30 inches thick. A few rock outcrops are present in places.

Practically all this soil is in woods, and this is a good use. Because of stoniness and slope, this soil is not suited to cultivation. It is poorly suited to pasture. (Capability unit VIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Fannin Series

The Fannin series consists of well-drained, micaceous, sloping to very steep soils. These soils formed under forest vegetation in residuum from mica gneiss. Depth to bedrock is more than 5 feet. The seasonally high water table remains below a depth of 5 feet.

In a typical profile, these soils have a very dark grayish-brown and brown loam surface layer about 6 inches thick. The subsoil is yellowish-red to red, friable fine sandy clay loam about 21 inches thick. Below the subsoil, to a depth of about 72 inches, is red and dark yellowish-brown fine sandy loam that contains many mica flakes.

Fannin soils are low in natural fertility and low to medium in organic-matter content. They have medium available water capacity and moderate permeability. They have a moderately deep to deep effective root zone and low to moderate shrink-swell potential.

Practically all the acreage of these soils is in forest, primarily low-quality hardwoods and scattered shortleaf and pitch pines. The major limitation in the use of these soils is the slope.

Representative profile of Fannin loam, 25 to 45 percent slopes, in Pisgah National Forest, about 3 miles north of Looking Glass Rock, 0.3 mile north of Log Hollow Branch bridge on Headwater Road, in a wooded area, 150 feet north of road:

O1—1 to ½ inch, fresh hardwood leaves.
O2—½ inch to 0, decayed leaves, twigs, and roots laced with mycelium form a matted surface.
A1—0 to 2 inches, very dark grayish-brown (10YR 3/2) loam; moderate, medium, granular structure; very friable; many small and medium roots; common fine mica flakes; very strongly acid; abrupt, smooth boundary.
A2—2 to 6 inches, brown (7.5YR 5/4) loam; weak, fine and medium, granular structure; very friable; many small and medium roots; common fine mica flakes; very strongly acid; clear, smooth boundary.
B21t—6 to 11 inches, yellowish-red (5YR 5/8) fine sandy clay loam; weak, medium, subangular blocky structure; friable; common small and medium roots; thin, discontinuous clay films in root channels; common fine and few coarse mica flakes; very strongly acid; gradual, smooth boundary.
B22t—11 to 17 inches, yellowish-red (5YR 4/8) fine sandy clay loam; weak to moderate, medium, subangular blocky structure; friable; common small and medium roots; thin, discontinuous clay films in root channels; many fine and few coarse mica flakes; very strongly acid; gradual, wavy boundary.
B3—17 to 27 inches, yellowish-red (5YR 5/6) and red (2.5YR 5/6) fine sandy loam; weak, coarse, subangular blocky structure; friable; few small and medium roots; many fine mica flakes; few medium mica gneiss fragments; very strongly acid; gradual, wavy boundary.
C1—27 to 39 inches, red (2.5YR 4/6) crushed fine sandy loam (soft weathered mica gneiss); rock structure; very friable; many fine and coarse mica flakes; very strongly acid; gradual, wavy boundary.
C2—39 to 72 inches, dark yellowish-brown (10YR 4/4) crushed fine sandy loam (weathered mica gneiss harder than in C1 horizon); rock structure; friable; many mica flakes; very strongly acid.

The solum ranges from 20 to 40 inches in thickness. The A horizon is 3 to 6 inches thick and is very dark grayish brown to brown. The B2 horizon is fine sandy loam to clay loam 17 to 34 inches thick and is yellowish red to red. Mica flakes are common to many in the upper part of the B horizon and many in the lower part of the B horizon and the C horizon. The mica gives the horizon a slick, greasy feel. The C horizon is weathered mica gneiss that is commonly fine sandy loam to loam that has a high content of mica.

Fannin loam, 15 to 25 percent slopes (FaE).—This micaceous soil is on ridgetops and upper side slopes. The surface layer is very dark grayish-brown to brown loam 3 to 6 inches thick. The subsoil is yellowish-red to red, friable sandy clay loam to clay loam 17 to 34 inches thick.

Included with this soil in mapping were a few eroded areas. Also included were small areas of Chandler soils.

Most of the acreage of this soil is in woods, and the rest is chiefly in pasture. This soil has a very severe erosion hazard, and intensive management is needed to reduce runoff and erosion if this soil is used for cultivation. It is moderately well suited to hay and pasture. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Fannin loam, 25 to 45 percent slopes (FaF).—This micaceous soil is on side slopes. Areas are irregular in shape and are 10 to 100 acres in size.

This soil has the profile described as representative for the series. The surface layer is very dark grayish-brown to brown loam 3 to 6 inches thick. The subsoil is

yellowish-red to red, friable sandy clay loam to clay loam 17 to 34 inches thick.

Included with this soil in mapping were areas of Chandler and Watauga soils. Also included were small depressions or coves occupied by Brevard soils.

Most of this soil is in forest, mainly low-quality hardwoods and scattered pitch and shortleaf pines. Because of the slope, this soil is not suited to cultivation. A good use is pasture or trees. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Fannin loam, 45 to 70 percent slopes (FaG).—This micaceous soil is on side slopes. The surface layer is very dark grayish-brown to brown loam 3 to 6 inches thick. The subsoil is yellowish-red to red, friable sandy clay loam to clay loam 17 to 30 inches thick.

Included with this soil in mapping were some areas of Chandler soils.

Nearly all of the acreage is in woods, primarily low-quality hardwoods. Because of slope, this soil is unsuited to cultivated crops, hay, or pasture. A good use is for trees. (Capability unit VIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Fletcher Series

The Fletcher series consists of well-drained, sloping to moderately steep soils. These soils formed under forest vegetation in residuum from schist. Depth to bedrock is more than 5 feet. The seasonally high water table remains below a depth of 5 feet.

In a typical profile, these soils have a brown loam surface layer about 7 inches thick. The subsoil is yellowish-red to red silty clay loam or clay loam about 31 inches thick. Below the subsoil, to a depth of about 72 inches, is red silt loam.

Fletcher soils are low in natural fertility and low to medium in organic-matter content. They have medium available water capacity, moderate permeability, and moderate shrink-swell potential. They have a moderately deep to deep effective root zone.

Most of these soils are in forest, and the rest are chiefly in pasture, cultivation, and homesites. The forested areas are in mixed upland hardwoods and shortleaf, pitch, and white pines. They have a heavy undergrowth of mountain-laurel and rhododendron. The major limitation in the use of these soils is the slope.

Representative profile of Fletcher loam, from an area of Fletcher and Fannin soils, 6 to 15 percent slopes, 0.5 mile north of Brevard College, in a wooded area, 200 feet northwest of end of State Road 1355:

Ap—0 to 7 inches, brown (7.5YR 5/4) loam; weak, medium, granular structure; friable; many small and medium roots; strongly acid; abrupt, smooth boundary.

B21t—7 to 11 inches, yellowish-red (5YR 4/8) silty clay loam; weak, fine and medium, subangular blocky structure; friable; common small roots; thin, discontinuous clay films on faces of peds; strongly acid; gradual, smooth boundary.

B22t—11 to 22 inches, red (2.5YR 4/8) silty clay loam; moderate, medium, subangular blocky structure; friable; common small roots; thin, discontinuous clay films on faces of peds; strongly acid; gradual, smooth boundary.

B23t—22 to 38 inches, red (2.5YR 4/8) clay loam; weak, coarse, subangular blocky structure; friable; few small roots; thin, discontinuous clay films in pores; strongly acid; gradual, smooth boundary.

C—38 to 72 inches, red (2.5YR 4/6) crushed silt loam (weathered schist); platelike structure; friable; strongly acid.

The solum ranges from 24 to 50 inches in thickness. The A horizon is 5 to 10 inches thick and is brown to dark brown. The B horizon is yellowish-red to red silty clay loam or clay loam 19 to 40 inches thick. The structure of the B horizon is moderate to weak, fine to coarse, subangular blocky. Schist fragments range from none to common in the B horizon. The C horizon is weathered schist that is silt loam or loam.

These soils have sufficient schist fragments to put them outside the defined range for the Fletcher series. They are enough alike in morphology, composition, and behavior that a new series is not warranted.

Fletcher and Fannin soils, 6 to 15 percent slopes (FfD).—These soils are on smooth, broad ridges in areas underlain by schist. Areas are variable in shape and are 3 to 20 acres in size. Any given area may consist of one or the other of these soils, or of both. The Fletcher soil has the profile described as representative for the series.

The Fletcher soil has a surface layer of brown to dark-brown loam 5 to 10 inches thick and a subsoil of yellowish-red to red silty clay loam to clay loam 19 to 40 inches thick. The Fannin soil has a surface layer of very dark grayish-brown to brown loam 3 to 6 inches thick. It has a subsoil of yellowish-red to red sandy clay loam to clay loam, 17 to 34 inches thick, that contains common to many mica flakes.

Included in mapping were a few eroded areas. Also included were small areas of Brevard and Tusquitee soils.

About half of the acreage of these soils is cleared and is used for pasture, hay, and homesites. The rest is in woods. Because of slope, these soils have a severe erosion hazard, and management is needed to reduce runoff and erosion if these soils are used for cultivated crops. They are well suited to hay and pasture. (Capability unit IIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Fletcher and Fannin soils, 15 to 25 percent slopes (FfE).—These soils are on smooth ridgetops and upper side slopes in areas underlain by schist. Areas are variable in shape and are 3 to 20 acres in size. Any given area may consist of one or the other of these soils, or of both.

The Fletcher soil has a surface layer of brown to dark-brown loam 5 to 10 inches thick. The subsoil is yellowish-red to red silty clay loam to clay loam 19 to 40 inches thick. The Fannin soil has a surface layer of very dark grayish-brown to brown loam 3 to 6 inches thick. It has a subsoil of yellowish-red to red sandy clay loam to clay loam, 17 to 34 inches thick, that contains common to many mica flakes.

Included with these soils in mapping were a few eroded areas. Also included were some small areas of Brevard or Tusquitee soils.

Most of the acreage is in woods, and the rest is in pasture and cultivation. Because of slope, these soils are subject to very severe erosion, and intensive management is needed to reduce runoff and erosion in cultivated areas. They are moderately well suited to hay and pasture. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Hayesville Series

The Hayesville series consists of well-drained, sloping to very steep soils on the broader ridges and smoother positions in the intermountain area. These soils formed under forest vegetation in residuum chiefly from gneiss. Depth to bedrock is more than 5 feet. The seasonally high water table remains below a depth of 5 feet.

In a typical profile, these soils have a surface layer of dark-brown and yellowish-brown fine sandy loam about 7 inches thick. The subsoil is red and yellowish-red, friable to firm clay loam about 33 inches thick. Below the subsoil, to a depth of about 50 inches, is yellowish-brown loam.

Hayesville soils are low in natural fertility and low to medium in organic-matter content. They have high available water capacity, moderate permeability, and moderate shrink-swell potential. They have a moderately deep to deep effective root zone.

Most of the acreage of these soils is in woods, and the rest is chiefly in pasture and cultivation. The wooded areas are dominantly in scarlet, white, and red oaks, and, to a lesser extent, in white and shortleaf pines. Slope is the major limitation to use of these soils.

Representative profile of Hayesville fine sandy loam, 6 to 15 percent slopes, 0.5 mile east of Penrose Post Office, 1,000 feet south of State Road 1504, in a wooded area, 50 feet east of farm road:

O1—½ inch to 0, pine needles.

A1—0 to 1 inch, dark-brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; very friable; many small roots; very strongly acid; clear, smooth boundary.

A2—1 to 7 inches, yellowish-brown (10YR 5/4) fine sandy loam; moderate, fine and medium, granular structure; very friable; many small roots; very strongly acid; clear, smooth boundary.

B1—7 to 12 inches, yellowish-red (5YR 4/6) clay loam; weak, medium, subangular blocky structure; friable; few small roots; very strongly acid; gradual, smooth boundary.

B21t—12 to 22 inches, yellowish-red (5YR 4/8) clay loam; moderate, medium, subangular blocky structure; friable; few small roots; thin, continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B22t—22 to 34 inches, red (2.5YR 4/8) clay loam; moderate, medium, subangular blocky structure; friable and firm; few small roots; thin, continuous clay films on faces of peds; very strongly acid; gradual, smooth boundary.

B3t—34 to 40 inches, yellowish-red (5YR 4/8) clay loam; weak, medium, subangular blocky structure; friable; thin, discontinuous clay films; 10 percent coarse fragments of soft gneiss; very strongly acid; gradual, smooth boundary.

C—40 to 50 inches, yellowish-brown (10YR 5/6) loam (weathered gneiss); massive; very friable; many feldspar fragments; very strongly acid.

The solum ranges from 24 to 48 inches in thickness. The A horizon is fine sandy loam or clay loam 3 to 10 inches thick and is dark brown to reddish brown. The B horizon is friable to firm clay loam to clay 20 to 38 inches thick. It is red to yellowish red and has weak to moderate, medium, subangular blocky structure. The C horizon is dominantly weathered gneiss, and it ranges from loam to sandy clay loam containing few to many rock fragments and unweathered primary minerals.

Hayesville fine sandy loam, 6 to 15 percent slopes (HaD).—This soil is on the broader ridges of the less mountainous areas. Areas are irregular in shape and are 4 to 20 acres in size. This soil has the profile described as representative for the series. The surface layer is dark-brown to reddish-brown fine sandy loam 4 to 10 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam 20 to 38 inches thick.

Included in mapping were some eroded areas where the surface layer is a mixture of the original surface layer and the subsoil.

Most of the acreage of this soil is in forest, and the rest is in pasture, cultivation, and homesites. It is well suited to most locally grown crops. Because of slope, the erosion hazard is severe if this soil is cultivated, and management is needed that will effectively control runoff and erosion. (Capability unit IIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Hayesville fine sandy loam, 15 to 25 percent slopes (HaE).—This soil is on smooth broad ridges and side slopes. Areas are irregular in shape and are 5 to 40 acres in size. The surface layer is dark-brown to reddish-brown fine sandy loam 4 to 8 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam to clay 20 to 38 inches thick.

Included with this soil in mapping were areas of Chester soils. Also included were small areas of Fannin soils.

Most of the acreage of this soil is in woodland, and the rest is chiefly in pasture, cultivation, and homesites. Because of the slope, the erosion hazard is very severe if this soil is cultivated. Intensive management is needed that will effectively control runoff and erosion. Hay and pasture are moderately well suited. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Hayesville fine sandy loam, 25 to 50 percent slopes (HaF).—This soil is on smooth side slopes that border drainageways. Areas are irregular in shape and are 6 to 30 acres in size. The surface layer is dark-brown to reddish-brown fine sandy loam 4 to 8 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam to clay 20 to 36 inches thick.

Included with this soil in mapping were a few small areas that have stones on the surface.

Most of this soil is in forest, but a few small areas are in pasture. Because of slope, this soil is not suited to cultivated crops or hay. It is moderately well suited to pasture. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Hayesville clay loam, 10 to 25 percent slopes, severely eroded (HcE3).—This soil (fig. 4) is in areas that are somewhat rectangular in shape and are 2 to 15 acres in size. The surface layer is reddish-brown clay loam 3 to 5 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam to clay 20 to 36 inches thick.

Included with this soil in mapping were some areas where gullies have cut through the surface layer and subsoil and into the parent material.

Most of this soil is wooded. The trees are chiefly white, pitch, or Virginia pines. Because of severe erosion and slope, this soil is not suited to row crops and only moderately well suited to hay and pasture. (Capability unit VIe–1; woodland suitability group 7; wildlife suitability group 1B)

Figure 4.—**An eroded area where most of the surface layer has been lost. The soil is Hayesville clay loam, 10 to 25 percent slopes, severely eroded.**

Haywood Series

The Haywood series consists of well drained and moderately well drained, moderately steep to very steep soils in coves and on toe slopes. These soils formed under forest vegetation in local alluvium derived from materials on the adjoining slopes. Depth to bedrock is more than 5 feet. Depth to seasonally high water table is more than 5 feet.

In a typical profile, these soils have a surface layer of very dark brown and very dark grayish-brown loam, about 30 inches thick, that contains stones. The next layer is yellowish-brown fine sandy loam about 20 inches thick. Below this, to a depth of about 56 inches, is dark-brown loam.

Haywood soils are medium in natural fertility and high in organic-matter content. They are moderate to high in available water capacity and moderately rapid in permeability. They have a deep to very deep effective root zone and low shrink-swell potential.

Practically all the acreage of these soils is in forest, dominantly yellow-poplar, northern red oak, black birch, and black cherry. The slope and stoniness are the major limitations in the use of these soils.

Representative profile of Haywood loam, from an area of Haywood stony loam, 15 to 25 percent slopes, in Pisgah National Forest, 3 miles southwest of Cradle of Forestry, in a wooded area, 20 feet north of old logging road near head of Rockhouse Creek:

O1—1 inch to 0, mat of hardwood leaves.

A1—0 to 7 inches, very dark brown (10YR 2/2) loam; moderate, very coarse, granular structure; friable; many small and medium roots; few fine mica flakes; about 2 percent angular granitic stones and cobblestones; slightly acid; clear, wavy boundary.

A3—7 to 30 inches, very dark grayish-brown (10YR 3/2) loam; weak, fine and coarse, granular structure; very friable; common small and medium roots; few fine mica flakes; about 2 percent angular granitic stones and cobblestones; strongly acid; clear, wavy boundary.

C—30 to 50 inches, yellowish-brown (10YR 5/6) fine sandy loam; weak, fine and medium, granular and subangular blocky structure; very friable; few small roots; few fine mica flakes; about 25 percent coarse fragments of weathered gneiss; strongly acid; abrupt, wavy boundary.

Ab—50 to 56 inches, dark-brown (10YR 3/3) loam; weak, medium and coarse, granular structure; very friable; medium acid.

The solum ranges from 30 to 80 inches in thickness. The A horizon is 20 to 30 inches thick and is black to very dark brown. The C horizon is 20 to 50 inches thick and is yellowish-brown to dark-brown loam or fine sandy loam. Underlying this is an old buried soil or stony or gravelly sandy loam material.

Haywood stony loam, 15 to 25 percent slopes (HdE).—This stony soil is in coves and on toe slopes. Areas are irregular in shape and are 2 to 25 acres in size. This soil has the profile described as representative for the series. The surface layer is black to very dark brown loam 20 to 30 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The underlying material is yellowish-brown to dark-brown loam or fine sandy loam 20 to 50 inches thick.

Included in mapping were areas of similar soils that have a thinner surface layer.

Nearly all of the acreage is in forest. Because of stoniness and slope, this soil is not suited to cultivated crops or hay. It is moderately well suited to pasture. (Capability unit VIe–2; woodland suitability group 5; wildlife suitability group 1A)

Haywood stony loam, 25 to 50 percent slopes (HdF).—This stony soil is in coves and on toe slopes. The surface layer is black to very dark brown loam 20 to 30 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The underlying material is yellowish-brown to dark-brown loam or fine sandy loam 20 to 50 inches thick.

Nearly all of the acreage is in forest. Because of stoniness and slope, this soil is not suited to cultivated crops or hay and is poorly suited to pasture. A good use is for trees. (Capability unit VIIe–1; woodland suitability group 5; wildlife suitability group 1A)

Ponzer Series, Cool Variant

This variant of the Ponzer series consists of very poorly drained, nearly level soils on stream flood plains that are subject to very frequent flooding of very brief duration. Depth to bedrock is more than 5 feet. The seasonally high water table is at the surface for long periods of time.

In a typical profile, these soils have a muck layer about 35 inches thick that is black in the upper part and very dark gray and very dark brown in the lower part. Below this layer, to a depth of about 65 inches, is dark grayish-brown fine sandy loam stratified with layers of loamy fine sand and silt loam.

Ponzer soils are low in natural fertility and high in organic-matter content. They have high available water capacity, moderate permeability, high shrink-swell potential, and a deep effective root zone.

Most of the acreage is cleared and is used for cultivation or pasture. A seasonally high water table and very frequent flooding are the major limitations in using these soils. Flooding is generally of brief duration.

Representative profile of Ponzer muck, cool variant, 2 miles south of Penrose, 0.3 mile south of State Road

No. 1528, in cultivated field, 20 feet south of elbow of field road:

Oap—0 to 8 inches, black (10YR 2/1) decomposed organic matter (muck); about 20 percent organic matter; moderate, medium and coarse, granular structure; friable, slightly sticky; many small roots; few fine mica flakes; very strongly acid; gradual, smooth boundary.

Oa2—8 to 20 inches, very dark gray (10YR 3/1) decomposed organic matter (muck); approximately 35 percent organic matter; high content of loamy mineral soil; less than 10 percent rubbed fiber; massive; friable, slightly sticky; common small roots; few fine mica flakes; very strongly acid; gradual, smooth boundary.

Oa3—20 to 35 inches, very dark brown (10YR 2/2) decomposed organic matter (muck); approximately 35 percent organic matter; a high content of loamy mineral soil; less than 10 percent rubbed fiber; massive; slightly sticky; very strongly acid; gradual, smooth boundary.

IIBb—35 to 65 inches, dark grayish-brown (10YR 4/2) fine sandy loam; stratified with layers of loamy fine sand and silt loam; massive; friable; very strongly acid.

The organic layer is black to very dark gray muck that is more than 20 percent organic matter. It is 16 to 40 inches thick and is underlain by stratified loamy materials.

These soils are variants of the Ponzer series. They are in a somewhat colder climate than is normal for the Ponzer series and have a mean annual soil temperature less than 59° F., but are otherwise similar.

Ponzer muck, cool variant (Pm).—This nearly level soil is on stream flood plains. It occurs as somewhat circular shaped areas in low pockets of the larger flood plains. It has a surface layer of black to very dark gray muck that is more than 20 percent organic matter and is 16 to about 40 inches thick. The underlying layers are stratified loamy materials.

Included with this soil in mapping were small areas of soils that have a lower content of organic matter in the surface layer.

Most of the acreage is in cultivation or pasture, and the rest is chiefly in forest. This soil is moderately well suited to most locally grown crops. It is easy to keep in good tilth and can be worked throughout a wide range of moisture content. The major limitations in the use of this soil are very frequent flooding and a seasonally high water table. Artificial drainage is required for most crops. (Capability unit IIIw–1; woodland suitability group 2; wildlife suitability group 4)

Porters Series

The Porters series consists of well-drained, moderately steep to steep soils on ridgetops and side slopes of the higher mountains, mostly at elevations above 3,500 feet. These soils formed under forest vegetation in residuum from gneiss. Depth to bedrock ranges from 2 to 6 feet. The seasonally high water table remains at a depth below 5 feet.

In a typical profile, these soils have a dark-brown loam surface layer about 9 inches thick. The subsoil is dominantly brown, very friable clay loam about 20 inches thick. Below this layer, to a depth of 45 inches, is gravelly sandy loam.

Porters soils are medium in natural fertility and high in organic-matter content. They have high available water capacity, moderately rapid permeability, and low shrink-swell potential. They have a moderately deep effective root zone.

Nearly all of the acreage is owned by the Federal Government and is administered by the Forest Service. Most areas are in forest. The chief limitation in the use of these soils is slope, and, in places, stoniness and depth to bedrock.

Representative profile of Porters loam, 25 to 45 percent slopes, Pisgah National Forest, 1.5 miles north of Gloucester Gap, on U.S. Forest Service Road, in wooded area 20 feet north of the road:

O1—2 inches to 1 inch, hardwood leaves and twigs.

O2—1 inch to 0, decomposed leaf mold laced with live roots and mycelia.

A1—0 to 9 inches, dark-brown (10YR 3/3) loam; moderate, fine and medium, granular structure; very friable; many small and medium roots; few fine mica flakes; strongly acid; abrupt, smooth boundary.

B2t—9 to 25 inches, brown (7.5YR 4/4) clay loam; weak, medium, subangular blocky structure; very friable; common small and medium roots; common medium and large pores; thin, discontinuous clay films on faces of peds, in old root channels, and in earthworm burrows; common fine mica flakes; about 2 percent angular quartzite and banded gneiss cobblestones; medium acid; gradual, wavy boundary.

B3—25 to 29 inches, yellowish-brown (10YR 5/4) fine sandy loam; weak, coarse, subangular blocky structure, very friable; few medium and large roots; common mica flakes; few, small and medium, partly weathered gneiss rock fragments; medium acid; gradual, wavy boundary.

C—29 to 45 inches, gneiss saprolite consisting of weathered feldspar, hornblende, and other minerals; crushes to gravelly sandy loam; massive; friable; medium acid.

R—45 inches +, banded gneiss.

The solum ranges from 20 to 40 inches in thickness. The A horizon is 6 to 10 inches thick and is very dark grayish brown to dark brown. The B2t horizon is very friable to friable loam, clay loam, or sandy clay loam 14 to 30 inches thick. It is dark yellowish brown to strong brown and has weak, fine to coarse, subangular blocky structure. The C horizon contains few to many gneiss fragments, and it is commonly gravelly sandy loam to loam. In some areas the C horizon is lacking.

Porters loam, 15 to 25 percent slopes (PoE).—This soil is on the ridgetops of the higher mountains in irregularly shaped areas 5 to 25 acres in size. The surface layer is very dark grayish-brown or dark-brown loam 6 to 10 inches thick. The subsoil is dark yellowish-brown or strong-brown loam, clay loam, or sandy clay loam 14 to 30 inches thick.

Included with this soil in mapping were a few areas where the slope is less than 15 percent. Also included were small areas of soils having sufficient gravel and stones in the surface layer to interfere with cultivation in some places.

Most of the acreage of this soil is in woods, and the rest is chiefly in pasture and cultivation. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is well suited to most pasture and hay crops. Because of slope, it is only fairly well suited to row crops. If cultivated, this soil has a very severe erosion hazard, and intensive management is needed for effective control of runoff and erosion. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Porters loam, 25 to 45 percent slopes (PoF).—This is a well-drained soil in fairly long, wide bands up to 40

acres in size. It has the profile described as representative for the series.

The surface layer is very dark grayish-brown to dark-brown loam 6 to 10 inches thick. The subsoil is dark yellowish-brown to strong-brown loam, clay loam, or sandy clay loam 14 to 25 inches thick.

Included with this soil in mapping were a few areas where the slope is greater than 45 percent. Gravel and stones interfere with tillage in a few places.

Most of the acreage is in forest of mixed hardwoods. Because of slope, this soil is not suited to cultivated crops or hay. It is well suited to most locally grown pasture plants, particularly bluegrass. A good use for this soil is for pasture or trees. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Porters stony loam, 15 to 45 percent slopes (PrF).—This soil is well drained and stony and is on smooth ridges and side slopes of the higher mountains. Areas are irregular in shape and are 10 to 100 acres in size.

The surface layer is very dark grayish-brown to dark-brown loam 6 to 10 inches thick. Stones more than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is dark yellowish-brown or strong-brown loam, clay loam, or sandy clay loam 14 to 30 inches thick.

Included with this soil in mapping were areas of Brandywine, Haywood, and Tusquitee soils.

Most of the acreage is in woods. Because of slope and stoniness, it is not suited to cultivation and is poorly suited to pasture. A good use for this soil is trees. (Capability unit VIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Rock Outcrop

Rock outcrop (Rk) consists of small areas where bedrock or loose stones cover more than 90 percent of the surface (fig. 5). It occurs in small areas on steep slopes of the more mountainous sections of the county, and its total acreage is small. It consists of both acidic and basic rocks.

Because of the rock and stones, this miscellaneous land type is suitable only for recreation, wildlife, and for its esthetic qualities. (Capability unit VIIIs–1; woodland suitability group 11; not placed in a wildlife suitability group)

Rosman Series

The Rosman series consists of well-drained to moderately well drained, nearly level soils on the stream flood plains that are subject to very frequent flooding of very brief duration. These soils formed in recent alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at a depth of about 2½ feet during winter.

In a typical profile, these soils have a very dark grayish-brown and dark-brown fine sandy loam surface layer about 15 inches thick. The next layer is dark yellowish-brown loam and fine sandy loam, about 35 inches thick, that is underlain by stratified sand and gravel.

Rosman soils are low to medium in natural fertility, medium in organic-matter content, and medium in available water capacity. They have moderately rapid permeability, low shrink-swell potential, and a deep effective root zone.

Figure 5.—Rock outcrop.

Most of the acreage is cleared and used for pasture or crops. Very frequent flooding of very brief duration is the major limitation to the use of these soils. A seasonally high water table, seepage water from adjoining slopes, and ponding are minor limitations in some places.

Representative profile of Rosman fine sandy loam, 0.3 mile northwest of Pisgah Forest Post Office in a cultivated field, 200 feet east of abandoned church:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; very friable; few fine mica flakes; slightly acid; clear, smooth boundary.

A12—10 to 15 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine and medium, granular structure; very friable; few fine mica flakes; slightly acid; clear, smooth boundary.

C1—15 to 21 inches, dark yellowish-brown (10YR 4/4) loam; massive; very friable; common fine mica flakes; strongly acid; clear, smooth boundary.

C2—21 to 35 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; few, medium, distinct, grayish-brown (10YR 5/2) mottles; massive; very friable; common fine mica flakes; strongly acid; clear, smooth boundary.

C3—35 to 50 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; many, medium, distinct, grayish-brown

(10YR 5/2) mottles in lower parts; massive; very friable; common fine mica flakes; strongly acid; clear, smooth boundary.

IIC4—50 to 60 inches, stratified sand and gravel; single grain; strongly acid.

The Rosman soils are 35 to 60 inches thick and are underlain by unconforming material. The A horizon is fine sandy loam and loam 10 to 20 inches thick and is very dark grayish brown to dark brown. The C horizon is loam, fine sandy loam, or silt loam 25 to 40 inches thick and is brown to dark yellowish brown. Few to many gray mottles occur at a depth below 20 inches in places. The IIC horizon is stratified sand, loamy sand, silt, and gravel or stones.

Rosman fine sandy loam (Ro).—This nearly level soil is on stream flood plains. The areas are irregular in shape and are between the stream and adjoining uplands or the stream and a more poorly drained soil.

This soil has the profile described as representative of the series. The surface layer is very dark grayish-brown or dark-brown fine sandy loam 10 to 20 inches thick. The next layer is brown or dark yellowish-brown loam, fine sandy loam, or silt loam 25 to 40 inches thick.

Included with this soil in mapping were small areas of similar soils that are somewhat poorly drained.

Most of the acreage is cleared and is in pasture or cultivation. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is well suited to most locally grown crops. The major limitation to the use of this soil is very frequent flooding (fig. 6). (Capability unit IIw–1; woodland suitability group 1; wildlife suitability group 3)

Rosman soils (Rs).—This undifferentiated group consists of nearly level soils on stream flood plains and along drainageways. It occurs as long, narrow strips 4 to 12 acres in size. More than 40 percent of the unit is Rosman soils, which have a very dark grayish-brown to dark-brown fine sandy loam and loam surface layer 10 to 20 inches thick. Below this is brown to dark yellowish-brown loam, fine sandy loam, and silt loam 25 to 40 inches thick. The rest of the acreage includes soils that are similar in texture but are somewhat poorly drained and poorly drained.

Included with these soils in mapping were small areas of Toxaway soils.

Figure 6.—Flooding in a field of young pole beans. The soil is Rosman fine sandy loam.

More than half the acreage is in pasture or cultivation, and the rest is in woods. These soils are fairly well suited to most locally grown crops. The major limitations in using these soils are very frequent flooding and seepage water from adjoining slopes. Artificial drainage is needed on the wet areas. (Capability unit IIw–1; woodland suitability group 1; wildlife suitability group 3)

Stony Colluvial Land

Stony colluvial land (Sc) consists of areas in which 25 to 70 percent of the soil mass is made up of stones. It occurs in coves and on toe slopes in association with steep, stony upland soils. The soil material filling the spaces between the stones is dark-brown to yellowish-brown loam, fine sandy loam, or clay loam.

Stoniness makes this land type unsuitable for cultivation. It is fairly well suited to pasture grasses, but management that requires the use of equipment is impractical. It is practically all in forest, predominantly yellow-poplar, yellow and black birches, and northern red oak. (Capability unit Vs–1; woodland suitability group 11; not placed in a wildlife suitability group)

Stony Land

Stony land (St) consists of upland areas where exposed bedrock or loose stones (fig. 7) cover 25 to 90 percent of the surface. It is mostly on the steeper slopes in the more mountainous areas particularly along the southern rim of the county and the northern section.

Stones and rock outcrops are sufficiently numerous to make the areas unsuitable for cultivation. The soil between the stones varies in thickness, but in most places it is thin.

Most of the acreage is in trees, primarily low-quality hardwoods. A good use for this land type is trees or wildlife. (Capability unit VIIs–1; woodland suitability group 11; not placed in a wildlife suitability group)

Suncook Series

The Suncook series consists of excessively drained, nearly level soils on stream flood plains. They are sub-

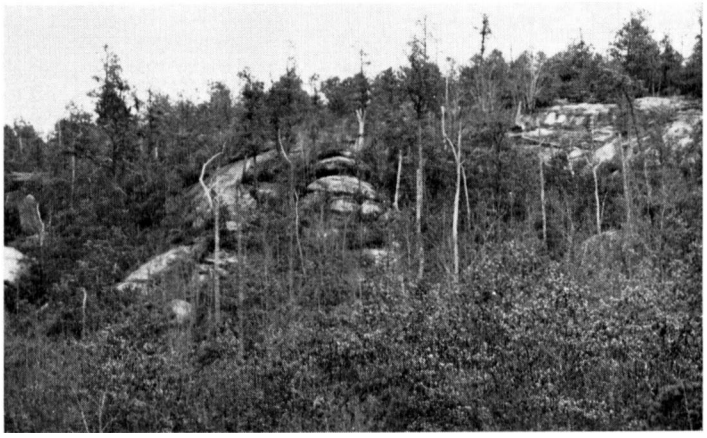

Figure 7.—An area of Stony land.

ject to very frequent flooding of very brief duration. They formed in recent alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at a depth of about 3 feet.

In a typical profile, these soils have a dark-brown loamy sand surface layer about 6 inches thick. The underlying layers, to a depth of more than 50 inches, are dark yellowish-brown and dark-brown loamy fine sand and fine sand. They are underlain at some depth by gravel or stones.

Suncook soils are very low in natural fertility and low to medium in organic-matter content. They have low available water capacity and a low shrink-swell potential. Permeability is rapid.

Most of the acreage is cleared and used for pasture or crops. The major limitations to the use of these soils are very frequent flooding and droughtiness.

Representative profile of Suncook loamy sand, 0.5 mile east of Penrose Post Office, 1,000 feet east of bridge on State Road 1528, in cultivated field, 100 feet north of the French Broad River:

Ap—0 to 6 inches, dark-brown (10YR 4/3) loamy sand; single grain; loose; strongly acid; gradual, wavy boundary.

C1—6 to 12 inches, dark yellowish-brown (10YR 4/4) loamy fine sand; single grain; loose; common mica; strongly acid; gradual, wavy boundary.

C2—12 to 50 inches, dark-brown (7.5YR 4/4) fine sand; single grain; loose; common mica; strongly acid.

The A horizon is 6 to 12 inches thick and is dark brown or dark yellowish brown. The C horizon is loamy fine sand or loamy sand to sand 30 to 75 inches or more in thickness and is dark brown or dark yellowish brown to yellowish brown. These soils are underlain at some depth by gravel or stones.

Suncook loamy sand (Su).—This nearly level soil is on stream flood plains and is subject to very frequent flooding of very brief duration. It has a surface layer of dark-brown to dark yellowish-brown loamy sand 6 to 12 inches thick. In places the surface layer is sand and is very dark grayish brown. The underlying layers are dark-brown to yellowish-brown loamy fine sand or loamy sand to sand 30 to 75 inches or more thick.

The soil is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content.

A large percentage of the acreage is in pasture. The rest is in row crops or trees. This soil is only fairly well suited to locally grown crops. Very frequent flooding and droughtiness are major limitations to the use of this soil. (Capability unit IIIs–1; woodland suitability group 3; wildlife suitability group 3)

Talladega Series

The Talladega series consists of well-drained, steep to very steep soils on narrow convex ridgetops and uneven side slopes. These soils formed under forest vegetation in residuum from schist. Depth to bedrock is 1 to 4 feet. The seasonally high water table is below 5 feet.

In a typical profile, these soils have a surface layer of dark-brown and dark yellowish-brown silt loam about 4 inches thick. The subsoil is strong-brown, friable channery silt loam or channery silty clay loam about 14 inches thick. Below this layer, to a depth of about 40 inches, is strong-brown channery silt loam.

Talladega soils are very low to low in natural fertility and low to medium in organic-matter content. They are low in available water capacity and have a shallow to moderately deep effective root zone. They have moderate permeability and low shrink-swell potential.

Most of the acreage of these soils is in forest, predominantly low-quality hardwoods and scattered white, pitch, and shortleaf pines. Slope and droughtiness are the major limitations to the use of these soils for crops.

Representative profile of Talladega silt loam, 25 to 45 percent slopes, 5 miles northeast of Brevard, 1.6 miles north of U.S. Highway No. 64, in wooded area, 30 feet south of State Road 1507:

O2—1 inch to 0, decaying leaves and twigs; mass of abundant small roots.

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

A2—2 to 4 inches, dark yellowish-brown (10YR 4/4) silt loam; moderate, fine and medium, granular structure; friable; many small and medium roots; 5 percent small hard schist fragments; very strongly acid; clear, wavy boundary.

B2t—4 to 18 inches, strong-brown (7.5YR 5/6) channery silty clay loam; weak, medium, subangular blocky structure; friable; common small roots; thin, discontinuous clay films; 40 percent coarse hard schist fragments; very strongly acid; clear, irregular boundary.

C—18 to 40 inches, strong-brown (7.5YR 5/6) weathered schist that crushes easily to channery silt loam; rock structure; friable; 60 percent coarse schist fragments; very strongly acid; clear, irregular boundary.

R—40 inches +, moderately hard schist rock.

The solum ranges from 10 to 28 inches in thickness. The A horizon is silt loam or channery silt loam 3 to 10 inches thick and is dark brown to dark yellowish brown. The B horizon is 7 to 18 inches thick and is channery silt loam or channery silty clay loam that contains many coarse schist fragments. It is yellowish brown to yellowish red. The C horizon consists of yellowish-brown or strong-brown to yellowish-red channery silt loam or channery silty clay loam in crevices between weathered schist fragments.

Talladega silt loam, 25 to 45 percent slopes (TaF).—This soil is on uneven mountain side slopes. Areas are irregular in shape and are 6 to 50 acres in size.

This soil has the profile described as representative for the series. The surface layer is dark-brown to dark yellowish-brown silt loam 3 to 10 inches thick. The subsoil is yellowish-brown to yellowish-red channery silt loam or channery silty clay loam 7 to 18 inches thick. It contains many coarse schist fragments.

Included with this soil in mapping were areas where the slope is less than 25 percent. Also included were small areas that have a channery surface layer, as well as areas of Rock outcrop.

Practically all of the acreage is forested. A small percentage is cleared and in pasture. Because of slope and low available water capacity, this soil is unsuited to cultivation and poorly suited to pasture. A good use for this soil is trees. (Capability unit VIIe–1; woodland suitability group 9; wildlife suitability group 2)

Talladega channery silt loam, 45 to 70 percent slopes (TcG).—This soil is on mountain side slopes. Thin, flat schist fragments make up 15 to 50 percent of the surface

layer. Areas are irregular in shape and are 10 to 70 acres in size.

The surface layer is dark-brown to dark yellowish-brown channery silt loam 3 to 8 inches thick. The subsoil is yellowish-brown to yellowish-red channery silt loam or channery silty clay loam, 7 to 18 inches thick, that contains many coarse schist fragments.

Nearly all of this soil is in forest. Because of slope and low available water capacity, it is unsuited to cultivation and poorly suited to pasture. A good use for this soil is trees. (Capability unit VIIs–1; woodland suitability group 9; wildlife suitability group 2)

Tate Series

The Tate series consists of well-drained, gently sloping to moderately steep soils in upland draws and on foot slopes. These soils formed under forest vegetation in local alluvial deposits washed from the surrounding uplands. Depth to bedrock is more than 4 feet. The seasonally high water table is at a depth of about 2½ feet.

In a typical profile, these soils have a dark grayish-brown fine sandy loam surface layer about 6 inches thick. The upper part of the subsoil is yellowish-brown or brownish-yellow fine sandy clay loam and clay loam about 22 inches thick. The lower part of the subsoil is brownish-yellow fine sandy loam about 10 inches thick. Below the subsoil, to a depth of more than 60 inches, is yellow and light brownish-gray sandy clay loam that contains a small amount of gravel.

Tate soils are low in natural fertility, low to medium in organic-matter content, and high in available water capacity. They have a deep to very deep effective root zone, moderate permeability, and low shrink-swell potential.

Most of the acreage of these soils is in forest. The rest is chiefly in pasture, hay, or row crops. Slope is the major limitation to the use of these soils.

Representative profile of Tate fine sandy loam, 6 to 15 percent slopes, 7 miles south of Brevard, 2 miles south of U.S. Highway No. 276, in a pasture 50 feet east of State Road 1106:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) fine sandy loam; weak, medium, granular structure; friable; strongly acid; abrupt, smooth boundary.

B21t—6 to 18 inches, yellowish-brown (10YR 5/8) fine sandy clay loam; weak, medium, subangular blocky structure; friable; thin, discontinuous clay films on faces of peds; strongly acid; clear, smooth boundary.

B22t—18 to 30 inches, brownish-yellow (10YR 6/8) clay loam; moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films on faces of peds; strongly acid; clear, smooth boundary.

B3—30 to 40 inches, brownish-yellow (10YR 6/8) fine sandy loam; distinct, common, gray mottles and few strong-brown mottles; weak, medium, subangular blocky structure; very friable; strongly acid; abrupt, smooth boundary.

IIC1—40 to 50 inches, yellow (10YR 7/6) fine sandy clay loam; massive; firm; strongly acid; abrupt, smooth boundary.

IIC2—50 to 60 inches, light brownish-gray (10YR 6/2) sandy clay loam; massive; friable; few fine and medium quartz pebbles; strongly acid.

The solum ranges from 30 to 40 inches in thickness. The A horizon is 6 to 12 inches thick and is very dark grayish brown to brown. The B horizon is dominantly clay loam and fine sandy clay loam, but it ranges to loam or fine sandy loam. It is 24 to 34 inches thick and is yellowish brown to brownish yellow. It has weak to moderate, medium, subangular blocky structure. The C horizon is local alluvium that is commonly sandy clay loam to fine sandy loam that contains few to many subrounded quartz pebbles or stones.

Tate fine sandy loam, 2 to 6 percent slopes (TeB).—This soil is in upland draws and on foot slopes in small areas. The surface layer is very dark grayish-brown to brown fine sandy loam 6 to 12 inches thick. The subsoil is yellowish-brown to brownish-yellow clay loam, fine sandy clay loam, loam, or fine sandy loam 24 to 34 inches thick.

Included with this soil in mapping were areas of moderately well drained and well drained soils on low stream terraces. Also included were a few small areas of somewhat poorly drained soils along the drainageways.

Most of the acreage of this soil is in forest, and the rest is in row crops, hay, or pasture. This soil is well suited to most locally grown crops. It is easy to keep in good tilth and can be worked throughout a wide range of moisture content. If used for row crops, this soil has a moderate erosion hazard because of slope. Conservation practices are needed to control runoff and erosion. (Capability unit IIe–1; woodland suitability group 5; wildlife suitability group 1A)

Tate fine sandy loam, 6 to 15 percent slopes (TeD).—This soil is in upland draws and on foot slopes in small areas 2 to 10 acres in size.

This soil has the profile described as representative for the series. The surface layer is very dark grayish-brown to brown fine sandy loam 6 to 12 inches thick. The subsoil is yellowish-brown to brownish-yellow clay loam, fine sandy clay loam, loam, or fine sandy loam 24 to 34 inches thick.

Included with this soil in mapping were areas of Brevard and Tusquitee soils.

This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is well suited to most locally grown crops.

Most of the acreage of this soil is in forest, and the rest is chiefly in hay or pasture. Because of slope, this soil has a severe erosion hazard if cultivated, and conservation practices are needed to effectively control runoff and limit erosion. (Capability unit IIIe–1; woodland suitability group 5; wildlife suitability group 1A)

Tate fine sandy loam, 15 to 25 percent slopes (TeE).—This soil is in upland draws and on foot slopes in areas 2 to 10 acres in size. The surface layer is very dark grayish-brown to brown fine sandy loam 6 to 12 inches thick. The subsoil is yellowish-brown to brownish-yellow clay loam, fine sandy clay loam, or loam 24 to 34 inches thick.

Included with this soil in mapping were small areas of Brevard and Tusquitee soils.

Most of the acreage of this soil is in forest, and the rest is chiefly in pasture or hay. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is well suited to locally grown pasture and hay plants, but because of slope, it is only fairly well suited to row crops.

If this soil is cultivated, the erosion hazard is very severe and intensive conservation practices are needed

to reduce runoff and control erosion. (Capability unit IVe–1; woodland suitability group 5; wildlife suitability group 1A)

Toxaway Series

The Toxaway series consists of very poorly drained, nearly level soils on the stream flood plains that are subject to very frequent, very brief flooding. These soils formed in recent alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at the surface.

In a typical profile, these soils have a surface layer of very dark gray and very dark grayish-brown silt loam about 30 inches thick. The subsoil is very dark grayish-brown silty clay loam about 9 inches thick. Below the subsoil, to a depth of more than 50 inches, is dark-gray loam.

Toxaway soils are low to medium in natural fertility and are high in organic-matter content and available water capacity. They have moderate permeability and shrink-swell potential and a deep effective root zone.

Most of the acreage of these soils is in row crops or pasture, and the rest is in forest. Very frequent, very brief flooding and a seasonally high water table are the major limitations to the use of these soils.

Representative profile of Toxaway silt loam, 3 miles south of Brevard on State Route 1114, in a pasture, 300 feet southeast of bridge over the French Broad River:

Ap—0 to 10 inches, very dark gray (10YR 3/1) silt loam; weak, fine and medium, granular structure; friable; strongly acid; clear, smooth boundary.

A12—10 to 30 inches, very dark grayish-brown (2.5Y 3/2) silt loam; weak, medium, granular structure; friable; very strongly acid; clear, smooth boundary.

Bg—30 to 39 inches, very dark grayish-brown (2.5Y 3/2) silty clay loam; common, medium, distinct, gray (10YR 6/1) mottles; massive; firm; very strongly acid; clear, smooth boundary.

Cg—39 to 50 inches, dark-gray (N 4/0) loam; common, medium, distinct, very dark grayish-brown (10YR 3/2) mottles; massive; friable; common fine mica flakes; very strongly acid.

The solum ranges from 30 to 60 inches in thickness. The A horizon is 24 to 40 inches thick and is black to very dark gray or very dark grayish brown. The B horizon is loam, silt loam, or silty clay loam, 6 to 20 inches thick, and is very dark grayish brown to grayish brown. Underlying this horizon are dark-gray to gray loamy to sandy alluvial deposits.

Toxaway silt loam (To).—This nearly level soil is on stream flood plains. It is subject to very frequent, very brief flooding. It occurs in irregularly shaped, depressed areas on the larger flood plains. The areas range from 2 to 25 acres in size.

This soil has the profile described as representative for the series. The surface layer is black to very dark gray or very dark grayish-brown silt loam 24 to 40 inches thick. The subsoil is very dark grayish-brown to grayish-brown loam, silt loam, or silty clay loam 6 to 20 inches thick.

Included with this soil in mapping were some areas of soils that have similar texture but are poorly drained. Also included were soils that have similar drainage but have a finer textured subsoil.

Most of the acreage of this soil is in pasture or cultivation, and the rest is in forest. If drained, this soil is well suited to most locally grown crops. It is easy to keep in good tilth and can be worked throughout a wide range of moisture content. The major limitations to the use of this soil are very frequent flooding and a seasonally high water table. (Capability unit IIIw–1; woodland suitability group 2; wildlife suitability group 4)

Toxaway soils (To).—This undifferentiated group consists of nearly level soils on flood plains along medium to small streams. About 50 percent of the acreage is very poorly drained Toxaway soils. These soils have a surface layer of black to very dark gray or very dark grayish-brown silt loam 24 to 40 inches thick. This layer is underlain by a subsoil of very dark grayish-brown to grayish-brown loam, silt loam, or silty clay loam.

Most of the remaining 50 percent of the acreage consists chiefly of soils of similar texture, but which are poorly drained, and of soils that have similar drainage but that have a sandier subsoil that is gravelly or cobbly in places.

Included with these soils in mapping were some small areas of Ponzer muck, cool variant.

Most of the acreage of these soils is in woods, and the rest is chiefly in pasture, hay, or cultivated crops. If these soils are drained they are fairly well suited to most locally grown crops. They are easy to keep in good tilth and can be worked throughout a wide range of moisture content. The major limitations to the use of these soils are very frequent flooding and a seasonally high water table. (Capability unit IIIw–1; woodland suitability group 2; wildlife suitability group 4)

Transylvania Series

The Transylvania series consists of well drained to moderately well drained, nearly level soils on flood plains. These soils are subject to very frequent flooding of very brief duration. They formed in recent alluvial deposits. Depth to bedrock is more than 5 feet. The seasonally high water table is at a depth of about 2½ feet.

In a typical profile, these soils have a very dark grayish-brown silt loam surface layer about 27 inches thick. The subsoil is silty clay loam, about 33 inches thick, that is yellowish brown in the upper part and mottled light gray and light yellowish brown in the lower part. Below the subsoil, to a depth of about 70 inches, is light olive-gray loamy fine sand.

Transylvania soils are medium in natural fertility and high in organic-matter content. They have high available water capacity, moderately rapid permeability, a deep to very deep effective root zone, and moderate shrink-swell potential.

A large percentage of these soils is in row crops or pasture, and the rest is in forest. Very frequent flooding and, in places, a seasonally high water table are major limitations to the use of these soils.

Representative profile of Transylvania silt loam in Little River community, in a cultivated field, 700 feet south of Little River and 50 feet east of State Road 1535:

Ap—0 to 10 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; very friable; very strongly acid; clear, smooth boundary.

A1—10 to 27 inches, very dark grayish-brown (10YR 3/2) silt loan; moderate, medium, granular structure;

very friable; very strongly acid; clear, smooth boundary.

B21—27 to 42 inches, yellowish-brown (10YR 5/6) silty clay loam; few, fine, faint, light-gray mottles at a depth of 38 inches; weak, medium, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

B22g—42 to 60 inches, mottled light-gray (10YR 7/2) and light yellowish-brown (10YR 6/4) silty clay loam; weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

IIC—60 to 70 inches, light olive-gray (5YR 6/2) loamy fine sand; single grain; loose; medium acid.

The solum ranges from 40 to 80 inches in thickness. The A horizon is 20 to 40 inches thick and is very dark brown to very dark grayish brown. The B horizon is silty clay loam, silt loam, or loam, is 20 to 40 inches thick, and is yellowish brown to brown. Grayish mottles occur at a depth below 20 inches. The C horizon consists of unconsolidated sandy or loamy alluvial deposits.

Transylvania silt loam (Tr).—This nearly level soil is on slightly elevated positions on the larger flood plains. The surface layer is very dark brown to very dark grayish-brown silt loam 20 to 40 inches thick. The subsoil is yellowish-brown to brown silty clay loam, or loam 20 to 40 inches thick.

Included with this soil in mapping were areas of similar soils that are more poorly drained.

Most of the acreage of this soil is in pasture or cultivation, and the rest is in forest. This soil is well suited to all crops, pasture, or hay grown in the county. It is one of the most productive soils in the county. The plow layer is easy to keep in good tilth and can be worked throughout a wide range of moisture content. The major limitations to the use of this soil are very frequent flooding and, in places, a seasonally high water table. (Capability unit IIw–1; woodland suitability group 1; wildlife suitability group 3)

Tusquitee Series

The Tusquitee series consists of well-drained, sloping to steep soils in upland draws and on foot slopes. These soils formed under forest vegetation in local alluvial deposits from the surrounding uplands. Depth to bedrock is more than 5 feet, and the seasonally high water table is at a depth below 5 feet.

In a typical profile, these soils have a very dark brown loam surface layer about 9 inches thick. The subsoil is strong-brown and yellowish-brown, friable clay loam and fine sandy clay loam about 37 inches thick. Below the subsoil, to a depth of 60 inches, is reddish-yellow sandy loam.

Tusquitee soils are medium in natural fertility and high in organic-matter content. They have moderately rapid permeability, medium available water capacity, a deep to very deep effective root zone, and low shrink-swell potential.

Most of the acreage is in forest, predominantly yellow-poplar, yellow and black birches, and northern red oaks. The rest is chiefly in hay or pasture. The major limitations to the use of these soils are slope and, in places, stoniness.

Representative profile of Tusquitee loam, 6 to 15 percent slopes, 1 mile west of Balsam Grove Community Center, in a wooded area, 30 feet east of State Road 1324:

A1—0 to 6 inches, very dark brown (10YR 2/2) loam; moderate, medium, granular structure; friable; many small and medium roots; few fine mica flakes; slightly acid; gradual, wavy boundary.

A3—6 to 9 inches, dark-brown (10YR 3/3) loam; moderate, medium, granular structure; friable; common small and medium roots; few fine mica flakes; medium acid; clear, wavy boundary.

B21t—9 to 24 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; common small and medium roots; thin, discontinuous clay films in cavities; common fine mica flakes; strongly acid; clear, wavy boundary.

B22t—24 to 46 inches, yellowish-brown (10YR 5/6) fine sandy clay loam; weak, coarse, subangular blocky structure; friable; few small roots; thin, discontinuous clay films in cavities; common fine mica flakes; strongly acid; clear, wavy boundary.

C—46 to 60 inches, reddish-yellow (7.5YR 6/6) sandy loam; massive; common fine mica flakes; stone line of common angular quartz and gneiss gravel and cobblestones at the bottom of this layer; medium acid; abrupt, smooth boundary.

The solum ranges from 40 to 70 inches in thickness. The A horizon is 6 to 15 inches thick and is very dark brown or dark brown to very dark grayish brown. The B horizon is loam, clay loam, or fine sandy clay loam 34 to 55 inches thick. It is dark brown, yellowish brown, strong brown, or yellowish red and has weak to moderate, fine to coarse, subangular blocky structure. The C horizon is sandy loam to loam and contains few to many fragments of gravel and rock.

Tusquitee loam, 6 to 15 percent slopes (TsD).—This soil is in upland draws and on foot slopes. It has the profile described as representative for the series. The surface layer is very dark brown or dark brown to very dark grayish-brown loam 6 to 15 inches thick. The subsoil is dark-brown, yellowish-brown, strong-brown, or yellowish-red, friable loam, clay loam, or fine sandy clay loam 34 to 55 inches thick.

Included with this soil in mapping were a few areas that have gravel and stones in sufficient quantities to interfere with tillage.

Most of the acreage is in forest, and the rest is chiefly in hay or pasture. This soil is well suited to all row crops, pasture, or hay crops grown in the county. The plow layer is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Because of slope, this soil has a severe erosion hazard if it is cultivated, and conservation practices are needed to effectively control runoff and reduce erosion. (Capability unit IIIe–1; woodland suitability group 5; wildlife suitability group 1A)

Tusquitee loam, 15 to 25 percent slopes (TsE).—This soil is in upland draws and on foot slopes. The surface layer is very dark brown or dark brown to very dark grayish-brown loam 6 to 15 inches thick. The subsoil is dark-brown, yellowish-brown, strong-brown, or yellowish-red, friable loam, clay loam, or fine sandy clay loam 34 to 48 inches thick.

Included with this soil in mapping were a few areas where the slope is more than 25 percent. Gravel and stones interfere with tillage in a few places.

Practically all the acreage of this soil is in forest, and most of the rest is in pasture or hay. This soil is well suited to all crops grown in the county. It is easy to keep in good tilth and can be worked throughout a

wide range of moisture content. The erosion hazard is very severe if this soil is cultivated, and intensive management is needed to reduce runoff and control erosion effectively. Slope is the major limitation in the use of this soil. (Capability unit IVe–1; woodland sutability group 5; wildlife suitabilty group 1A)

Tusquitee stony loam, 6 to 15 percent slopes (TuD).—This stony soil is in upland draws and on foot slopes. The surface layer is very dark brown or dark brown to very dark grayish brown loam 6 to 15 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is dark-brown, yellowish-brown, strong-brown, or yellowish-red, friable loam, clay loam, or fine sandy clay loam 34 to 48 inches thick.

Included with this soil in mapping were some areas of Tate stony soils.

Practically all of this soil is in forest, and only a small acreage is in pasture and cultivation. The plow layer is easy to keep in good tilth and can be worked throughout a wide range of moisture content, although stones on the surface make cultivation difficult. Because of stones and slope, this soil is only fairly well suited to cultivation or pasture. The erosion hazard is very severe if the soil is cultivated, and intensive management is needed to effectively control runoff and reduce erosion. (Capability unit IVe–2; woodland suitability group 5; wildlife suitability group 1A)

Tusquitee stony loam, 15 to 25 percent slopes (TuE).—This stony soil is in upland draws and on foot slopes. The surface layer is very dark brown or dark brown to very dark grayish-brown loam 6 to 15 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is dark-brown, yellowish-brown, strong-brown, or yellowish-red, friable loam, clay loam, or fine sandy clay loam 34 to 48 inches thick.

Included with this soil in mapping were a few areas of very stony soils on first bottoms and in draws. Also included were small areas of Tate stony soils. In a few places the slope is more than 25 percent.

Practically all of this soil is in forest. Because of slope and stoniness, this soil is not suited to cultivated crops or hay. It is fairly well suited to pasture and well suited to trees. (Capability unit VIe–2; woodland suitability group 5; wildlife suitability group 1A)

Tusquitee stony loam, 25 to 45 percent slopes (TuF).—This soil is in upland draws and on foot slopes. The surface layer is very dark brown or dark brown to very dark grayish-brown loam 6 to 15 inches thick. Stones larger than 10 inches in diameter make up 5 to 25 percent of the surface layer. The subsoil is dark-brown, yellowish-brown, strong-brown, or yellowish-red, friable loam, clay loam, or fine sandy clay loam 34 to 40 inches thick.

Practically all of the acreage is in forest. Because of slope and stoniness, this soil is not suited to cultivation or pasture. A good use for this soil is trees. (Capability unit VIIe–1; woodland suitability group 5; wildlife suitability group 1A)

Watauga Series

The Watauga series consists of well-drained, micaceous, sloping to steep soils on the narrow ridgetops and side slopes that have northern and eastern aspects. These soils formed under forest vegetation in residuum from mica gneiss. Depth to bedrock is more than 4 feet, and the seasonally high water table remains below 5 feet.

In a typical profile, these soils have a dark-brown loam surface layer about 5 inches thick and a yellowish-brown clay loam and loam subsoil about 26 inches thick. Below the subsoil, to a depth of about 50 inches, is yellow fine sandy loam.

Watauga soils are medium in natural fertility and organic-matter content. They have medium available water capacity, moderate permeability, and moderate shrink-swell potential. They have a moderately deep to deep effective root zone.

Most of the acreage is in forest, predominantly northern red oak, yellow-poplar, and red maple. The rest is chiefly in pasture. Slope is the major limitation to the use of these soils.

Representative profile of Watauga loam, 25 to 45 percent slopes. Balsam Grove community, 1.4 miles south of Albert Schweitzer Hospital, 0.5 mile east of State Road 1321, in wooded area 50 feet north of logging road:

O2—1 inch to 0, black mat of live small roots and decayed forest litter.

A1—0 to 5 inches, dark-brown (10YR 3/3) loam; moderate, fine and medium, granular structure; friable; many small roots; few fine mica flakes; strongly acid; clear, smooth boundary.

B2t—5 to 22 inches, yellowish-brown (10YR 5/8) clay loam; weak, medium, subangular blocky structure; friable; common small and medium roots; thin, discontinuous clay films on faces of peds; common to many, fine and medium mica flakes; strongly acid; clear, smooth boundary.

B3—22 to 31 inches, yellowish-brown (10YR 5/6) loam; weak, medium, subangular blocky structure; very friable; many fine and medium mica flakes; strongly acid; gradual, wavy boundary.

C—31 to 50 inches, highly weathered mica gneiss that crushes to yellow (10YR 7/6) fine sandy loam; rock structure; very friable; strongly acid.

The solum ranges from 20 to 40 inches in thickness. The A horizon is dark brown or brown to very dark grayish brown and is 3 to 8 inches thick. The B horizon is strong-brown to yellowish-brown, friable to very friable clay loam to loam 17 to 32 inches thick. The content of mica flakes ranges from common to many in the upper part of the B horizon to many in the lower part of the B and the C horizon. The C horizon consists of weathered mica gneiss that is dominantly a fine sandy loam or loam that has a high content of mica.

Watauga loam, 6 to 15 percent slopes (WaD).—This micaceous soil is on ridges and upper side slopes. The surface layer is dark-brown or brown to very dark grayish-brown loam 3 to 8 inches thick. The subsoil is strong-brown to yellowish-brown, friable to very friable clay loam to loam and is 17 to 32 inches thick.

Included with this soil in mapping were areas of Chandler soils and areas of Porters soils that have a stony surface layer in some places.

Most of the acreage is in forest, and the rest is chiefly in pasture. It is well suited to all locally grown crops. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Because of slope, the erosion hazard is severe if the soil is cultivated, and conservation practices are needed to reduce runoff and control erosion. (Capability unit IIIe–1; woodland suitability group 6; wildlife suitability group 1A)

Watauga loam, 15 to 25 percent slopes (WaE).—This micaceous soil is on ridgetops and upper side slopes. The

surface layer is dark-brown or brown to very dark grayish-brown loam 3 to 8 inches thick. The subsoil is strong-brown to yellowish-brown, friable to very friable clay loam to loam 17 to 32 inches thick.

Nearly all of the acreage is in forest. It is well suited to all pasture and hay crops grown in the county. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Because of slope, the erosion hazard is very severe if this soil is cultivated, and intensive management is needed to reduce runoff and control erosion. (Capability unit IVe–1; woodland suitability group 6; wildlife suitability group 1A)

Watauga loam, 25 to 45 percent slopes (WaF).—This micaceous soil is on mountain side slopes. It has the profile described as representative for the series. The surface layer is dark-brown or brown to very dark grayish-brown loam 3 to 8 inches thick. The subsoil is strong-brown to yellowish-brown, friable to very friable clay loam to loam 17 to 30 inches thick.

Included with this soil in mapping were a few stony areas and some areas of Chandler soils.

Practically all of the acreage is in forest. Because of slope, it is not suited to cultivated crops or hay. It is fairly well suited to pasture if good management practices are used in establishing the stands. It is well suited to trees. (Capability unit VIe–1; woodland suitability group 6; wildlife suitability group 1A)

Use and Management of the Soils

This section discusses use and management of the soils for crops and pasture, for woodland, for wildlife, for recreation, and for engineering purposes. It does not give detailed information about management of individual soils. For specific suggestions, consult a representative of the Soil Conservation Service, the Extension Service, or the Agricultural Experiment Station.

Use of Soils for Crops and Pasture[2]

This section discusses the capability grouping of soils and describes the capability units of Transylvania County. A table lists all the mapping units in alphabetical order and gives estimated yields for specific crops based on a high level of management.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of farming. The groups are made according to the limitations of the soils, 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 the 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 forest trees or engineering.

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

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

Class I soils have few limitations that restrict their use. (None in Transylvania County)

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife habitat.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife habitat.

Class VII soils have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife habitat.

Class VIII soils and landforms have limitations that preclude their use for commercial plants and restrict their use to recreation, wildlife, 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 wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Transylvania County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at most, only subclasses indicated by *w*, *s*, and *c* because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, 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

[2] J. E. Pollock, conservation agronomist, Soil Conservation Service, assisted in preparing this section.

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 IVe–2. Thus, in one symbol, the Roman numeral designates the capability class or degree of limitation, and the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph. The Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages, the capability units of Transylvania County are described, and suggestions for the use and management of the soils are given. For the names of the soils in any given unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT IIe–1

This unit consists of well-drained, gently sloping soils in coves, on toe slopes of the uplands, and on stream terraces. These soils have a loam or fine sandy loam surface layer and a loam or fine sandy loam to clay loam or fine sandy clay loam subsoil.

The soils in this unit are low to medium in natural fertility and organic-matter content. Available water capacity is high, and permeability is moderate. Tilth is good, and these soils can be worked throughout a wide range of moisture content.

Most of the acreage in this unit is in cultivated crops or grass, and the rest is chiefly in woods. These soils are well suited to most cultivated crops, grasses, and legumes grown in the county. Erosion is a moderate hazard if the soils are used for cultivated crops.

Soil and water loss can be controlled by (1) returning crop residue to the soil, (2) using contour tillage with terraces and diversions, stripcropping, or both, and (3) using a cropping system that includes a close-growing crop 25 to 50 percent of the time. An example of a suitable cropping system is 2 or more years of close-growing crops followed by 1 or 2 years of row crops and a winter cover crop coming between the row crops. Another example is 1 year of close-growing crops followed by row crops for 2 or 3 years.

Distinct natural draws, field borders, and other outlets needed for disposing of surface runoff should be vegetated with a perennial grass. If these soils are used for grazing, the top growth of the forage plants should be kept at a minimum height of 2 to 3 inches to maintain production, provide soil protection, and prolong the life of the plants.

CAPABILITY UNIT IIw–1

This unit consists of well drained and moderately well drained, nearly level soils on stream flood plains that are subject to very frequent flooding. The soils have a fine sandy loam, loam, or silt loam surface layer and a fine sandy loam, loam, silt loam, or silty clay loam subsoil.

The soils in this unit are low to medium in natural fertility and medium to high in organic-matter content. Available water capacity is medium to high, and permeability is moderately rapid. Tilth is good, and these soils can be worked throughout a wide range of moisture content.

Most of the acreage in this unit has been cleared and is in cultivated crops, pasture, or hay. These soils are well suited to fairly well suited to most crops grown in the county, except for alfalfa, which is poorly suited.

There are no serious limitations to intensive use of these soils, other than a moderate hazard of flooding and a seasonally high water table. In some areas local ponding occurs on the surface of the siltier soils, and some surface smoothing may be required.

These soils can be used as intensively as any in the county. They can be cropped each year with little damage, except from flooding, if a good cover crop is maintained and all crop residue is returned to the soil to add organic matter and maintain tilth. Organic-matter content and soil tilth can be maintained at higher levels if soil-conserving crops are included in the cropping system every other year or 1 year out of 3. Minimum tillage helps to maintain good structure in these soils. If these soils are used for grazing, keep the top growth of forage plants at a height of 3 inches or more to maintain production, prolong the life of the plants, and protect the soils.

CAPABILITY UNIT IIw–2

This unit consists of Delanco fine sandy loam, 2 to 6 percent slopes, a moderately well drained, gently sloping soil on stream terraces. It has a fine sandy loam surface layer and a sandy clay loam or clay loam subsoil.

This soil is low to medium in natural fertility and organic-matter content. Available water capacity is medium, and permeability is moderate. Tilth is good, and the soil can be worked throughout a wide range of moisture content.

Most of the acreage is in cultivation or pasture. This soil is well suited to most locally grown crops.

Some seepage or the water table may restrict plant roots at a depth of about 24 inches during wet periods unless drainage is provided. Erosion is a hazard on the stronger slopes if this soil is cultivated.

Runoff and erosion can be reduced by returning crop residue to the soil and using a cropping system that includes a close-growing crop 25 to 50 percent of the time. An example of a suitable cropping system is row crops, followed by small grain and perennial grass and clover for 2 or more years. Another example is 1 year of a close-growing crop, followed by row crops for 2 or more years and winter cover crops. Minimum tillage helps to maintain good soil structure in these soils. If this soil is used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil, prolong the life of the plants, and maintain yields.

CAPABILITY UNIT IIIe–1

This unit consists of well drained and somewhat excessively drained, sloping and strongly sloping soils that are chiefly on uplands and in draws or on foot slopes of the uplands. They have a fine sandy loam or loam surface layer and a sandy loam to clay subsoil.

The soils in this unit are low to medium in natural fertility and low to high in organic-matter content. Available water capacity is low to high, and permeability is moderate to moderately rapid. Tilth is good, and these soils can be worked throughout a wide range of moisture content.

Most of the acreage in this unit is in forest, and the rest is chiefly in pasture and hay. A small acreage is in cultivation. These soils are moderately well suited to well suited to most locally grown crops.

Erosion is a severe hazard if these soils are cultivated. Soil and water losses can be reduced and tilth improved by returning all crop residue to the soil. The soils should be protected by use of a close-growing crop 50 to 75 percent of the time. Diversion terraces and contour tillage, stripcropping, or both, should be used on long slopes. Well-defined natural draws, field borders, and other outlets needed for the disposal of surface water should be vegetated with a perennial grass, preferably a sod-forming type.

An example of a suitable cropping system for these soils is 2 or more years of soil-conserving crops followed by 1 year of row crops. Another example is 2 or more years of soil-conserving crops followed by 2 years of row crops. Perennial grasses are suitable. Minimum tillage reduces soil and water losses and tends to maintain good tilth. If these soils are used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to maintain yields, protect the soil, and prolong the life of the plants.

CAPABILITY UNIT IIIw–1

This unit consists of very poorly drained, nearly level soils on stream flood plains that are subject to very frequent flooding of very brief duration. They have a silt loam or muck surface layer 16 to 40 inches thick. Underlying layers are chiefly silty clay loam, silt loam, loam, and fine sandy loam.

The soils in this unit are low to medium in natural fertility and high in organic-matter content. Available water capacity is high, and permeability is moderate. These soils are easy to keep in good tilth and can be worked throughout a wide range of moisture content.

Most of the acreage in this unit has been cleared and is in pasture, hay, and corn. The rest is in forest of mixed hardwoods and white pines. If drained, these soils are moderately well suited to corn, white clover, fescue, and bluegrass.

Wetness is a severe limitation because of the seasonally high water table and very frequent flooding.

These soils can be planted to row crops year after year with little damage to the soil if a winter cover crop is used and all the crop residue is returned to the soil. A more suitable cropping system is 1 or more years of perennial grass followed by 2 or more years of row crops. If these soils are used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT IIIw–2

This unit consists of Augusta fine sandy loam, cool variant, 1 to 4 percent slopes. This is a somewhat poorly drained, nearly level and gently sloping soil on stream terraces. It is subject to infrequent flooding of very brief duration. The surface layer is fine sandy loam, and the subsoil is sandy clay loam to clay loam.

This soil is low to medium in natural fertility and organic-matter content. Available water capacity is medium, and permeability is moderate. This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content.

Most of the acreage in this unit has been cleared and is in cultivated crops, hay, and pasture. This soil is moderately well suited to most locally grown cultivated crops. It is well suited to locally grown grasses and legumes, except alfalfa, which is poorly suited. Drainage is needed on this soil.

Wetness is a severe hazard. A seasonally high water table, seepage water, and infrequent flooding are limitations to consider in the use and management of these soils. Erosion is a hazard on the stronger slopes. Organic-matter content can be maintained and soil structure improved by returning crop residue to the soil and using minimum tillage on the stronger slopes. An example of a suitable cropping system is 3 or more years of perennial grass followed by 2 or more years of row crops. Another example is 1 or more years of close-growing crops followed by 1 year of clean-tilled crops. If this soil is used for grazing, the top growth should be kept at a minimum of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT IIIs–1

This unit consists of Suncook loamy sand, an excessively drained, nearly level soil on stream flood plains. This soil has a loamy sand surface layer and loamy sand to sand underlying layers.

This soil is very low in natural fertility and low to medium in organic-matter content. Available water capacity is low, and permeability is rapid. These soils are fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content.

Most of the acreage in this unit has been cleared and is in cultivated crops, hay, or pasture. These soils are fairly well suited to most locally grown crops.

Droughtiness and very frequent flooding are major soil limitations to consider in managing these soils. Row crops can be grown each year with little damage to the soils if large amounts of organic matter are added. Crop residue and organic matter decompose quite rapidly. Fertilizer materials, particularly nitrogen, leach readily and should be applied in split applications. If this soil is used for grazing, the top growth should be kept at a minimum height of 3 inches to prolong the life of the plants.

CAPABILITY UNIT IVe–1

This unit consists of well drained and somewhat excessively drained, strongly sloping to moderately steep soils that are chiefly on mountain uplands and in coves. They have a fine sandy loam or loam surface layer and a friable sandy loam to firm clay subsoil.

The soils in this unit are low to medium in natural fertility and low to high in organic-matter content. Available water capacity is low to high, and permeability is moderate to moderately rapid. Tilth is good, and these soils can be worked throughout a wide range of moisture content.

Most of the acreage in this unit is in forest. The rest is chiefly in pasture or hay. These soils are fairly well suited to well suited to most locally grown crops.

Steepness of slope is the major limitation to the use of these soils. Runoff causes a severe erosion hazard if these soils are cultivated. Soil and water losses can be reduced,

soil tilth improved, and organic-matter content increased by using soil-conserving crops 75 percent or more of the time, returning all crop residue to the soil, tilling on the contour, arranging the crops in strips, and using diversions on the long slopes. Well-defined natural draws, field borders, and other outlets needed for disposal of surface water should be vegetated with a sod-forming perennial grass.

A suitable cropping system for these soils is 3 or more years of perennial grasses, legumes, or a mixture of these, followed by 1 year of row crops. Minimum tillage reduces soil and water losses and helps to maintain good tilth in these soils. If these soils are used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT IVe–2

This unit consists of somewhat excessively drained and well drained, sloping to strongly sloping soils on mountain uplands and foot slopes. They have a fine sandy loam or loam surface layer and a sandy loam to clay loam subsoil.

The soils in this unit are low to medium in natural fertility and low to high in organic-matter content. Available water capacity is low to high, and permeability is moderately rapid. Tilth is good, and these soils can be worked throughout a wide range of moisture content.

Most of the acreage in this unit is in forest, and a small amount is in pasture. These soils are fairly well suited to most locally grown row crops. They are moderately well suited to hay or pasture.

Slope, erosion hazard, low fertility, and stoniness are limitations that influence the management of these soils.

If these soils are cultivated, the erosion hazard is very severe. Soil and water losses can be reduced, soil tilth improved, and organic-matter content increased by returning all crop residue to the soil. The soil should be protected by using a soil-conserving crop 75 percent or more of the time, by contour cultivation, by stripcropping, and by using diversions. Perennial grasses are suitable soil-conserving crops. Well-defined natural draws, field borders, and other outlets needed for the disposal of surface water should be vegetated by using a sod-forming perennial grass.

An example of a suitable cropping system is 3 or more years of perennial grass or legumes followed by 1 year of a row crop. Another example is 4 or more years of perennial grass or legumes followed by 2 years of row crops. The cropping system should be arranged in strips, particularly on the steeper slopes. Minimum tillage reduces soil and water losses and helps to maintain good tilth. If the soils are used for pasture or hay, seeding should be done in alternate strips, particularly on the steep slopes. The top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT Vs–1

This unit consists of Stony colluvial land, a miscellaneous land type that occurs in coves and on toe slopes as stony colluvial areas in which 25 to 70 percent of the soil mass is stones. The soil material filling the spaces between the stones is loam, fine sandy loam, or clay loam. It is well drained.

Practically all the acreage in this unit is in forest. It is not suited to cultivation, because the amount of stones on the surface precludes the practical use of machinery. It is fairly well suited to locally adapted grasses and legumes.

If these areas are used for pasture, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT VIe–1

This unit consists of well-drained and somewhat excessively drained, strongly sloping to steep soils on mountain uplands and in coves. They have a fine sandy loam, loam, or clay loam surface layer and a sandy loam to clay subsoil. In some places the plow layer is a mixture of the remaining surface layer and the subsoil. The subsoil is exposed in spots.

The soils in this unit are low to medium in natural fertility and low to high in organic-matter content. Available water capacity is low to high, and permeability is moderate to moderately rapid.

Nearly all of the acreage is in forest. A very small acreage is cleared and in pasture. These soils are not suited to cultivated crops, because the soils are steep and eroded and there is a hazard of further erosion. They are fairly well suited to well suited to locally adapted grasses and legumes.

Pasture seeding or renovation should be done in alternate strips, particularly on steep or long slopes, to reduce erosion. If the soils are used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT VIe–2

This unit consists of somewhat excessively drained, well drained, and moderately well drained, moderately steep soils on mountain uplands, in draws, and on foot slopes. These soils have a surface layer of fine sandy loam and loam that is stony in places. They have a subsoil of sandy loam to clay loam.

The soils in this unit are low to medium in natural fertility and low to high in organic-matter content. Available water capacity is low to high, and permeability is moderate to moderately rapid.

Practically all of the acreage is in forest, and the rest is cleared and in pasture. These soils are not suited to cultivated crops, because of stoniness, slope, low fertility, or droughtiness. They are suited to trees, recreation, pasture, or wildlife.

Pasture seeding or renovation should be done in alternate strips, particularly on steep or long slopes, to reduce erosion. If the soils are used for grazing, the top growth should be kept at a minimum height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT VIIe–1

This unit consists of moderately well drained to somewhat excessively drained, moderately steep to very steep soils on mountain uplands, in draws, and on foot slopes. They have a loam, fine sandy loam, or silt loam sur-

face layer that is stony in places. The subsoil is sandy loam, silty clay loam, or clay loam.

The soils in this unit are very low to medium in natural fertility and low to high in organic-matter content. Available water capacity ranges from low to high, and permeability is moderate to moderately rapid.

Practically all of the acreage in this unit is in forest, and the rest is cleared and in pasture.

These soils are not suited to cultivated crops, because of the slope. They are fairly well suited to moderately well suited to locally adapted grasses and legumes. Hazards that limit their use for pasture are slope, stoniness, low fertility, and droughtiness. If used for pasture, seeding or renovation should be done in alternate strips, particularly on steep or long slopes. If this soil is used for grazing, keep the top growth of the forage plants at a height of 2 to 3 inches to protect the soil and prolong the life of the plants.

CAPABILITY UNIT VIIs–1

This unit consists chiefly of stony, moderately steep to very steep soils and of Stony land. Dominantly, these soils have a sandy loam to channery silt loam surface layer and are stony in places. The subsoil is sandy loam, loam, or fine sandy loam to channery silty clay loam. The subsoil is stony in places.

The soils of this unit are very low to medium in natural fertility and low to medium in organic-matter content. Available water capacity is low, and permeability is moderately rapid to moderate.

Nearly all of the acreage in this unit is in forest. These soils are not suitable for tillage, because of stoniness and steepness of slope. A good use for these soils is recreation or wildlife.

CAPABILITY UNIT VIIIs–1

This unit consists of Rock outcrop, a miscellaneous land type in which bedrock or loose stones cover more than 90 percent of the surface.

There is a sparse cover of vegetation that provides some food and cover for wildlife. Because of the rock and stones, this land type is suitable only for recreation and wildlife. It has scenic value.

Estimated yields

Table 2 gives estimates of yields of the principal crops grown in Transylvania County. Yields depend upon a combination of soil and climate, the kind of crop, and the level of management. The estimates given in table 2 are based on high-level management. Yields are substantially lower under less intensive management.

Practices generally considered necessary to obtain the yields given in table 2 are:

1. Fertilizer and lime are added according to the needs indicated by soil tests.
2. High-yielding varieties of crops are grown.
3. Legumes are inoculated.
4. The soils are properly tilled, and the crops are properly cultivated.
5. Weeds, insect pests, and plant diseases are controlled.
6. Crops are grown in conservation rotations.
7. Runoff is adequately controlled.
8. Overgrazing is avoided, and pasture is well managed.

The estimates given in the table are based on experience with crops and soils of the county. They are also based on assumptions of average rainfall over a long period of time, no supplemental irrigation, adequate drainage, and no flooding or ponding.

Use of the Soils for Woodland [3]

Forests cover 216,400 acres, or about 89.2 percent of Transylvania County and are one of its most important natural resources. Of the total forested area, 212,300 acres, or 87.6 percent, are classed as commercial forest. The remaining 4,100 acres are classed as either "productive reserve," or unproductive forest. The "productive reserve" is forest area that qualifies as commercial forest, but is withdrawn from timber utilization for recreational or other use. Most of this is in a forested strip along the Blue Ridge Parkway. About 128,200 acres of the commercial forest area is in private ownership. Farmers own the greatest part, mostly in small tracts. There are 84,100 acres in public ownership, of which 83,400 acres are in the Pisgah and Nantahala National Forests.

Originally, forests covered all the land area in the county, except for large rock outcrops, such as those in the vicinity of Devil's Courthouse, Cedar Mountain, and Looking Glass Rock. The trees were predominantly a wide variety of broad-leaved, deciduous hardwoods. Some cone-bearing species, such as pine and hemlock, grew among the hardwoods. The understory consisted of shade-tolerant trees, shrubs, and woody vines. In places dense stands of mountain-laurel and rhododendron were conspicuous in the understory.

Variable mixtures of red and white oaks, hickory, yellow-poplar, American chestnut, black cherry, black locust, beech, blackgum, white ash, basswood, black and yellow birches, black walnut, red and sugar maples, eastern hemlock, and eastern white, shortleaf, Virginia, pitch, and Table Mountain pines grew at different elevations and on different slopes and exposures in the mountains. Chestnut, scarlet oak, black oak, post oak, southern red oak, and shortleaf and pitch pines were predominant at lower elevations on the drier, less fertile south- and southwest-facing slopes. Yellow-poplar, northern red oak, white oak, chestnut, sugar maple, basswood, black walnut, butternut, Carolina silverbell, white ash, black locust, black birch, white pine, and hemlock grew on the northerly and easterly aspects, in the coves, and on the foot slopes. Yellow birch was a component of the stands at higher elevations, generally above 3,000 feet. Fraser fir (southern balsam) and red spruce occupied small areas at the highest elevations.

Mixed stands of yellow-poplar, sycamore, black walnut, white and green ash, river birch, black cherry, red and white oaks, and some white pine grew on the relatively fertile, better drained soils of the bottom lands and

[3] JOHN E. WIGGINS, JR., forester, Soil Conservation Service, U.S. Department of Agriculture, assisted in writing this section.

TABLE 2.—*Estimated average yields per acre of important crops under a high level of management*

[Dashed lines indicate that the crop is not commonly grown on the soil or that data on which to base an estimate are not available]

Soil	Corn	Corn for silage	Cabbage	Irish potatoes	Green beans	Gladiolus	Grass-clover	
							Hay	Pasture
	Bu.	*Tons*	*Tons*	*Cwt.*	*Bu.*	*Doz.*	*Tons*	*A.U.D.*[1]
Ashe fine sandy loam, 6 to 15 percent slopes	65	14	12	150	150		1. 5	120
Ashe fine sandy loam, 15 to 25 percent slopes							1. 3	100
Ashe fine sandy loam, 25 to 45 percent slopes								110
Ashe stony sandy loam, 15 to 45 percent slopes								100
Ashe stony sandy loam, 45 to 70 percent slopes								75
Ashe and Edneyville soils, 6 to 15 percent slopes	85	16	15	180	180		2. 2	168
Ashe and Edneyville soils, 15 to 25 percent slopes	70	15	14	160	160		2. 0	160
Ashe and Edneyville soils, 25 to 45 percent slopes								140
Augusta fine sandy loam, cool variant, 1 to 4 percent slopes	110	24	20	300	300	3, 000	3. 0	240
Brandywine stony soils, 15 to 45 percent slopes								170
Brandywine stony soils, 45 to 80 percent slopes								150
Brevard loam, 2 to 6 percent slopes	120	28	24	300	300	3, 000	3. 0	240
Brevard loam, 6 to 10 percent slopes	110	24	20	275	275	2, 500	2. 7	188
Brevard loam, 10 to 25 percent slopes	90	18	16	250	250	2, 000	2. 5	180
Brevard loam, 25 to 45 percent slopes								170
Burton stony loam, 25 to 60 percent slopes								180
Chandler loam, 15 to 25 percent slopes							1. 3	100
Chandler stony loam, 45 to 70 percent slopes								90
Chandler and Fannin soils, 25 to 45 percent slopes								110
Chester fine sandy loam, 6 to 15 percent slopes	90	18	16	250	250	2, 200	2. 7	188
Chester fine sandy loam, 15 to 25 percent slopes	80	16	15	180	180		2. 5	180
Chester fine sandy loam, 25 to 45 percent slopes								160
Chester stony loam, 15 to 25 percent slopes								170
Chester stony loam, 25 to 45 percent slopes								150
Delanco fine sandy loam, 2 to 6 percent slopes	110	24	20	300	300	3, 000	3. 0	240
Edneyville stony loam, 45 to 70 percent slopes								110
Fannin loam, 15 to 25 percent slopes	80	16	15	180	180		2. 0	160
Fannin loam, 25 to 45 percent slopes								140
Fannin loam, 45 to 70 percent slopes								110
Fletcher and Fannin soils, 6 to 15 percent slopes	90	18	16	250	250	2, 000	2. 5	180
Fletcher and Fannin soils, 15 to 25 percent slopes	80	16	15	180	180		2. 2	168
Hayesville fine sandy loam, 6 to 15 percent slopes	90	18	16	250	250	2, 000	2. 7	188
Hayesville fine sandy loam, 15 to 25 percent slopes	80	16	15	180	180		2. 3	170
Hayesville fine sandy loam, 25 to 50 percent slopes								
Hayesville clay loam, 10 to 25 percent slopes, severely eroded							1. 0	80
Haywood stony loam, 15 to 25 percent slopes								220
Haywood stony loam, 25 to 50 percent slopes								190
Ponzer muck, cool variant	100	21	20	200	200	2, 500	2. 7	188
Porters loam, 15 to 25 percent slopes	90	18	20	250	250		2. 5	180
Porters loam, 25 to 45 percent slopes								170
Porters stony loam, 15 to 45 percent slopes								160
Rock outcrop								
Rosman fine sandy loam	110	24	20	250	250	2, 500	2. 5	180
Rosman soils	100	21	18	225	225	2, 200	2. 5	180
Stony colluvial land								
Stony land								
Suncook loamy sand	90	18	15	220	220	2, 500	2. 0	160
Talladega silt loam, 25 to 45 percent slopes								100
Talladega channery silt loam, 45 to 70 percent slopes								75
Tate fine sandy loam, 2 to 6 percent slopes	120	24	22	275	275	3, 000	3. 0	240
Tate fine sandy loam, 6 to 15 percent slopes	100	20	20	250	250	2, 700	2. 7	188
Tate fine sandy loam, 15 to 25 percent slopes	95	18	16	240	240		2. 5	180
Toxaway silt loam	100	20	20	200	200	2, 500	2. 7	188
Toxaway soils	95	18	17	180	180	2, 200	2. 7	188
Transylvania silt loam	120	24	22	250	250	2, 500	3. 0	240
Tusquitee loam, 6 to 15 percent slopes	120	24	22	275	275	2, 700	3. 0	240
Tusquitee loam, 15 to 25 percent slopes	100	21	20	250	250		2. 7	188
Tusquitee stony loam, 6 to 15 percent slopes	100	22	20	240	240	2, 500	2. 7	188
Tusquitee stony loam, 15 to 25 percent slopes								
Tusquitee stony loam, 25 to 45 percent slopes								
Watauga loam, 6 to 15 percent slopes	100	21	20	250	250	2, 500	2. 7	188
Watauga loam, 15 to 25 percent slopes	90	18	20	250	250		2. 3	170
Watauga loam, 25 to 45 percent slopes								

[1] A.U.D., animal-unit-days, is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for 2 cows has a carrying capacity of 60 animal-unit-days. An animal unit is 1 cow, 1 steer, or 1 horse; 5 hogs; or 7 sheep or goats.

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low stream terraces. Sycamore, green ash, river birch, red maple, and other water-tolerant species were predominant on the very poorly drained semiswampy bottomland soils, such as those of the Toxaway and Ponzer series.

Nearly all the virgin stands, except those in the most inaccessible locations, have been cut for lumber and other forest products or destroyed. In clearing land for farming the early settlers cut and burned much fine timber, especially in the bottom lands and coves and on the lower slopes. Later, logs were floated down the French Broad River to Asheville to be cut into lumber. After the tracks of the Henderson-Brevard Railroad were laid through the county in 1894, sawmills began operating on a large scale, and most of the original forest was eventually cut over. As a result, the present stands are primarily second growth. The second-growth stands are still mainly hardwoods, although coniferous stands of white, shortleaf, and Virginia pines have become established on idle or abandoned cropland.

American chestnut was formerly a very important tree in the county for both timber and nut production. Unfortunately, by 1940, the chestnut blight fungus (*Endothia parasitica*) had killed practically all of it. Some of the dead trees were cut, and the wood utilized. Most of the rest have fallen, and the wood is decaying.

The wide variety of trees in the original forest, as well as the present second-growth stands, is a result, in part, of the different kinds of soils and diverse physiographic conditions. One objective of the soil survey is to delineate the different kinds of soils on the soil map so that they may be managed efficiently for forestry purposes.

Forest sites and tree growth

The type of forest that grows on a particular soil and the rate at which the trees grow depend largely on the site. A site is an area of land that has a distinctive combination of ecological factors that influence its productive capacity for trees and other vegetation. These factors include climate, physiography, soil, and the effect man, other animals, and plants have on the site. Some species are better adapted to certain sites than others. For example, shortleaf, Virginia, and pitch pines are more tolerant of, and more abundant on, the drier, less fertile soils of the ridges and south- and southwest-facing mountain slopes than white pine. Red maple, black willow, and smooth alder are suited to wet soils on alluvial bottom lands, such as the undrained Toxaway soils that are saturated much of the time. Few other mountain species are adapted to this condition.

Site quality is the productive capacity of a specific area for a given species or forest type. Within a limited climatic zone and physiographic area, it is largely controlled by those soil properties and site features that influence the amount and relationship between available water capacity and air in the soil. In effect, the factors that determine the quality and quantity of space available for root development are the ones most significantly related to tree growth (*4*). Among these are soil depth, texture of the surface and subsurface layers, pore space distribution, available water capacity and air in the soil, and changes in moisture content of the subsoil.

Soil depth determines the total volume of soil available for root growth. Other soil features related to site quality include the thickness of the surface layer; depth to bedrock; depth to a fine-textured, a mottled, or a least permeable layer; depth to the seasonally high water table; and total soil depth. The soils that are more shallow to bedrock, such as the Talladega soils, have limited space for root growth, and the site quality is thereby lowered.

The available water capacity of a soil is influenced by soil texture, which also affects the size and distribution of small roots. For these reasons, soil texture influences site quality. Although coarse-textured soils provide plenty of space for small roots, they have low available water capacity. This results in lowering the site quality. On the other hand, soils that have a fine-textured clayey subsurface layer have high available water capacity. A high clay content may cause poor soil aeration, and root growth may be hindered and site quality lowered. Soils that have a loam, sandy loam, and silt loam surface layer and a sandy clay, clay loam, or silty clay loam subsoil are the most favorable for tree growth.

Topographic factors, such as degree and extent of slope, position on slope, the direction in which the slope faces, and the degree of surface and subsurface drainage affect site quality and species suitability. Tree growth is better on the deeper soils of the lower slopes and coves, such as the Brevard and Tusquitee soils, than on the more shallow soils of the upper slopes and ridgetops, such as Talladega soils. In general, the steeper the topography the greater the effect these factors have on the site. Drainage is an important factor that affects site quality, species suitability, and management. Extremes of drainage will also lower site quality, restrict the number of suitable species, and present difficult management problems.

Rainfall and the length of the frost-free period per year are climatic factors that have been correlated with site quality and tree growth.

Site quality, or the potential productivity of a soil, may be rated by determining the site index. The site index of a given soil and site for a specified species is the average of the total height, measured in feet, of the best (dominant and codominant) trees in an even-aged stand at 50 years of age. Although the site index is not a direct measure of site quality, it is ordinarily used. A good direct measure is the total volume or yield of wood at a given age, but such information is costly and time consuming to obtain. Yield tables, developed for normal (fully stocked) or managed stands, are based on site index.

Although site index is an indirect indicator, those soils that have the highest site index produce the highest yield of timber.

The forester or woodland owner can use potential productivity ratings, combined with appropriate yield tables, as a key in solving problems and making important decisions involved in woodland use and management. Among these are predicting growth and yield, designating certain areas for tree crop production, selecting the right species for the site, determining the length of rotations for various wood crops, selecting the species to favor when cutting, determining the time interval between thinnings, and estimating the costs and returns to be expected in management.

Woodland suitability groups

The soils of Transylvania County have been placed in 11 woodland suitability groups to assist landowners in planning for the productive use of the soils and the management of the woodlands. The soils in each group can be determined by consulting the "Guide to Mapping Units" at the back of this soil survey. Each group consists of soils that have about the same available water capacity and other major physical properties and characteristics that affect tree growth. The potential productivity for important commercial tree species is about the same for each group. The soils in each group also have similar limitations that affect planting, tending, and harvesting trees. Consequently, all of the soils in a group require about the same management, including the application of similar conservation practices.

For each woodland suitability group, the soils are first briefly described, and then the preferred kinds of trees for producing sawtimber, pulpwood, veneer and other wood products, Christmas trees, and wildlife food and cover are discussed.

Next, the site index range (*3*, *5*, *6*) for each of several commercially important tree species [4] is given for each group. Yields for the different species may be obtained by consulting appropriate yield tables. The site indexes are based on plot studies made of soil-site and tree-growth relationships throughout the Blue Ridge Mountains. Approximately 75 of the plots examined were in Transylvania County. Although nearly 900 plots have been studied in the Mountain Resource Area, in some cases there were little or no data available for a specified tree species on a particular soil. In such cases the site index is based on data for the same species growing on a similar soil.

Finally, the management problems that apply to the soils in each woodland suitability group when used for forestry purposes are explained and evaluated. These soil-related hazards and limitations to establishing and managing trees include plant competition, seeding mortality, equipment restrictions, erosion, windthrow, and certain plant diseases and insects. They are defined in the following paragraphs.

Plant competition.—When openings are made in the canopy of a stand of desirable trees by cutting, fire, grazing, or other disturbance, undesirable trees, shrubs, vines, grasses, and other plants can invade the site. The invading plants compete with desirable tree seedlings for water, nutrients, and sunlight and hinder or prevent their establishment and growth. Ratings are given for each woodland suitability group according to the degree of competition that may be expected from unwanted plants. A rating of *slight* indicates that competition from such plants presents no special problem to management. A rating of *moderate* means plant competition develops, but does not ordinarily prevent an adequate stand of desired species from becoming established. The development of a normal, fully-stocked stand, however, may be delayed because seedling establishment is prolonged and early growth is slower. A rating of *severe* indicates that competition prevents adequate restocking, either natural or artificial, without intensive site preparation and without special maintenance practices, including weeding.

Seedling mortality.—The hazard of seedling mortality, or regeneration potential, is discussed for each woodland suitability group. This refers to the expected degree of loss of naturally occurring, direct-seeded, or planted tree seedlings as a result of unfavorable soil characteristics or topographic features. In evaluating seedling mortality, it is assumed that plant competition is not a limiting factor. For planted seedlings, it is assumed that healthy seedlings of the proper grade have been correctly planted. An adequate seed source is assumed for seedlings established by natural reseeding. Normal environmental factors are assumed for both planted and naturally established seedlings. A rating of *slight* indicates that, ordinarly, no more than 25 percent of either planted or naturally occurring seedlings will die. One planting will usually produce a satisfactory stand. A rating of *moderate* means that the losses to be expected will be between 25 and 50 percent of the stand and natural regeneration cannot always be relied upon for adequate and immediate restocking. A rating of *severe* indicates that more than 50 percent of the seedlings are likely to die. Superior planting techniques and much replanting are required to assure adequate stocking.

Equipment limitations (relative trafficability).—Physical soil characteristics or topographic features, such as texture, stoniness, slope, and drainage, may restrict or prohibit the use of equipment commonly employed in harvesting trees and in other forest management operations. An equipment limitation rating of *slight* indicates that there is no particular problem in the use of equipment, and no restriction on the kind of equipment or time of year it is used. A rating of *moderate* means that not all types of equipment can be used and that there are periods not in excess of 3 months when equipment cannot be used because of seasonal soil wetness, slopes of 15 to 25 percent, or soil characteristics, such as plasticity or texture, that restrict use of equipment. A rating of *severe* indicates that the kinds of equipment that may be used are limited and special equipment is required; that there is a seasonal restriction of more than 3 months; that slopes are stronger than 25 percent, or 15 percent on stony phases; or that the use of equipment may be expected to injure tree roots and cause serious damage to the structure and stability of the soils.

Erosion hazard.—This refers to the potential hazard of erosion when the soils are managed according to currently accepted standards. Woodland can be protected from erosion by growing certain kinds of trees, by adjusting the rotation age and cutting cycles, by using special management techniques, and by careful construction and maintenance of roads, trails, and landings. The ratings of erosion hazard are based on the increased risk of erosion on a well-managed woodland that is not protected by special practices. A rating of *slight* means that a small loss of soil is expected, generally where slopes are less than 6 percent. A rating of *moderate* indicates that a moderate loss of soil can be expected where runoff is uncontrolled and vegetative cover is inadequate, generally where slopes range from 6 to 15

[4] The ratings for yellow-poplar are based on 1957 data, and those for eastern white pine are based on 1960 data. These data were assembled by W. T. DOOLITTLE, Forest Service.

percent. The erosion hazard is rated *severe* if slopes are greater than 15 percent, the soil has slow infiltration and permeability, or erosion has left the soil bare.

Windthrow hazard.—Windthrow refers largely to windfirmness as reflected by those soil characteristics that influence and largely control the development of the root system of the tree. Soil characteristics, however, are not the only influence determining windfirmness, since the development of root systems differs among species or groups of species. Windfirmness is an important factor to consider in making recommendations for stand density control in thinnings, release and intermediate cuttings, regeneration, and final harvest cuttings. The windthrow hazard is given for each woodland suitability group. A rating of *slight* indicates that trees are not expected to be blown down in forested areas by commonly occurring winds. A rating of *moderate* indicates that root development of designated species is adequate for stability except during periods of excessive wetness and greatest wind velocity. A rating of *severe* means that the soils do not permit adequate rooting for stability. A high water table or shallow soil will restrict the depth of rooting.

The information given for each woodland suitability group is based primarily upon the field observations, experiences, and judgment of local foresters, soil scientists, and landowners; some is based on the results of research. It represents the latest available knowledge about the way soils influence the growth and management of trees.

WOODLAND SUITABILITY GROUP 1

This group consists of well drained and moderately well drained soils on flood plains. These soils have a surface layer that ranges from fine sandy loam to silt loam and a subsoil that ranges from fine sandy loam to silty clay loam.

Permeability is moderately rapid, and available water capacity is medium to high. Water and tree roots readily penetrate these soils. Natural fertility is low to medium, and organic-matter content is medium to high.

These soils have slopes of 0 to 2 percent and are subject to very frequent flooding. Although of very brief duration, flooding is the chief limitation to producing trees on these soils. It can increase seedling mortality, impede logging, and interfere with other forest management.

Eastern white pine grows faster on these soils than other suitable coniferous species. Shortleaf pine is also well suited, but it grows more slowly than white pine. Both species are suitable for pulpwood and sawlog rotations. Yellow-poplar, black walnut, white and green ashes, red and white oaks, black cherry, sugar maple, sycamore, and other desirable hardwoods also grow exceptionally well on these soils. These species can produce high-quality veneer bolts and sawtimber. White pine, Norway spruce, white spruce, Scotch pine, and Fraser fir are suitable for Christmas trees. Oaks, hickories, black cherry, and dogwood grow well on these soils; these are important species for production of food for wildlife.

The site index range is 85 to 95 for white pine, 75 to 85 for shortleaf pine, 95 to 115 for yellow-poplar, and 80 to 90 for red oaks.

Plant competition to pines, yellow-poplar, and other desirable hardwoods is moderate to severe. In many places disking or blading, is needed to eliminate or control competing undesirable vegetation before planting or seeding pines, yellow-poplar, and other desirable species.

Seedling mortality is generally slight on these soils; more than 75 percent of planted seedlings survive. In places surface drainage is needed to eliminate or reduce ponding. Satisfactory stocking usually can be obtained from natural reseeding on these soils where adequate seed trees are present and competing vegetation is controlled.

Restrictions on the use of equipment common in forest management are slight to moderate. Operation of equipment during wet periods can damage tree roots and soil structure.

The erosion hazard is slight on these soils. Windthrow is not a hazard, except during abnormally high winds.

WOODLAND SUITABILITY GROUP 2

This group consists of nearly level, very poorly drained soils on flood plains. These soils have a surface layer that ranges from silt loam to muck and a subsoil that ranges from stratified loamy material to silty clay loam. Natural fertility is low to medium, and organic-matter content is high. Permeability is moderate, and available water capacity is high. Unless these soils are drained, tree roots do not penetrate deeply, because of the seasonally high water table.

These soils are subject to very frequent flooding of very brief duration. In undrained areas water remains at or near the surface much of the time. This can prevent seed germination, drown the seedlings, and severely restrict the use of equipment.

Eastern white pine, green ash, sycamore, yellow-poplar, and red oaks are preferred species and are important sources of wildlife food. These soils are well suited to pulpwood and sawlog rotations and can produce high-quality veneer bolts.

Where these soils have been drained, the site index range is 85 to 95 for white pine, 85 to 95 for yellow-poplar, and 70 to 80 for red oaks.

Plant competition to pines and desirable hardwoods is generally severe. Low-grade hardwoods, dog hobble, rhododendron, mountain-laurel, and other shrubs, unless eradicated or controlled, prevent natural seeding or planting of desired species. Blading, clearing, or other intensive treatment is required to control competing vegetation and to prepare seedbeds for restocking to desirable kinds of trees.

Seedling mortality is moderate for most species on these soils. Yellow-poplar and pines are especially vulnerable to excessive wetness. Drainage reduces seedling mortality and improves site quality.

Restrictions on the use of equipment are moderate to severe. Poor drainage and flooding limit the time that equipment can be used. Drainage and road construction are required to make these soils accessible to forest management. Use of equipment during wet periods should be avoided to prevent soil compaction and damage to tree roots.

Erosion and windthrow are negligible hazards on these soils.

WOODLAND SUITABILITY GROUP 3

The one soil in this group is Suncook loamy sand, an excessively drained soil on flood plains. This soil has a

surface layer of loamy sand. The lower layers are loamy sand to sand. Permeability is rapid, and available water capacity is low. Natural fertility is very low, and organic-matter content is low to medium.

This soil has 0 to 2 percent slopes. The chief limitations to the production of trees are very frequent flooding, very low fertility, and droughtiness.

Eastern white pine is the preferred species for pulpwood or sawlog rotations. Shortleaf pine is also suitable. Once established, desirable hardwoods, such as yellow-poplar and sycamore, grow well on these soils.

The site index is 75 to 85 for white pine, 55 to 65 for shortleaf pine, and 85 to 95 for yellow-poplar.

Plant competition is generally moderate. In places undesirable vegetation must be controlled or eliminated.

Seedling mortality ranges from slight to moderate. Flooding, including scouring and silting, can cause loss of seedlings. In places extensive replanting is necessary. Natural reseeding cannot be relied upon to establish a fully stocked stand of desirable trees.

Limitations on the use of equipment are slight.

Erosion and windthrow are negligible hazards to growing trees on this soil.

WOODLAND SUITABILITY GROUP 4

This group consists of somewhat poorly drained and moderately well drained soils on stream terraces. These soils have a surface layer of fine sandy loam and a subsoil that ranges from sandy clay loam to clay loam. Permeability is moderate, and available water capacity is medium. Natural fertility and organic-matter content are low to medium.

These soils have slopes of 1 to 6 percent and are subject to infrequent flooding of very brief duration.

Eastern white pine, shortleaf pine, yellow-poplar, white and green ash, red and white oaks, and sycamore are preferred species. River birch and Virginia and pitch pines are species of secondary preference. White and Scotch pines and Norway and white spruces are suitable for Christmas trees. Nearly all of these species are important as sources of wildlife food and cover. These soils are suited to pulpwood and sawlog rotations and can produce high-quality veneer bolts.

The site index range is 85 to 95 for white pine, 65 to 75 for shortleaf pine, 75 to 85 for Virginia pine, 90 to 100 for yellow-poplar, and 75 to 85 for red oaks.

Plant competition to pines and desirable hardwoods is moderate to severe. In places land clearing, blading, disking, or other intensive site treatments are needed to eliminate or control competing vegetation and to prepare sites before planting or seeding desired species.

Seedling mortality is generally slight, and at least 75 percent of planted seedlings survive. If adequate seed trees are present and competing vegetation is controlled, well-stocked stands can be obtained through natural regeneration.

Limitations on the use of equipment are slight to moderate. During wet periods, logging is usually restricted. Flooding on these soils can temporarily interfere with forest management operations.

Erosion and windthrow are slight hazards on these soils.

WOODLAND SUITABILITY GROUP 5

This group consists of well drained and moderately well drained soils in draws and at the foot of slopes. The areas are known locally as cove land. These soils have a surface layer that ranges from loam to fine sandy loam and a subsoil that ranges from fine sandy loam to clay loam. In some places the surface layer is stony. Permeability is moderately rapid to moderate, and available water capacity is medium to high. Water and tree roots readily penetrate these soils. Natural fertility is low to medium, and organic-matter content is low to high.

These soils have slopes of 2 to 50 percent and are uneroded.

Eastern white pine, shortleaf pine, yellow-poplar, black walnut, black cherry, sugar maple, white ash, northern red oak, white oak, basswood, and yellow and black birches are preferred species. These species are suitable for pulpwood and sawlog rotations and can produce high-quality veneer bolts. White pine, Scotch pine, Norway and white spruces, and Fraser fir are suitable for Christmas trees. Oaks, hickories, black cherry, dogwood, and beech grow well on these soils; these are important species for production of food for wildlife.

The site index range is 85 to 95 for white pine, 75 to 85 for shortleaf pine, 90 to 110 for yellow-poplar (fig. 8), and 75 to 85 for red oak.

Figure 8.—**Yellow-poplar on Tusquitee loam, 15 to 25 percent slopes, where the average site index for yellow-poplar is 104. The stand is 30 years old.**

Plant competition to pines, yellow-poplar, and other desirable hardwoods is generally severe. In many places clearing, blading, or other intensive site treatments are needed to control or eradicate competing undesirable vegetation before planting or seeding pines, yellow-poplar, and other desirable species.

Seedling mortality is generally slight on these soils, and at least 75 percent of planted seedlings survive. Where adequate seed trees are present and competing vegetation is controlled, well-stocked stands can be established through natural regeneration.

Limitations on the use of equipment increase with the steepness of slope and the degree of stoniness. Except on the stony phases of these soils, limitations are slight on slopes up to 15 percent, moderate on slopes from 15 to 25 percent, and severe on steeper slopes. On the stony phases equipment limitations are moderate on slopes up to 15 percent and severe on steeper slopes.

The water erosion hazard is slight on slopes up to 6 percent, moderate on slopes from 6 to 15 percent, and severe on steeper slopes. Roads on unprotected slopes in steep areas are subject to severe erosion. In constructing roads and firebreaks, the grade should not exceed 10 percent. Windthrow hazard is slight on these soils.

Because of adverse climatic conditions, white pine should not be planted at elevations above 4,000 feet; shortleaf pine, above 3,000 feet; and yellow-poplar, above 4,500 feet.

WOODLAND SUITABILITY GROUP 6

This group consists of well-drained soils on uplands. These soils have a surface layer that ranges from fine sandy loam to loam and a subsoil that ranges from fine sandy loam to clay. In some places the surface is stony. Permeability is moderate to moderately rapid, and available water capacity is medium to high. Natural fertility is low to medium, and organic-matter content is low to high. Water and tree roots readily penetrate these soils.

These soils have slopes of 2 to 70 percent and are uneroded or slightly eroded.

Yellow-poplar, black walnut, black cherry, sugar maple, white and green ash, red and white oaks, and yellow and black birches are preferred hardwood species for veneer, sawtimber, or furniture stock. Eastern white pine is the preferred coniferous species. Shortleaf pine is also suited, but it grows more slowly than white pine. White pine, Scotch pine, Norway spruce, white spruce, and Fraser fir are suitable for Christmas trees. Oaks, hickories, black cherry, black and white walnuts, beech, and dogwood grow well on these soils; these are important species for production of food for wildlife.

The site index range is 80 to 100 for white pine (fig. 9), 65 to 75 for shortleaf pine, 80 to 100 for yellow-poplar, and 70 to 80 for red oaks.

Plant competition to pines and desirable hardwoods is moderate to severe. In many places clearing, blading, brush cutting, or a combination of these are frequently needed to eradicate or control competing undesirable vegetation before planting or seeding desired species.

Seedling mortality is generally slight on these soils, and generally 75 percent or more of the planted seedlings survive. If adequate seed trees of desired species are present and competing vegetation is controlled, well-stocked stands can be obtained through natural regeneration.

Figure 9.—**White pine on Hayesville fine sandy loam, 6 to 15 percent slopes, where the average site index for white pine is 86. The stand is 40 years old.**

Restrictions on the use of equipment increase with the slope and the degree of stoniness. Except on the stony phases, limitations are slight on slopes up to 15 percent, moderate on slopes from 15 to 25 percent, severe on slopes from 25 to 45 percent, and very severe on steeper slopes. On the stony phases, equipment limitations are moderate on slopes up to 15 percent, severe on slopes from 15 to 45 percent, and very severe on steeper slopes.

The water erosion hazard is slight on slopes up to 6 percent, moderate on slopes from 6 to 15 percent, and severe on steeper slopes. Roads on unprotected slopes in steep areas are subject to severe erosion. In constructing roads and firebreaks, the grade should not be allowed to exceed 10 percent. Windthrow hazard is slight.

Because of adverse climatic conditions, white pine should not be planted at elevations above 4,000 feet; shortleaf pine, above 3,000 feet; and yellow-poplar, above 4,500 feet.

WOODLAND SUITABILITY GROUP 7

This group consists of Hayesville clay loam, 10 to 25 percent slopes, severely eroded. This is a well-drained

soil on the uplands. It has a surface layer of clay loam and a subsoil that ranges from clay loam to clay. Permeability is moderate, and available water capacity is high. Natural fertility is low, and organic-matter content is low.

White pine is the preferred species for sawlog and pulpwood rotations on most sites. Shortleaf and Virginia pines are also suitable, but they grow more slowly than white pines.

The site index range is 85 to 95 for white pine, 65 to 75 for shortleaf pine, and 70 to 80 for Virginia pine.

Plant competition to pines is generally slight.

Seedling mortality is generally moderate, but it is severe in some places and some replanting is necessary. Natural reseeding cannot be depended upon to provide an adequately stocked stand of pines.

Equipment limitations are moderate on slopes up to 15 percent and severe on steeper slopes. Roads on unprotected slopes are severely eroded. Special precautions should be taken in constructing and maintaining roads, skid trails, and firebreaks to limit further soil losses from erosion. Soil structure and tree roots are severely damaged by heavy concentration of livestock.

The hazard of further erosion is moderate on slopes up to 10 percent and severe on steeper slopes. Adequate protective ground cover is needed. The windthrow hazard is generally moderate.

WOODLAND SUITABILITY GROUP 8

This group consists of somewhat excessively drained and well-drained soils on uplands. These soils have a surface layer that ranges from fine sandy loam to loam and a subsoil that ranges from sandy loam to loam and silt loam. In some places the surface layer and subsoil are stony. Permeability is moderately rapid, and available water capacity is low. Natural fertility and organic-matter content are low to medium.

These soils have slopes of 6 to 80 percent, but they are dominantly 30 to 60 percent and uneroded.

Penetration of water and tree roots is limited by depth to bedrock. Depth to bedrock commonly ranges from 2 to 6 feet in these soils.

Eastern white pine is the preferred species for pulpwood and sawlog rotations. Shortleaf, Virginia, and pitch pines are also suitable, but they grow more slowly. White pine and Scotch pine are suitable for Christmas trees.

The site index range is 75 to 85 for white pine and 55 to 75 for shortleaf pine.

Where bedrock is very near the surface and the soil is stony, no commercial wood crop of any species can be produced. Because of the limited root zone and droughtiness, the wood production potential, alone, does not justify the cost of establishing and managing trees. On such sites, watershed protection is the main objective of planting trees. Onsite investigation should be made on such areas before attempting intensive forest management for wood production.

Plant competition to pines is slight to moderate; severity varies with depth to bedrock. In places clearing, blading, or other intensive site treatments are needed to control competing undesirable vegetation.

Seeding mortality is generally slight to moderate on these droughty soils, but it is severe where the soils are shallow or very steep. In such areas, superior planting techniques and high-quality seedlings are required to obtain an adequately stocked stand of pines. Replanting may still be necessary. Ordinarily, well-stocked stands cannot be obtained through natural regeneration.

Restrictions on the use of equipment are slight to very severe and increase with the steepness of slope and degree of stoniness. Except on stony phases, limitations are slight on slopes up to 15 percent, moderate on slopes from 15 to 25 percent, severe on slopes from 25 to 45 percent, and very severe on the steeper slopes. On the stony phases, equipment limitations are moderate on slopes up to 15 percent, severe on slopes from 15 to 45 percent, and very severe on steeper slopes.

The water erosion hazard is moderate on slopes from 6 to 15 percent and severe on steeper slopes. Root development is restricted by droughtiness and by bedrock where it is near the surface. As a result, the windthrow hazard ranges from moderate to very severe. It is very severe where bedrock is near the surface.

WOODLAND SUITABILITY GROUP 9

This group consists of well-drained soils on uplands. These soils have a surface layer of silt loam or channery silt loam and a subsoil that ranges from channery silt loam to channery silty clay loam. Permeability is moderate, and available water capacity is low. Natural fertility is very low to low, and organic-matter content is low to medium.

The slopes are 25 to 70 percent, and the soils are uneroded or slightly eroded. Penetration of water and tree roots is restricted by depth to bedrock. This depth ranges from 1 to 4 feet, but it is commonly less than 3 feet.

Eastern white pine is the preferred species for wood production but should be restricted to northern and eastern slopes. Shortleaf, Virginia, and pitch pines are also suitable; these are better suited to the drier southern and southwestern slopes than white pine.

The site index range is 65 to 75 for white pine, 55 to 65 for shortleaf pine, 65 to 75 for pitch pine, and 65 to 75 for Virginia pine.

Plant competition to pines, especially from rhododendron and mountain-laurel, is severe. Intensive treatments, such as clearing by cutting or blading, are required in most places to control undesirable vegetation.

Seedling mortality is generally moderate. In places some replanting is necessary. Ordinarily, fully stocked stands cannot be obtained by natural reseeding.

Restrictions on the use of equipment are slight to very severe, increasing in severity with steepness of slope. Limitations are slight on slopes up to 15 percent, moderate on slopes from 15 to 25 percent, severe on slopes from 25 to 45 percent, and very severe on slopes of more than 45 percent.

The hazard of water erosion is moderate on slopes from 6 to 15 percent and severe on steeper slopes. Root development varies with the depth to bedrock, and the windthrow hazard is moderate to severe on these soils.

WOODLAND SUITABILITY GROUP 10

This group consists only of Burton stony loam, 25 to 60 percent slopes. This is well drained to moderately well

drained soil at the highest elevations, generally above 5,000 feet. The surface layer is loam and contains stones. The subsoil ranges from sandy loam to loam. Permeability is moderately rapid, and available water capacity is medium. Natural fertility is medium, and organic matter content is high.

Fraser fir, Norway spruce, and yellow birch are suitable species. Fraser fir and Norway spruce are suitable for Christmas trees. Beech is an important food-producing species for wildlife. Site index data for these are unavailable.

Plant competition to desirable species is generally moderate. In many places intensive site treatment is needed to control or eradicate competing undesirable vegetation before planting or seeding desirable species.

Seedling mortality is generally slight. Where adequate seed trees are present and competing vegetation is controlled, well-stocked stands can be established through natural regeneration.

Limitations on the use of equipment are severe to very severe because of steepness of slope and stoniness.

The water erosion hazard is severe because of the slope. Roads on unprotected slopes are subject to severe erosion. In constructing roads and firebreaks, the grade should not exceed 10 percent. The windthrow hazard is severe to very severe and increases with elevation and shallowness of the soil. The hazard of ice damage to trees is very severe at the higher elevations.

WOODLAND SUITABILITY GROUP 11

This group consists of several miscellaneous land types that are rocky or stony. The texture of the soil material varies greatly from one place to another, as does the depth to which tree roots and water penetrate. Careful investigation at the site is required to determine how an area can best be managed for trees.

The potential productivity of these land types for trees varies widely.

Plant competition is generally slight where erosion is still active. Where vegetation has become established and the soil is stabilized, plants compete severely for the limited supply of moisture.

Seedling mortality is generally very severe on these land types, even with special site preparation. Seedlings must be planted by hand, and extensive replanting may be necessary.

The use of most equipment is severely restricted by steep slopes and stoniness.

The hazard of windthrow is very severe for all kinds of trees.

Use of the Soils for Wildlife [5]

The soils of Transylvania County produce food and cover for many kinds of wildlife. Because most of this county is wooded, forest-dwelling kinds of game predominate.

Squirrel and grouse are most abundant, but raccoon are relatively scarce. Opossum are scattered throughout the county but are not numerous. Deer are most numerous in the more remote areas in the northern section of the county. Bears can be found in the southwestern section in the Whitewater, Toxaway, and Horsepasture River drainageways. A few remnant flocks of turkey are in the more remote areas, but their populations are low.

The predaceous bobcat and the red and gray foxes can be found in most of the wooded areas, but they are not numerous.

The acreage of open cultivated areas in this county is small and confined mainly to the French Broad River valley. A small population of bobwhite is found in this valley, but the type of farming limits their number. Rabbits are also found in this area, but they are not abundant. Doves are numerous early in fall in the French Broad River valley, but they diminish in numbers as winter approaches.

The duck population in the county is variable and is relatively low in winter. It consists of wood ducks, mallards, and a few black ducks. Some wood ducks nest along the French Broad River.

Furbearers of the county are mink, raccoon, skunk, fox, muskrat, and a few scattered colonies of beaver.

Nongame birds are of wide variety. They range from the northern species that winter in the higher mountains to the waterfowl that inhabit areas along streams and rivers. Their numbers vary according to the season.

Because of the high elevation and the woodland cover of the county, the water in many of the streams and rivers is cool, and consequently trout are present in many of them. Brown, rainbow, and brook trout are the most abundant gamefish in the area, but smallmouth bass, redbreasted sunfish, bluegills, and rock bass are also in the lower, warmer sections of some streams. Largemouth bass and bluegills inhabit some of the farm ponds, but the colder ponds are generally stocked with trout. The temperature in the colder ponds does not exceed 70°F.

Two large lakes, Toxaway and Cascade, are in this county. These lakes are inhabited primarily by trout, but they are also inhabited by a small population of sunfish and bass.

The abundance of a particular kind of wildlife depends upon the availability of its preferred foods. Transylvania County produces food for a wide variety of wildlife. The choice food and the cover requirements for the major kinds of wildlife are discussed in the following paragraphs.

Bear.—These animals are omnivorous and consume a wide variety of food. Some of these foods are acorns, beechnuts, cherries, apples, corn, grapes, blueberries, blackberries, greenbriers, grasses, hawthorn, blackgum, various plant roots, small mammals, insects, fish, carrion, and garbage. Occasionally, a bear becomes an outlaw and kills cattle.

Beaver.—Food for beaver consists entirely of plant material, mostly bark, roots, tender twigs, and greens. Acorns, corn, and the tender bark or the cambium of alder, ash, birch, hornbeam, maple, pine, and willows are the choice foods. Beaver also eat the tender shoots of alder, honeysuckle, and various grasses and weeds. Feeding areas are chiefly within 150 feet of water.

Bobcat.—These are predators that feed on squirrels,

[5] JOHN P. EDWARDS, biologist, Soil Conservation Service, assisted in writing this section.

rabbits, mice, voles, snakes, and small birds, and occasionally on young deer.

Deer.—The choice foods for deer include acorns, bluegrass, clovers, cowpeas, fescue, greenbriers, honeysuckle, annual and shrub lespedezas, oats, orchardgrass, rescuegrass, rye, soybeans, wheat, alfalfa, apples, birch, blackberries, dewberries, blueberries, huckleberries, buffalo nuts, strawberries, strawberry bush, sassafras, Asiatic chestnut, chinquapin, corn, mountain-laurel, maple, yellow-poplar, rhododendron, tickclover, and various grasses. Generally, deer can find their cover requirements in woodlands that are 500 acres or more in size and that have an adequate supply of surface water. For best use food plantings for deer should be well limed and fertilized.

Doves. —Choice foods for doves are browntop millet, corn, Japanese millet, seeds of pine, pokeberry, and common ragweed, grain sorghum, sunflower, wheat, and rye. Doves do not eat insects, green leaves, or fruits.

Ducks.—Choice foods for ducks are ash, acorns, beechnuts, browntop millet, corn, Japanese millet, and smartweed seeds. These foods must be covered by water to be readily available to ducks, but ducks do occasionally feed on acorns and grains on dry land.

Fish.—The temperature of water governs the species of fish that inhabit ponds, streams, or rivers. The coldest water supports highly prized trout; cold to cool water supports smallmouth bass, rock bass, and robins, and the warmer water supports largemouth bass and bluegills.

Fox.—Both the gray and the red fox are hunted with hounds in this county. Their food habits are similar. Mice, rabbits, songbirds, and cold-blooded vertebrates make up approximately 75 percent of their diet. The rest of their food is plant material that includes cherries, corn, persimmons, mulberries, grapes, pokeberries, hawthorn, blueberries, acorns, and beechnuts.

Grouse.—Grouse are common in suitable woodland cover. Their diet is highly variable. Some of their favorite foods are acorns, beechnuts, blackberries, branch lettuce, apples, clover, dewberries, oats, elaeagnus, pyracantha, tender leaves, insects, strawberries, buds of beech, birch, and maple, sumac, wild cherries, hawthorn, rose hips, wild grapes, ferns, teaberries, mountain-laurel, greenbriers, viburnums, blueberries, dogwood berries, rhododendron, serviceberries, and mountain-ash.

Minks.—These semiaquatic mammals are predators and feed mainly on animals that are associated with water. Their diet includes fish, frogs, crayfish, mice, songbirds, snakes, lizards, salamanders, rabbits, squirrels, muskrats, and any other animals that they can readily catch.

Muskrats.—Muskrats are essentially vegetarian. Their food consists of roots, stems, bark, fruit, and leaves of various plants. Their favorite foods are grasses, clover, corn, and many kinds of marsh vegetation. Occasionally, muskrats feed on fish, fresh-water mussels, insects, crayfish, and snails.

Nongame birds.—The food preferences of the many nongame birds vary widely. Several kinds of birds eat nothing but insects; a few eat insects, nuts, and fruits; and others eat insects and seeds. Many desirable species of nongame birds, such as bluebirds, cardinals, robins, mockingbirds, and tanagers, can be attracted by dogwoods, hollies, elaeagnus, blueberries, huckleberries, pokeberries, privets, pyracantha, viburnum, blackgum, smooth sumac, sunflowers, browntop millet, cherries, elderberries, grapes, hackberries, hemlock, mulberries, poison ivy, and rose.

Opossums.—These slow-moving mammals are omnivorous and eat almost anything available. Included in their diet are fleshy fruits, acorns, corn, persimmons, blackgum, invertebrates, small mammals, snakes, lizards, salamanders, bird eggs, fresh carrion, and garbage.

Quail.—Choice foods for quail include acorns, beechnuts, blackberries, browntop millet, buckwheat, wild black cherries, corn, cowpeas, hawthorn, alfalfa, honeysuckle, flowering dogwood, seeds of annual and shrub lespedezas, panicgrass, sunflower, tickclover, wheat, sorghum, mulberries, pine seeds, seeds of common ragweed, and soybeans. Quail also eat many insects. Nutritious food and cover that protects them from predators and adverse weather are vitally important to quail in this county because of the severity of the winters. These two items are essential in maintaining a high population.

Rabbits.—Cover, such as blackberry, greenbrier, or honeysuckle patches, is an important requirement for rabbit habitat. Among the choice foods are clovers, alfalfa, bluegrass, fescue, winter grasses, lespedeza, orchardgrass, poison ivy, soybeans, sumac, waste grain, bark, and twigs. These foods and other succulent vegetation are generally available. Food plantings that are well fertilized and limed are more attractive to rabbits than those that are not.

Raccoon.—Raccoons eat a wide variety of food, both plant and animal. Among their favorite plant foods are acorns, blackgum, corn, grapes, greenbrier, holly, oak, persimmons, and pokeberries. Among their favorite animal foods are crayfish, frogs, grasshoppers, insects, and small animals. Raccoons prefer stream and river bottoms where den trees are plentiful.

Squirrel.—Gray squirrel and red squirrel, frequently called mountain boomer, inhabit this county. The gray squirrel is hunted more than the red squirrel. The choice foods of these animals are acorns, beechnuts, blackgum, black cherry, corn, flowering dogwood, hickories, mulberries, pine mast, chestnuts, hazelnuts, walnuts, butternuts, chinquapins, and poplar.

Turkeys.—These birds thrive only in areas of woodland that are generally 1,000 acres or more in size. They need surface water daily for drinking and often roost in large trees over the water. Choice foods are insects, acorns, beechnuts, blackberries, blueberries, huckleberries, browntop millet, blackgum, clover, corn, cowpeas, flowering dogwood, wild grapes, hackberries, mulberries, oats, pine mast, rescuegrass, rose, rye, and wheat.

Woodchucks.—These are not considered game animals, but they afford many hours of hunting. Some people eat the young woodchucks but reject the older ones that are strongly flavored and tough. Woodchucks are vegetarians; their favorite foods are alfalfa, apples, bluegrass, honeysuckle, and soybeans.

Wildlife suitability groups

Most kinds of wildlife can be related to soils in a two-step process. First determined is the relation of the kinds of wildlife to the plants that provide food and cover, and second is the relation of those plants to the kinds of soil. Table 3 shows these relationships for groups of soils

known as wildlife suitability groups. In table 3, for example, alder is listed as a choice food for beaver, and it is shown that three of the wildlife suitability groups are poor sites for growth of alder. To this extent at least, these groups of soils are poor habitat for beaver. Four terms are used to rate relative suitability in table 3. *Good* indicates that plants grow very well on soils of the specified wildlife group; *fair* indicates less favorable growth; and *poor* or *unsuited* indicates that growth is poor or that the plant does not grow.

Following are descriptions of the wildlife suitability groups in Transylvania County. The soils in each of these groups can be determined by referring to the "Guide to Mapping Units" at the back of this publication. The miscellaneous land types, Rock outcrop, Stony colluvial land, and Stony land, are so variable that they are not placed in wildlife groups.

WILDLIFE SUITABILITY GROUP 1A

This group consists of well drained and moderately well drained soils on uplands, in upland draws, on toe slopes, and on stream terraces. These soils have a fine sandy loam or loam surface layer. In places the surface is stony. The subsoil ranges from sandy loam to clay.

These soils have low to medium natural fertility and low to high organic-matter content. Available water capacity is medium to high, and permeability is moderate to moderately rapid. Surface runoff varies considerably with the slope and the ground cover. Slopes range from 2 to 70 percent.

WILDLIFE SUITABILITY GROUP 1B

This group consists only of Hayesville clay loam, 10 to 25 percent slopes, severely eroded. This is a well-drained soil on uplands. Accelerated erosion has removed most of the original surface layer. The plow layer is primarily in the subsoil but consists also of remnants of the original surface layer. This soil has a clay loam surface layer poor in tilth and a clay loam or clay subsoil.

This soil has low natural fertility and low to medium organic-matter content. Available water capacity is high, and permeability is moderate. This soil has a moderately deep to deep effective root zone.

WILDLIFE SUITABILITY GROUP 2

This group consists of somewhat excessively drained and well-drained soils on uplands. These soils have a fine sandy loam to silt loam surface layer. In some places the surface layer is stony or channery. The subsoil ranges from sandy loam to loam to channery silt loam and channery silty clay loam. In some places the subsoil is stony.

These soils have very low to medium natural fertility and low to medium organic-matter content. Available water capacity is low, and permeability is moderately rapid to moderate. Surface runoff varies considerably with the slope and the ground cover. Slopes range from 6 to 80 percent.

WILDLIFE SUITABILITY GROUP 3

This group consists of excessively drained to moderately well drained, nearly level soils on stream flood plains. They have a loamy sand, fine sandy loam, loam, or silt loam surface layer and lower layers that range from sand to silty clay loam.

These soils have very low to medium natural fertility and low to high organic-matter content. Available water capacity is low to high, and permeability is moderately rapid to rapid. Flooding occurs very frequently but is of very brief duration.

WILDLIFE SUITABILITY GROUP 4

This group consists of very poorly drained and somewhat poorly drained, nearly level to gently sloping soils on flood plains and stream terraces. They have a fine sandy loam, silt loam, or muck surface layer and a variably textured subsoil.

These soils have low to medium natural fertility and low to high organic-matter content. Available water capacity is medium to high, and permeability is moderate. Depth to seasonally high water table ranges from 0 to about 2 feet.

TABLE 3.—*Suitability of plants for the soils in the wildlife groups*

Kind of plant	Wildlife group					Choice foods for—
	1A	1B	2	3	4	
Alder	Poor	Poor	Poor	Good	Good	Beaver.
Alfalfa	Good	Fair	Poor	Good	Poor	Deer, quail, rabbit, and woodchuck.
Apple	Good	Fair	Fair	Good	Poor	Deer, grouse, bear, and woodchuck.
Ash	Fair	Fair	Poor	Good	Good	Beaver and duck.
Beech	Good	Fair	Fair	Good	Poor	Duck, fox, grouse, quail, bear, turkey, and squirrel.
Birch (black and yellow)	Good	Fair	Poor	Good	Good	Beaver, deer, and grouse.
Blackberry and dewberry	Good	Fair	Fair	Good	Good	Deer, grouse, bear, turkey, rabbit, and quail.
Blackgum	Good	Fair	Poor	Good	Fair	Raccoon, squirrel, bear, opossum, turkey, and nongame birds.
Blueberry and huckleberry	Good	Fair	Fair	Good	Fair	Deer, fox, grouse, bear, turkey, and nongame birds.
Bluegrass	Good	Fair	Fair	Good	Fair	Deer, rabbit, and woodchuck.
Branch lettuce	Poor	Poor	Poor	Poor	Good	Grouse.
Browntop millet	Good	Fair	Fair	Good	Fair	Dove, duck, quail, turkey, and nongame birds.
Buckwheat	Good	Fair	Fair	Good	Fair	Quail.
Buffalo nut	Good	Fair	Poor	Good	Fair	Deer.
Butternut	Good	Fair	Fair	Good	Fair	Squirrel.

TABLE 3.—*Suitability of plants for the soils in the wildlife groups*—Continued

Kind of plant	Wildlife group					Choice foods for—
	1A	1B	2	3	4	
Cherry (black, pin, and sweet)	Good	Fair	Fair	Good	Poor	Fox, grouse, quail, squirrel, bear, and nongame birds.
Chestnut, Asiatic	Good	Fair	Poor	Good	Poor	Deer and squirrel.
Chinquapin	Good	Fair	Fair	Fair	Poor	Deer and squirrel.
Clover (crimson, red, and white)	Good	Fair	Fair	Good	Fair	Deer, grouse, muskrat, turkey, and rabbit.
Corn	Good	Poor	Poor	Good	Fair	Beaver, dove, duck, turkey, deer, fox, quail, bear, muskrat, raccoon, squirrel, and opossum.
Cowpea	Good	Fair	Fair	Good	Fair	Deer, quail, and turkey.
Dogwood	Good	Fair	Poor	Good	Fair	Grouse, quail, squirrel, nongame birds, and turkey.
Elaeagnus	Good	Fair	Fair	Good	Poor	Grouse and nongame birds.
Elderberry	Fair	Fair	Poor	Good	Good	Nongame birds.
Fern	Fair	Poor	Poor	Good	Good	Grouse.
Fescue	Good	Fair	Fair	Good	Good	Deer and rabbit.
Grape, wild	Good	Fair	Fair	Good	Fair	Fox, grouse, raccoon, bear, turkey, and nongame birds.
Greenbrier	Fair	Poor	Poor	Good	Good	Deer, grouse, rabbit, bear, and raccoon.
Hackberry	Good	Fair	Fair	Good	Fair	Nongame birds and turkey.
Hawthorn	Good	Fair	Fair	Good	Fair	Fox, grouse, bear, and quail.
Hazelnut	Good	Fair	Fair	Good	Poor	Squirrel.
Hemlock	Good	Fair	Poor	Good	Fair	Nongame birds.
Hickory (mockernut, pignut, red, and shagbark).	Good	Fair	Poor	Good	Poor	Squirrel.
Holly	Good	Fair	Poor	Good	Poor	Raccoon and nongame birds.
Honeysuckle	Good	Fair	Fair	Good	Good	Beaver, deer, quail, rabbit, and woodchuck.
Hornbeam	Good	Fair	Poor	Good	Poor	Beaver.
Japanese millet	Fair	Poor	Poor	Good	Good	Dove and duck.
Laurel, mountain	Good	Fair	Fair	Good	Fair	Deer and grouse.
Lespedeza, annual	Good	Fair	Fair	Good	Fair	Deer, quail, and rabbit.
Lespedeza, sericea and shrub	Good	Fair	Fair	Good	Poor	Deer, quail, and rabbit.
Maple	Good	Fair	Fair	Good	Fair	Beaver, deer, and grouse.
Mountain-ash	Fair	Fair	Fair	Fair	Poor	Grouse.
Mulberry	Good	Poor	Poor	Good	Poor	Fox, quail, squirrel, turkey, and nongame birds.
Oak (chestnut, red, scarlet, and white).	Good	Fair	Fair	Good	Fair	Beaver, turkey, deer, duck, fox, grouse, bear, opossum, quail, raccoon, and squirrel.
Oats	Good	Fair	Fair	Good	Fair	Deer, grouse, and turkey.
Orchardgrass	Good	Fair	Fair	Good	Fair	Deer and rabbit.
Panicgrass	Good	Poor	Poor	Good	Good	Deer and quail.
Persimmon	Good	Fair	Fair	Good	Fair	Fox, opossum, and raccoon.
Pine (pitch, shortleaf, Virginia, and white).	Good	Fair	Fair	Good	Fair	Beaver, dove, quail, turkey, and squirrel.
Poison ivy	Good	Fair	Good	Good	Fair	Rabbit and nongame birds.
Pokeberry	Good	Fair	Fair	Good	Fair	Dove, fox, raccoon, and nongame birds.
Poplar, yellow	Good	Poor	Poor	Good	Good	Deer and squirrel.
Privet	Good	Fair	Fair	Good	Fair	Nongame birds.
Pyracantha	Good	Fair	Fair	Good	Poor	Grouse and nongame birds.
Ragweed	Good	Fair	Fair	Good	Good	Dove and quail.
Rescuegrass	Good	Fair	Fair	Good	Fair	Deer, turkey, and rabbit.
Rhododendron	Good	Fair	Fair	Good	Good	Deer and grouse.
Rose	Good	Fair	Fair	Good	Poor	Grouse, turkey, and nongame birds.
Rye	Good	Fair	Fair	Good	Fair	Deer, dove, rabbit, and turkey.
Sassafras	Good	Fair	Fair	Good	Fair	Deer.
Serviceberry	Fair	Poor	Poor	Good	Fair	Grouse.
Smartweed	Fair	Poor	Poor	Good	Good	Duck.
Sorghum, grain	Good	Poor	Poor	Good	Fair	Dove and quail.
Soybean	Good	Fair	Poor	Good	Fair	Deer, quail, rabbit, and woodchuck.
Strawberry	Good	Fair	Fair	Good	Fair	Deer and grouse.
Strawberry bush	Good	Fair	Poor	Good	Poor	Deer.
Sumac	Good	Fair	Fair	Good	Poor	Grouse, rabbit, and nongame birds.
Sunflower	Good	Fair	Fair	Good	Poor	Dove, quail, and nongame birds.
Teaberry	Fair	Fair	Fair	Good	Poor	Grouse.
Tickclover	Good	Fair	Poor	Good	Poor	Deer, quail, and rabbit.
Viburnum	Good	Fair	Fair	Good	Fair	Grouse and nongame birds.
Walnut, black	Good	Fair	Poor	Good	Fair	Squirrel.
Wheat	Good	Fair	Fair	Good	Fair	Dove, deer, turkey, and quail.
Willows	Good	Poor	Poor	Good	Good	Beaver.

Engineering Uses of the Soils [6]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, dwellings, facilities for water storage, earthen dams, erosion control structures, drainage systems, sewage disposal systems, and recreational facilities. They also affect the suitability of materials for topsoil, road fill, and subgrade. Among the properties most important to the engineer are permeability, compaction characteristics, and shrink-swell potential. Other features important to engineers are grain size, plasticity, pH, soil drainage, topography, depth to a seasonally high water table, and depth to bedrock. Estimates are generally for depths to about 5 feet, and interpretations, therefore, normally do not apply to greater depth.

Information concerning these and related soil properties is given in tables 4, 5, and 6. The estimates and interpretations of soil properties in these tables can be used to—

1. Make studies that will aid in selecting and evaluating areas for developing industrial, business, residential, and recreational sites, and sewage disposal systems.
2. Make preliminary estimates of the engineering properties of soils in planning for agricultural drainage systems, earthen dams, and irrigation systems.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed investigations for the selected locations.
4. Locate sources of construction materials.
5. Correlate the performance of engineering structures with soil mapping units so that information that is useful in designing and maintaining the structures can be obtained.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.

Used with the soil map for identification, the engineering interpretations in this section can be useful for many purposes. It should be emphasized that they do not eliminate the need for sampling and testing at the site of engineering works involving heavy loads or excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected. Because of the mapping scale used, small areas of other soils are included in the mapping units.

Some of the terms used by the soil scientist are different from terms and classifications used by engineers. For example, *clay*, *silt*, *sand*, and *consistence* have different meanings in soil science. These terms are defined in the Glossary at the back of this soil survey.

[6] S. T. CURRIN, civil engineer, Soil Conservation Service, assisted in writing this section.

Engineering classification of soils

Most highway engineers classify soil materials according to the system used by the American Association of State Highway Officials (AASHO) (*1*). In this system, soils are classified in seven principal groups. They range from A–1 (gravelly soils of high traffic-supporting capacity) to A–7 (clayey soils having low traffic-supporting capacity when wet). The relative engineering value of the soils within each group is indicated by group index numbers, which range from 0 for the best materials to 20 for the poorest. The group index numbers can be determined accurately only if the soils have been analyzed. The group indexes for the soils that have been analyzed are shown in table 4.

Some engineers prefer to use the Unified Soil Classification System (*11*) that classifies soils according to grain size distribution, plasticity, liquid limit, and organic matter. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH, and one class of highly organic soils, identified as Pt.

The classification of a soil by either the AASHO or the Unified system identifies the soil material with regard to gradation and plasticity.

Engineering test data

Samples of eight profiles, representing eight soil series, were tested by the North Carolina State Highway Department so that the soils could be evaluated for engineering purposes. For the soil series not tested, classification was estimated from descriptions of soil profiles written by the soil scientist. The test data are given in table 4. They indicate the characteristics of the soil at the specified location. The physical characteristics of each soil at other locations may vary from those of the soil sampled in the surface layer and in the B and C horizons. All samples were obtained at a depth of less than 7 feet.

The engineering classifications in table 4 are based on data obtained by mechanical anaylses and by tests made to determine liquid limit and plastic limit. Mechanical analyses were made by combined sieve and hydrometer methods.

The tests to determine plastic limit and liquid limit measure the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a solid to a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material passes from a semisolid to a plastic state. The liquid limit is the moisture content at which the material passes from a plastic to a liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which soil material is in a plastic condition.

Estimated properties of soils

Table 5 gives some of the significant characteristics of the soils of the county. It also gives the engi-

neering classification of principal horizons in the representative profiles.

The depth to bedrock varies considerably for some soils. The range given in the column showing depth to bedrock is typical of most areas, but in many places, soft weathered rock extends to a greater depth than shown.

The depth to the seasonally high water table is based on field observations. This depth is shown as more than 5 feet because a depth greater than 5 feet cannot be estimated satisfactorily. The soils that flood are noted. Very frequent indicates that flooding occurs more than once every year, and infrequent indicates that flooding occurs once in 5 to 20 years.

The depth from surface is shown in inches for the typical profile.

The soil material in the main horizons is classified according to textural terms used by the U.S. Department of Agriculture. Except for the soils listed in table 4, for which engineering test data are available, the classifications shown for the Unified and AASHO systems are estimates based on the USDA classification of texture and on the description of the soils.

The estimated permeability rates are for soil material in its natural state. They are based on field observations and limited laboratory data.

Available water capacity refers to the water in the soil that is available to plants. It is the amount of water held in the soil between field capacity and the permanent wilting point; that is, between one-third atmosphere and 15 atmospheres of tension. The amounts are based on laboratory tests of a limited number of soils; for soils not tested, the estimates are based on test results of similar soils.

Reaction, or the degree of acidity or alkalinity, is given in terms of pH values.

Shrink-swell potential indicates the expected change in volume when the moisture content changes. It is estimated primarily on the basis of the amount and type of clay in a soil. In general, soils classified as CH and A–7 have a high shrink-swell potential. Sandy soils have low shrink-swell potential.

Engineering interpretations

Table 6 gives interpretations of the properties that affect suitability of soils for engineering.

Soil limitations for dwellings, septic tank absorption fields, and recreational uses are rated *slight*, *moderate*, and *severe*. *Slight* means that the soils have few or no properties unfavorable for a particular use or that the problems are so minor that they can be easily overcome. *Moderate* means that the soils have one or more properties unfavorable for a particular use or that the problems can be overcome with correct planning, careful design, and good management. *Severe* means that the soils have one or more properties very unfavorable for a particular use or that the problems are difficult and costly to overcome. Major reclamation work is generally required. Sand and gravel sources are not rated, because sand and gravel sources are minor. A rating of *good*, *fair*, or *poor* is given to show suitability of soil material as a source of topsoil and road fill.

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Soil features considered in making suitability ratings for topsoil are fertility, texture, organic-matter content, available water capacity, coarse fragments, wetness, and thickness of usable materials. Topsoil refers to soil material used to grow vegetation.

Soil features considered in making suitability ratings for road fill are depth to bedrock, stoniness, workability, shrink-swell potential, compaction characteristics, traffic-supporting capacity, and depth to a seasonally high water table. The ratings indicate performance of soil material moved from borrow areas for the purpose of constructing subgrade for road fills.

Soil features considered in rating sites for dwellings are the flood hazard, seasonally high water table, depth to bedrock, shrink-swell potential, and slope. The limitation for soils that have slopes of 10 to 25 percent was considered moderate and for those that have slopes of more than 25 percent was considered severe.

Soil features considered in ratings for septic tank absorption fields are those that affect the ability of the soil to absorb effluent. The features considered important are slope, depth to bedrock, flooding, seasonally high water table, and permeability of subsoil and substratum. Also considered important are local experience with, and the records for, existing filter fields.

Ratings of soils for campsites, picnic areas, and intensive play areas are based primarily on slope, stoniness, seasonally high water table, and flooding.

Soil features affecting highway location are depth to bedrock, stoniness, topography, flooding, depth to seasonally high water table, susceptibility to frost heave, stability of cut slopes, and plasticity of the soil material. The entire soil profile is evaluated on the basis of undisturbed soil material, except where the surface material has to be removed and wasted because the organic-matter content is high.

Considered in rating reservior areas are those features and qualities of undisturbed soils that affect their use for water impoundment. The soil features are permeability, topography, and depth to seasonally high water table, bedrock, or other unfavorable materials that would allow seepage.

Considered for compacted embankments are those features of disturbed soil that affect earth fills. The features are stability, consolidation potential, compaction characteristics, permeability of compacted material, susceptibility to piping, and stoniness. Permeability of compacted embankments is the relative rate at which water moves through the embankment. As used in table 6, *pervious*, *semipervious*, and *impervious* refer to the relative permeability of compacted embankments. Water loss is excessive in pervious soils. It is significant in semipervious soils but almost negligible in impervious soils.

Soil features that affect agricultural drainage are soil permeability, depth to bedrock, depth to seasonally high water table, topography, flooding, and availability of outlets.

Soil features that affect their suitability for sprinkler irrigation are available water capacity, depth to bedrock, depth to seasonally high water table, flooding, intake rate, slope, and stoniness. Irrigation on slopes greater than 15 percent is hazardous because of the erosion potential.

TABLE 4.—*Engineering*

[Tests performed by North Carolina State Highway Department, in cooperation with Bureau of Public Roads, U.S. Department

Soil name and location	Parent material	Report No.	Depth from surface	Moisture-density data [1]	
				Maximum dry density	Optimum moisture
		S64NC–88	*In.*	*Lb. per cu. ft.*	*Pct.*
Ashe fine sandy loam: 2 miles southwest of Rosman on State Road 1139, then 0.9 mile south on private road, in wooded area 25 feet east of road (modal profile).	Residuum from light-colored, siliceous, coarse-textured granite gneiss.	2–3	1–5	97	19
		2–4	5–20	111	14
		2–5	20–28	108	14
		S65NC–88			
Brevard loam: About 5 miles north of Brevard in Pisgah National Forest, 2 miles north of Looking Glass Rock, and 1 mile west of U.S. Highway No. 276 on Headwater Road, then 0.3 mile northwest of logging road, in wooded area 150 feet west of road (modal profile).	Colluvium.	9–6	13–30	105	19
		9–7	30–48	105	20
		9–8	48–76	102	22
		S64NC–88			
Chester fine sandy loam: About 3 miles southwest of Brevard, then 1.5 miles south of U.S. Highway No. 276 on State Road 1107, in wooded area 50 feet northwest of road (modal profile).	Residuum from gneiss.	7–2	0–5	80	30
		7–4	9–20	99	22
		7–5	20–32	102	20
		7–6	32–42	101	19
Delanco fine sandy loam: 6 miles east of Brevard, in cultivated field, 2,000 feet southeast of Penrose School and 1,000 feet north of French Broad River (modal profile).	Old alluvium.	1–1	0–6	117	13
		1–3	18–30	106	19
		1–4	30–53	109	18
		S65NC–88			
Fannin loam: In Pisgah National Forest, 3 miles north of Looking Glass Rock, 0.3 mile north of Log Hollow Branch bridge on Headwater Road, in wooded area 150 feet north of road (modal profile).	Residuum from micaceous gneiss.	6–6	8–15	97	23
		6–7	15–27	103	21
		6–8	27–39	99	21
Fletcher loam: 0.5 mile north of Brevard College, in wooded area 200 feet northwest of end of State Road 1355 (modal profile).	Residuum from Brevard schist.	8–3	11–22	92	30
		8–4	22–38	96	27
		8–5	38–72	99	19
		S64NC–88			
Ponzer muck, cool variant: About 7 miles southwest of Brevard, in Little River community, 1,500 feet southeast of bridge over Little River on State Road 1533, in cultivated field 1,000 feet west of barn (modal profile).	Alluvial material.	3–1	0–10	63	52
		3–3	18–42	64	42
		3–4	42–50	97	20
		S64NC–88			
Transylvania silt loam: Little River community, in cultivated field 700 feet south of Little River and 50 feet east of State Road 1535 (modal profile).	Allluvial material.	5–1	0–10	74	41
		5–3	27–42	92	27
		5–4	42–70	99	19

[1] Based on AASHO Designation T 99, Methods A and C (*1*).

[2] Analysis according to AASHO Designation T 88. Results by this procedure 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 use in determining the textural classes of soils.

test data

of Commerce, in accordance with standard procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [2]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO [3]	Unified [4]
¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
										Pct.			
--------	--------	--------	100	95	48	38	24	14	9	25	([5])	A-4(3)	SM
--------	--------	--------	--------	94	45	34	23	16	12	([5])	([5])	A-4(2)	SM
--------	--------	--------	100	93	41	29	17	12	10	([5])	([5])	A-4(1)	SM
--------	[6] 98	97	97	93	54	48	40	32	26	34	9	A-4(4)	ML-CL
100	98	--------	98	94	50	44	35	27	21	34	7	A-4(3)	ML
--------	--------	--------	100	97	59	51	41	32	24	35	8	A-4(5)	ML
--------	--------	--------	100	89	57	51	40	24	16	50	10	A-5(4)	ML
--------	--------	--------	100	91	62	57	50	40	34	44	16	A-7-6(8)	ML-CL
--------	--------	--------	100	90	51	45	36	25	17	36	5	A-4(3)	ML
--------	--------	--------	100	86	41	33	25	17	9	([5])	([5])	A-4(1)	SM
--------	--------	--------	100	94	54	45	31	21	16	21	4	A-4(4)	ML-CL
--------	100	--------	--------	97	66	58	46	36	30	37	16	A-6(9)	CL
[7] 98	98	95	95	90	57	49	39	29	26	32	12	A-6(6)	CL
[6] 98	96	92	92	90	56	53	49	37	28	43	15	A-7-6(6)	ML-CL
--------	--------	--------	100	99	51	45	37	26	19	36	5	A-4(3)	ML
[6] 99	96	95	94	89	37	33	25	15	11	37	([5])	A-4(1)	SM
--------	--------	100	99	89	79	77	69	53	46	66	28	A-7-5(19)	MH
--------	--------	--------	100	85	71	66	55	38	30	59	22	A-7-5(15)	MH
--------	--------	100	98	75	53	47	33	16	12	47	5	A-5(5)	ML
--------	--------	--------	100	90	61	58	44	23	12	67	9	A-5(5)	OH
--------	--------	--------	100	93	60	54	38	18	13	52	([5])	A-5(5)	OH
--------	--------	--------	100	99	69	47	32	19	13	30	([5])	A-4(5)	ML
--------	--------	--------	--------	100	95	88	67	28	15	52	10	A-5(8)	MH
--------	--------	--------	100	99	84	77	60	38	27	40	10	A-4(8)	ML
--------	--------	--------	100	99	83	73	54	34	25	34	9	A-4(8)	ML-CL

[3] Based on AASHO Designation M 145–49 (*1*).

[4] Based on MIL–STD–619B (*11*). The SCS and the Bureau of Public Roads (BPR) have agreed that any soil having a plasticity index within 2 points of the A-line is to be given a borderline classification. ML–CL is an example of a borderline classification.

[5] Nonplastic.

[6] 100 percent passed the 1-inch sieve.

[7] 100 percent passed the 3-inch sieve; 99 percent passed the 2-inch and 1½-inch sieves.

TABLE 5.—*Estimated*

[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 for referring to other series that appear in the first column of this

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonally high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
*Ashe:						
AeD, AeE, AeF, AnD, AnE, AnF	2. 5–6	>5	0–30	Fine sandy loam, sandy loam.	SM, ML	A–4
			30	Bedrock.		
For Edneyville component of AnD, AnE, and AnF, see Edneyville series.						
AhF, AhG	2. 5–6	>5	0–36	Sandy loam	SM, ML	A–4
			36	Bedrock.		
Augusta, cool variant: AuA	>5	2	0–8	Fine sandy loam	SM, ML	A–4
			8–50	Clay loam	ML, ML–CL	A–4
Subject to infrequent flooding.						
Brandywine: BrF, BrG	2–4	>5	0–33	Loam, fine sandy loam.	SM, ML	A–2, A–4
			33	Bedrock.		
Brevard: BvB, BvC, BvE, BvF	>5	>5	0–4	Loam	ML	A–4
			4–76	Fine sandy clay loam.	ML–CL, ML	A–4
			76–82	Gravel	CM	A–2
Burton: ByG	2–3	2	0–4	Loam	ML	A–4
			4–21	Sandy loam	ML	A–4
			21–28	Fine sandy loam	SM	A–2, A–4
			28	Bedrock.		
*Chandler:						
CdE, CfF	>4	>5	0–23	Loam	ML	A–4
			23–80	Loam	ML	A–4
For Fannin component of CfF, see Fannin series.						
CeG	>4	>5	0–4	Loam	ML	A–4
			4–60	Fine sandy loam	ML	A–4
			60	Bedrock.		
Chester:						
ChD, ChE, ChF	>5	>5	0–6	Fine sandy loam	ML	A–5, A–4
			6–33	Clay loam, fine sandy loam.	ML–CL, ML, SM	A–7, A–4, A–5, A–6
			33–70	Fine sandy loam	SM	A–4
CrE, CrF	>5	>5	0–8	Loam	ML	A–4, A–5
			8–40	Clay loam, sandy clay loam.	ML–CL, ML, SM	A–4, A–5, A–6, A–7
			40–60	Sandy loam	SM	A–4
			60	Bedrock.		
Delanco: DeB	>5	2. 5	0–6	Fine sandy loam	ML–CL	A–4
			6–45	Clay loam, sandy clay loam.	CL	A–6
Subject to infrequent flooding.			45–60	Fine sandy loam	ML, ML–CL	A–4, A–6
Edneyville	>5	>5	0–10	Fine sandy loam	SM	A–4
			10–30	Sandy clay loam	SM, SC	A–4, A–6
			30–40	Gravelly sandy loam	SM	A–2
Soils mapped only in combination with the Ashe soils as Ashe and Edneyville soils.						
EdG	>5	>5	0–5	Loam	SM	A–4
			5–20	Clay loam, loam	SM, SC	A–4, A–6
			20–50	Gravelly loam	SM	A–2
			50	Bedrock.		

engineering properties

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions table. The symbol < means less than; the symbol > means more than]

Coarse fraction larger than 3 inches in diameter	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
Pct.					*Inches per hour*	*Inches per inch of soil*	*pH*	
0–5	95–100	95–100	85–97	36–55	2. 0–6. 3	0. 08–0. 10	4. 5–5. 5	Low.
10–25	90–100	90–100	80–97	36–55	2. 0–6. 3	0. 07–0. 09	4. 5–5. 5	Low.
0	95–100	95–100	75–95	40–55	2. 0–6. 3	0. 11–0. 13	4. 5–5. 5	Low.
0–5	95–100	95–100	80–95	50–75	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Moderate.
10–25	85–95	75–90	60–75	25–65	2. 0–6. 3	0. 10–0. 12	4. 5–6. 0	Low.
0	100	100	85–95	60–75	2. 0–6. 3	0. 15–0. 17	5. 1–6. 0	Low.
0–5	95–100	95–100	90–97	50–60	0. 63–2. 0	0. 15–0. 17	5. 1–6. 0	Low to moderate.
5–10	30–50	30–50	35–45	12–35	6. 3–20. 0	0. 4–0. 6	5. 1–5. 5	Low.
0–5	95–100	95–100	80–95	65–80	6. 3–20. 0	0. 17–0. 19	4. 5–5. 0	Low.
5–10	95–100	95–100	70–85	55–70	2. 0–6. 3	0. 17–0. 19	4. 5–5. 0	Low.
10–25	60–80	60–80	40–55	25–40	2. 0–6. 3	0. 12–0. 14	4. 5–5. 0	Low.
----------	98–100	95–98	85–95	70–90	2. 0–6. 3	0. 11–0. 13	4. 5–5. 5	Low.
----------	98–100	90–95	85–90	60–75	2. 0–6. 3	0. 11–0. 13	4. 5–5. 5	Low.
10–15	98–100	95–98	85–95	70–90	2. 0–6. 3	0. 10–0. 12	4. 5–5. 5	Low.
5–15	95–100	90–95	85–90	60–75	2. 0–6. 3	0. 11–0. 13	4. 5–5. 5	Low.
----------	95–100	95–100	85–90	55–65	2. 0–6. 3	0. 15–0. 17	4. 5–5. 5	Low.
----------	95–100	95–100	85–95	45–65	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Low to moderate.
----------	90–100	90–100	80–90	36–50	0. 63–2. 0	0. 15–0. 17	4. 5–5. 5	Low.
5–25	95–100	95–100	85–90	55–65	2. 0–6. 3	0. 12–0. 14	4. 5–5. 5	Low.
----------	95–100	95–100	85–90	45–65	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Low to moderate.
----------	90–100	90–100	80–90	36–50	0. 63–2. 0	0. 15–0. 17	4. 5–5. 5	Low.
0–5	95–100	95–100	85–95	50–60	2. 0–6. 3	0. 11–0. 13	4. 5–7. 3	Low.
0–5	90–100	90–100	85–95	55–70	0. 63–2. 0	0. 12–0. 14	4. 5–6. 0	Moderate.
0–5	90–100	90–100	80–95	50–65	0. 63–2. 0	0. 10–0. 12	4. 5–5. 0	Moderate.
----------	95–100	95–100	70–85	40–50	2. 0–6. 3	0. 15–0. 17	4. 5–5. 5	Low.
----------	95–100	95–100	80–90	36–50	0. 63–2. 0	0. 14–0. 16	4. 5–5. 5	Low.
----------	80–95	80–95	60–70	12–30	2. 0–6. 3	0. 12–0. 14	4. 5–5. 5	Low.
5–25	95–100	95–100	70–85	44–50	2. 0–6. 3	0. 12–0. 14	4. 5–5. 5	Low.
0–5	95–100	95–100	80–90	36–50	0. 63–2. 0	0. 14–0. 16	4. 5–5. 5	Low.
----------	80–95	80–95	60–70	12–30	2. 0–6. 3	0. 12–0. 14	4. 5–5. 5	Low.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonally high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Fannin: FaE, FaF, FaG	>5	>5	0–6	Loam	ML	A–4
			6–27	Fine sandy clay loam, fine sandy loam.	ML–CL, ML	A–7, A–4 A–5, A–6
			27–72	Fine sandy loam	SM	A–4, A–2
*Fletcher: FfD, FfE	>5	>5	0–7	Loam	ML	A–4
			7–38	Silty clay loam, clay loam.	MH	A–7
For Fannin component of FfD, FfE, see Fannin series.			38–72	Silt loam	ML	A–5
Hayesville:						
HaD, HaE, HaF	>5	>5	0–7	Fine sandy loam	SM	A–4
			7–40	Clay loam	CL, MH, ML–CL	A–6, A–7
			40–50	Loam	SM, ML	A–4, A–6
HcE3	>5	>5	0–4	Clay loam	CL, MH, ML–CL	A–6, A–7
			4–36	Clay, clay loam	CL, MH, ML–CL	A–6, A–7
			36–60	Loam	SM, ML	A–4, A–6
Haywood: HdE, HdF	>5	>5	0–30	Loam	MH	A–4, A–5
			30–50	Gravelly fine sandy loam.	SM	A–4
			50–56	Loam	ML–CL, ML	A–4
Ponzer muck, cool variant: Pm	>5	0	0–35	Muck	OH	A–5
Subject to very frequent flooding.			35–65	Fine sandy loam	ML	A–4
Porters:						
PoE, PoF	2–6	>5	0–9	Loam	ML, MH, SM	A–4, A–5
			9–29	Clay loam, fine sandy loam.	ML, SM	A–6, A–4
			29–45	Gravelly sandy loam.	ML, SM	A–4, A–2
			45	Bedrock.		
PrF	2–6	>5	0–20	Loam	SM, ML, MH	A–4, A–5
			20–36	Sandy clay loam	ML, SM	A–4, A–6, A–2
			36	Bedrock.		
Rock outcrop: Rk.						
Estimates were not made because soil material is too variable.						
Rosman: Ro, Rs	>5	2.5	0–15	Fine sandy loam	SM, ML	A–4
Subject to very frequent flooding.			15–50	Fine sandy loam, loam.	SM, ML	A–4
			50–60	Sand and gravel	SM	A–2
Stony colluvial land: Sc.						
Estimates were not made because soil material is too variable.						
Stony land: St.						
Estimates were not made because soil material is too variable.						
Suncook: Su	>5	3	0–12	Loamy sand, loamy fine sand.	SM	A–4, A–2
Subject to very frequent flooding.			12–50	Fine sand	SM	A–2

engineering properties—Continued

Coarse fraction larger than 3 inches in diameter	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
Pct.					*Inches per hour*	*Inches per inch of soil*	*pH*	
0	90–100	90–100	85–100	55–75	2. 0–6. 3	0. 10–0. 12	4. 5–5. 5	Low.
0	90–100	90–100	85–100	50–60	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low to moderate.
0	90–100	90–100	85–95	30–45	0. 63–2. 0	0. 11–0. 13	4. 5–5. 5	Low.
0	90–100	90–100	85–100	55–75	2. 0–6. 3	0. 14–0. 16	4. 5–5. 5	Low.
0	95–100	95–100	80–95	65–80	0. 63–2. 0	0. 14–0. 16	4. 5–5. 5	Moderate.
0	95–100	95–100	70–80	50–60	0. 63–2. 0	0. 14–0. 16	4. 5–5. 5	Low.
0	90–100	85–95	80–90	36–50	2. 0–6. 3	0. 15–0. 17	4. 5–6. 0	Low.
0	90–100	90–100	85–95	55–70	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Moderate.
0	90–100	90–100	85–95	40–60	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Low.
0	95–100	95–100	85–95	55–70	0. 63–2. 0	0. 16–0. 18	4. 5–6. 0	Low.
0	90–100	90–100	85–95	55–70	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Moderate.
0	90–100	90–100	85–95	40–60	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Low.
5–25	90–95	90–95	80–90	55–70	6. 3–20. 0	0. 15–0. 17	5. 1–6. 5	Low.
10–25	80–90	80–90	65–80	36–50	2. 0–6. 3	0. 14–0. 16	5. 1–5. 5	Low.
0–5	95–100	95–100	85–95	60–75	2. 0–6. 3	0. 14–0. 16	5. 6–6. 0	Low.
0	100	100	90–100	60–75	0. 63–2. 0	0. 22–0. 24	4. 5–5. 0	High.
0	100	100	95–100	55–70	0. 63–2. 0	0. 15–0. 17	4. 5–5. 0	Low.
0–5	85–95	80–90	70–85	45–75	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	Low.
5–15	75–90	70–85	60–75	36–70	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	Low.
0	80–95	80–95	75–90	25–60	2. 0–6. 3	0. 14–0. 16	5. 1–6. 0	Low.
5–25	85–95	80–90	70–85	45–75	2. 0–6. 3	0. 15–0. 17	5. 1–6. 0	Low.
5–15	75–90	70–85	60–75	25–70	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	Low.
0	100	100	75–90	40–65	2. 0–6. 3	0. 14–0. 16	5. 1–6. 5	Low.
0	95–100	95–100	75–90	40–65	2. 0–6. 3	0. 14–0. 16	5. 1–6. 0	Low.
0–5	75–90	70–85	50–70	10–25	6. 3–20. 0	0. 14–0. 16	5. 1–5. 5	Low.
0	100	100	50–85	15–45	6. 3–20. 0	0. 06–0. 08	5. 1–5. 5	Low.
0	100	100	65–80	20–35	6. 3–20. 0	0. 04–0. 06	5. 1–5. 5	Low.

TABLE 5.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification		
	Bedrock	Seasonally high water table		USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Talladega:						
TaF	1–4	>5	0–4	Silt loam	ML	A–4
			4–18	Channery silty clay loam.	GM, GC, ML	A–4, A–6
			18–40	Channery silt loam	GM, GC	A–4, A–6, A–2
			40	Bedrock.		
TcG	1–4	>5	0–4	Channery silt loam	GM, GC, GM–GC	A–4, A–6, A–2
			4–16	Channery silty clay loam.	GM, GC, ML	A–4, A–6
			16–40	Channery silt loam	GM, GC	A–4, A–6, A–2
			40	Bedrock.		
Tate: TeB, TeD, TeE	>4	2.5	0–6	Fine sandy loam	SM, ML, ML–CL	A–4, A–6
			6–40	Fine sandy clay loam, clay loam, fine sandy loam.	ML, ML–CL	A–4, A–6, A–7
			40–60	Sandy clay loam, fine sandy clay loam.	ML, ML–CL	A–4
Toxaway: Tn, To	>5	0	0–30	Silt loam	ML	A–4
Subject to very frequent flooding.			30–39	Silty clay loam	CL	A–6
			39–50	Loam	ML	A–4
Transylvania: Tr	>5	2.5	0–27	Silt loam	MH	A–5
Subject to very frequent flooding.			27–60	Silt clay loam	ML, ML–CL	A–4
			60–70	Loamy fine sand	SM, ML	A–2, A–4
Tusquitee:						
TsD, TsE	>5	>5	0–9	Loam	MH, SM	A–4, A–5
			9–46	Clay loam, fine sandy clay loam.	SM, SM–SC, CL	A–4, A–6
			46–60	Sandy loam	SM, SM–SC	A–2, A–4
TuD, TuE, TuF	5	5	0–7	Loam	MH, SM	A–4, A–5
			7–36	Clay loam	SM, SM–SC, CL	A–4, A–6
			36–60	Cobbly fine sandy clay loam.	SM, SM–SC	A–2, A–4
Watauga: WaD, WaE, WaF	>4	>5	0–5	Loam	ML, MH	A–5, A–7
			5–22	Clay loam	ML, MH	A–5, A–7
			22–50	Loam, fine sandy loam.	ML, SM	A–4, A–5

engineering properties—Continued

Coarse fraction larger than 3 inches in diameter	Percentage passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
Pct.					*Inches per hour*	*Inches per inch of soil*	*pH*	
0	95–100	95–100	80–95	65–85	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low.
0	50–70	45–65	45–60	40–55	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low.
0	40–60	35–55	35–50	30–45	0. 63–2. 0	0. 11–0. 13	4. 5–5. 5	Low.
0	50–85	40–70	40–70	20–40	2. 0–6. 3	0. 11–0. 13	4. 5–5. 5	Low.
0	50–70	45–65	45–60	40–55	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low.
0	40–60	35–55	35–50	30–45	0. 63–2. 0	0. 11–0. 13	4. 5–5. 5	Low
0	95–100	95–100	65–90	45–85	2. 0–6. 3	0. 17–0. 19	4. 5–5. 5	Low.
0	95–100	85–100	75–95	65–90	0. 63–2. 0	0. 17–0. 19	4. 5–5. 5	Low.
0–10	90–100	90–100	85–95	60–85	0. 63–2. 0	0. 17–0. 19	4. 5–5. 5	Low.
0	100	100	90–100	70–90	0. 63–2. 0	0. 16–0. 18	4. 5–5. 5	Low.
0	100	100	95–100	85–95	0. 63–2. 0	0. 18–0. 20	4. 5–5. 5	Moderate.
0	100	100	85–95	60–85	0. 63–2. 0	0. 18–0. 20	4. 5–5. 5	Low.
0	100	100	95–100	90–100	2. 0–6. 3	0. 17–0. 19	4. 5–6. 0	Moderate.
0	100	100	95–100	80–95	2. 0–6. 3	0. 18–0. 20	4. 5–5. 5	Low.
0	100	100	70–90	25–60	2. 0–6. 3	0. 06–0. 08	5. 6–6. 0	Low.
0–5	95–100	90–100	80–95	40–65	6. 3–20. 0	0. 21–0. 23	5. 1–6. 5	Low,
0–10	90–100	85–95	70–85	45–70	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	Low.
0–15	50–90	50–90	40–85	13–50	2. 0–6. 3	0. 19–0. 21	5. 1–6. 0	Low.
5–25	95–100	90–100	80–95	40–65	6. 3–20. 0	0. 17–0. 19	5. 1–6. 5	Low.
5–20	90–100	85–95	70–85	45–70	2. 0–6. 3	0. 15–0. 17	5. 1–6. 0	Low
5–20	50–90	50–90	40–85	13–50	2. 0–6. 3	0. 15–0. 17	5. 1–6. 0	Low.
0–5	85–95	80–90	65–85	50–75	2. 0–6. 3	0. 17–0. 19	5. 1–5. 5	Low.
0	95–100	90–100	80–90	55–80	0. 63–2. 0	0. 17–0. 19	5. 1–5. 5	Moderate.
0	95–100	90–100	90–100	36–75	0. 63–2. 0	0. 17–0. 19	5. 1–5. 5	Low.

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 more kinds of soil. The soils for referring to other series that

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
*Ashe: AeD, AeE, AeF, AnD, AnE, AnF—For Edneyville component of AnD, AnE, and AnF, see Edneyville series.	Fair: limited amount of material; low available water capacity.	Fair: depth to bedrock is 2.5 to 6 feet.	Moderate where slopes are less than 25 percent. Severe where slopes are more than 25 percent.	Severe: slope; depth to bedrock is 2.5 to 6 feet.	Moderate where slopes are 6 to 15 percent. Severe where slopes are more than 15 percent.
AhF, AhG	Poor: coarse fragments; limited amount of material.	Poor: stoniness; depth to bedrock is 2.5 to 6 feet.	Moderate where slopes are less than 25 percent. Severe where slopes are more than 25 percent.	Severe: slope; depth to bedrock is 2.5 to 6 feet.	Severe: slope
Augusta, cool variant: AuA	Fair: limited amount of material.	Fair: seasonally high water table; moderate shrink-swell potential; medium traffic-supporting capacity.	Severe: seasonally high water table; infrequent flooding.	Severe: seasonally high water table; infrequent flooding.	Severe: seasonally high water table, infrequent flooding.
Brandywine: BrF, BrG	Poor: coarse fragments; limited amount of material.	Poor: depth to bedrock is 2 to 4 feet; stoniness.	Moderate where slopes are less than 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope; depth to bedrock is 2 to 4 feet.	Severe: slope
Brevard: BvB, BvC, BvE, BvF	Fair: limited amount of material.	Fair: low to moderate shrink-swell potential; medium traffic-supporting capacity.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 10 percent. Severe where slopes are greater than 10 percent.	Slight where slopes are less than 6 percent. Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
Burton: ByG	Poor: coarse fragments; limited amount of material.	Poor: stoniness; depth to bedrock is 2 to 3 feet.	Severe: slope	Severe: slope; depth to bedrock is 2 to 3 feet.	Severe: slope

interpretations

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions appear in the first column of this table]

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Moderate where slopes are 6 to 15 percent. Severe where slopes are more than 15 percent.	Severe: slope	Depth to bedrock is 2.5 to 6 feet; slopes of 6 to 45 percent.	Moderately rapid permeability; depth to bedrock is 2.5 to 6 feet.	Fair stability; pervious; limited amount of material.	Somewhat excessively drained.	Low available water capacity; mostly slopes of more than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Depth to bedrock is 2.5 to 6 feet; slopes of 15 to 70 percent; stones hinder grading operations.	Moderately rapid permeability; depth to bedrock is 2.5 to 6 feet.	Fair stability; pervious; limited amount of material; stoniness.	Somewhat excessively drained.	Low available water capacity; stoniness; slopes of more than 15 percent; erodibility.
Severe: seasonally high water table; infrequent flooding.	Severe: seasonally high water table; infrequent flooding.	Seasonally high water table; infrequent flooding.	Seasonally high water table; moderate permeability.	Semipervious; poor stability; poor compaction characteristics.	Seasonally high water table; moderate permeability; infrequent flooding.	Seasonally high water table; infrequent flooding.
Severe: slope	Severe: slope; stoniness.	Depth to bedrock is 2 to 4 feet; slopes of 15 to 80 percent; stones hinder grading operations.	Moderately rapid permeability; depth to bedrock is 2 to 4 feet.	Limited amount of material; semipervious; stoniness.	Well drained	Low available water capacity; depth to bedrock is 2 to 4 feet; slopes greater than 15 percent, erodibility.
Slight where slopes are less than 6 percent. Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Moderate where slopes are less than 6 percent. Severe where slopes are greater than 6 percent.	Slopes of 2 to 45 percent; moderate to high susceptibility to frost heave.	Moderate permeability.	Semipervious to a depth of 76 inches; pervious at a depth below 76 inches.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Slopes of 25 to 60 percent; stones hinder grading operations; depth to bedrock is 2 to 3 feet.	Moderately rapid permeability; depth to bedrock is 2 to 3 feet.	Stoniness; limited amount of material; pervious.	Well drained and moderately well drained; downslope movement of water along the top of the underlying bedrock is common.	Depth to bedrock is 2 to 3 feet; slopes greater than 25 percent; erobibility.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
*Chandler: CdE, CfF For Fannin component of CfF, see Fannin series.	Poor: limited amount of material.	Poor: low traffic-supporting capacity.	Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope
CeG	Poor: limited amount of material; coarse fragments.	Poor: stoniness; depth to bedrock is more than 4 feet; low traffic-supporting capacity.	Severe: slope	Severe: slope	Severe: slope
Chester: ChD, ChE, ChF	Fair: limited amount of material.	Fair: low to moderate shrink-swell potential; medium traffic-supporting capacity.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
CrE, CrF	Poor: coarse fragments; limited amount of material.	Poor: stoniness.	Moderate where slopes are 15 to 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope
Delanco: DeB	Fair: limited amount of material.	Fair: moderate shrink-swell potential; medium traffic-supporting capacity; seasonally high water table.	Moderate: seasonally high water table. Severe: in low-lying areas; subject to infrequent flooding.	Moderate: seasonally high water table. Severe: in low-lying areas; subject to infrequent flooding.	Moderate: seasonally high water table. Severe: in low-lying areas; subject to infrequent flooding.

interpretations—Continued

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Severe: slope	Severe: slope	Slopes of 15 to 45 percent; unstable cut slopes; highly erodible; depth to bedrock is more than 4 feet; high susceptibility to frost heave.	Moderately rapid permeability; depth to bedrock is more than 4 feet.	Poor to fair stability; pervious; poor resistance to piping; poor compaction characteristics.	Somewhat excessively drained.	Low available water capacity; slopes greater than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Slopes of 45 to 70 percent; stones hinder grading operations; unstable cut slopes; highly erodible; depth to bedrock is more than 4 feet; high susceptibility to frost heave.	Moderately rapid permeability; depth to bedrock is more than 4 feet.	Stoniness; poor to fair stability; pervious; poor resistance to piping; poor compaction characteristics.	Somewhat excessively drained.	Low available water capacity; stoniness; slopes greater than 45 percent; erodibility.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 45 percent; moderately high susceptibility to frost heave; unstable cut slopes; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Slopes of 15 to 45 percent; stones hinder grading operations; moderate to high susceptibility to frost heave; unstable cut slopes; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious; stoniness.	Well drained	Stoniness; slopes greater than 15 percent; erodibility.
Moderate: seasonally high water table; low-lying areas; subject to infrequent flooding.	Moderate: seasonally high water table. Severe: in low-lying areas; subject to infrequent flooding.	Seasonally high water table; high susceptibility to frost heave; infrequent flooding in low-lying areas.	Moderate permeability; seasonally high water table.	Semipervious; fair stability.	Seasonally high water table; moderate permeability; infrequent flooding in low-lying areas.	Seasonally high water table; infrequent flooding of low-lying areas.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
Edneyville: Soils mapped only in combination with the Ashe soils as Ashe and Edneyville soils.	Fair: limited amount of material.	Fair: depth to bedrock is more than 5 feet; medium traffic-supporting capacity.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
EdG	Poor: coarse fragments; limited amount of material.	Poor: stoniness; depth to bedrock is more than 4 feet.	Severe: slope	Severe: slope	Severe: slope
Fannin: FaE, FaF, FaG	Fair: limited amount of material.	Fair: medium traffic-supporting capacity; low to moderate shrink-swell potential.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
*Fletcher: FfD, FfE For Fannin component of FfD, FfE, see Fannin series.	Fair: limited amount of material.	Fair: moderate shrink-swell potential; low to medium traffic-supporting capacity.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
Hayesville: HaD, HaE, HaF	Fair: limited amount of material.	Fair: moderate shrink-swell potenttial; medium raffic-supporting capacity.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
HcE3	Poor: limited amount of material.	Fair: moderate shrink-swell potential; medium traffic-supporting capacity.	Moderate: slope.	Severe: slope	Moderate where slopes are less than 15 percent. Severe where slopes are greater than 15 percent.

interpretations—Continued

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 45 percent; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious; limited material.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Slopes of 45 to 70 percent; stones hinder grading operations; depth to bedrock is more than 4 feet.	Moderate permeability; depth to bedrock is more than 4 feet.	Semipervious; limited amount of material; stoniness.	Well drained	Slopes greater than 45 percent; erodibility; stoniness.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 70 percent; moderate to high susceptibility to frost heave; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Poor to fair stability; semipervious; poor resistance to piping.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 25 percent; high susceptibility to frost heave; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious; poor stability.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 50 percent; moderate to high susceptibility to frost heave; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious; fair stability; fair compaction characteristics; fair resistance to piping.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Moderate where slopes are less than 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 10 to 25 percent; moderate to high susceptibility to frost heave; depth to bedrock is more than 5 feet.	Moderate permeability; depth to bedrock is more than 5 feet.	Semipervious; fair stability; fair compaction characteristics; fair resistance to piping.	Well drained	Mostly where slopes are greater than 15 percent; erodibility; low intake rate.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
Haywood: HdE, HdF	Poor: coarse fragments; limited amount of material.	Poor: stoniness.	Moderate where slopes are less than 25 percent; located in coves and on toe slopes. Severe where slopes are greater than 25 percent.	Severe: slope	Severe: slope
Ponzer muck, cool variant: Pm	Poor: accessibility; wetness.	Poor: organic layer is 16 to 40 inches thick; high shrink-swell potential; seasonally high water table; poor compaction characteristics; low traffic-supporting capacity.	Severe: very frequent flooding; wetness; high shrink-swell potential.	Severe: very frequent flooding; seasonally high water table.	Severe: very frequent flooding; seasonally high water table.
Porters:					
PoE, PoF	Fair: limited amount of material.	Fair: depth to bedrock is 2 to 6 feet. Poor: medium traffic-supporting capacity.	Moderate where slopes are less than 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope; depth to bedrock is 2 to 6 feet.	Severe: slope
PrF	Poor: coarse fragments; limited amount of material.	Poor: stoniness; depth to bedrock is 2 to 6 feet.	Moderate where slopes are less than 25 percent. Severe where slopes are greater than 25 percent.	Severe: slope; depth to bedrock is 2 to 6 feet.	Severe: slope
Rock outcrop: Rk. Soil material is too variable for reliable evaluation.					
Rosman: Ro, Rs	Good	Fair: seasonally high water table.	Severe: very frequent flooding.	Severe: very frequent flooding.	Severe: very frequent flooding.
Stony colluvial lands: Sc. Soil material is too variable for reliable evaluation.					
Stony land: St. Soil material is too variable for reliable evaluation.					

interpretations—Continued

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Severe: slope	Severe: stoniness; slope.	Slopes of 15 to 50 percent; stones hinder grading operations.	Moderately rapid permeability.	Stoniness; pervious; fair stability.	Well drained and moderately well drained; in coves and on toe slopes.	Stoniness; slopes greater than 15 percent; erodibility.
Severe: very frequent flooding; seasonally high water table.	Severe: very frequent flooding; seasonally high water table.	Very frequent flooding; seasonally high water table; organic layer 16 to 40 inches thick.	Seasonally high water table; moderate permeability; organic layer 16 to 40 inches thick.	Organic layer 16 to 40 inches thick; poor stability; poor compaction characteristics; poor resistance to piping.	Seasonally high water table; moderate permeability; poor outlets; very frequent flooding.	Seasonally high water table; very frequent flooding.
Severe: slope	Severe: slope	Slopes of 15 to 45 percent; depth to bedrock is 2 to 6 feet.	Moderately rapid permeability; depth to bedrock is 2 to 6 feet.	Limited amount of material; pervious; poor resistance to piping; poor to fair stability.	Well drained	Depth to bedrock is 2 to to 6 feet; slopes greater than 15 percent; erodibility.
Severe: slope	Severe: stoniness; slope.	Slopes of 15 to 45 percent; depth to bedrock is 2 to 6 feet; stones hinder grading operations.	Moderately rapid permeability; depth to bedrock is 2 to 6 feet.	Limited amount of material; pervious; poor resistance to piping; poor to fair stability; stoniness.	Well drained	Depth to bedrock is 2 to 6 feet; stoniness; slopes greater than 15 percent; erodibility.
Severe: very frequent flooding.	Severe: very frequent flooding; seasonally high water table.	Very frequent flooding; seasonally high water table.	Moderately rapid permeability; seasonally high water table.	Pervious; poor resistance to piping.	Seasonally high water table; moderately rapid permeability; very frequent flooding.	Seasonally high water table; very frequent flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
Suncook: Su	Fair: low available water capacity; very low fertility.	Good	Severe: very frequent flooding.	Severe: very frequent flooding.	Severe: very frequent flooding.
Talladega:					
TaF	Poor: limited amount of material.	Poor: depth to bedrock is 1 to 4 feet; low traffic-supporting capacity.	Severe: slope	Severe: slope; depth to bedrock is 1 to 4 feet.	Severe: slope
TcG	Poor: coarse fragments; limited amount of material.	Poor: depth to bedrock is 1 to 4 feet; low traffic-supporting capacity.	Severe: slope	Severe: slope; depth to bedrock is 1 to 4 feet.	Severe: slope
Tate: TeB, TeD, TeE	Fair: limited amount of material.	Fair: medium traffic-supporting capacity.	Moderate: at base of slopes and in small draws.	Moderate where slopes are less than 10 percent; seasonally high water table. Severe where slopes are greater than 10 percent.	Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
Toxaway: Tn, To	Fair: wetness.	Poor: seasonally high water table; moderate shrink-swell potential; medium traffic-supporting capacity.	Severe: very frequent flooding; seasonally high water table.	Severe: very frequent flooding; seasonally high water table.	Severe: very frequent flooding; seasonally high water table.
Transylvania: Tr	Good	Fair: moderate shrink-swell potential; medium traffic-supporting capacity.	Severe: very frequent flooding.	Severe: very frequent flooding.	Severe: very frequent flooding.

interpretations—Continued

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Severe: very frequent flooding.	Severe: very frequent flooding.	Very frequent flooding.	Rapid permeability.	Pervious; poor resistance to piping.	Excessively drained.	Low available water capacity; very frequent flooding.
Severe: slope	Severe: slope	Slopes of 25 to 45 percent; depth to bedrock is 1 to 4 feet; unstable cut slopes; high susceptibility to frost heave.	Moderate permeability; depth to bedrock is 1 to 4 feet.	Limited amount of material; semipervious; poor to fair stability.	Well drained	Low available water capacity; depth to bedrock is 1 to 4 feet; slopes greater than 25 percent; erodibility.
Severe: slope	Severe: slope	Slopes of 45 to 70 percent; depth to bedrock is 1 to 4 feet; unstable cut slopes; high susceptibility to frost heave.	Moderate permeability; depth to bedrock is 1 to 4 feet.	Limited amount of material; semipervious; poor to fair stability.	Well drained	Low available water capacity; depth to bedrock is 1 to 4 feet; slopes greater than 45 percent; erodibility.
Slight where slopes are 2 to 6 percent. Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Moderate where slopes are less less than 6 percent. Severe where slopes are greater than 6 percent.	Seepage	Moderate permeability.	Semipervious; fair to poor stability.	Hillside seepage	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Severe: very frequent flooding; seasonally high water table.	Severe: very frequent flooding: seasonally high water table.	Very frequent flooding; seasonally high water table.	Moderate permeability; seasonally high water table.	Semipervious; poor stability; poor resistance to piping.	Seasonally high water table; moderate permeability; very frequent flooding.	Seasonally high water table; susceptibility to very frequent flooding.
Severe: very frequent flooding.	Severe: very frequent flooding.	Very frequent flooding; seasonally high water table.	Moderately rapid permeability; seasonally high water table.	Pervious; fair stability.	Seasonally high water table; moderately rapid permeability; very frequent flooding.	Seasonally high water table; susceptibility to very frequent flooding.

TABLE 6.—*Engineering*

Soil series and map symbols	Suitability as source of—		Degree of limitation and soil features affecting—		
	Topsoil	Road fill	Dwellings	Septic tank absorption fields	Campsites
Tusquitee: TsD, TsE	Good	Fair: medium traffic-supporting capacity.	Moderate: at base of slopes and in small draws.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
TuD, TuE, TuF	Poor: coarse fragments.	Poor: stoniness; medium traffic-supporting capacity.	Moderate where soils are at base of slopes and in small draws; slopes are less than 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.
Watauga: WaD, WaE, WaF	Fair: limited amount of material.	Fair: moderate shrink-swell potential; medium traffic-supporting capacity; depth to bedrock is more than 4 feet.	Slight where slopes are less than 10 percent. Moderate where slopes are 10 to 25 percent. Severe where slopes are greater than 25 percent.	Moderate where slopes are less than 10 percent. Severe where slopes are greater than 10 percent.	Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.

interpretations—Continued

Degree of limitation and soil features affecting—Continued		Soil features affecting—				
			Earthen dams			
Picnic areas	Intensive play areas	Highway location	Reservoir area	Compacted embankment	Agricultural drainage	Sprinkler irrigation
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 25 percent; moderate to high susceptibility to frost heave.	Moderately rapid permeability.	Pervious; fair stability.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: stoniness.	Slopes of 6 to 45 percent; moderate to high susceptibility to frost heave; stones hinder grading operations.	Moderately rapid permeability.	Pervious; fair stability; stoniness.	Well drained	Stoniness; slopes greater than 15 percent; erodibility.
Moderate where slopes are 6 to 15 percent. Severe where slopes are greater than 15 percent.	Severe: slope	Slopes of 6 to 45 percent; depth to bedrock is more than 4 feet; high susceptibility to frost heave.	Moderate permeability; depth to bedrock is more than 4 feet.	Semipervious; poor resistance to piping; poor compaction characteristics; poor stability.	Well drained	Features generally favorable, except where slopes are greater than 15 percent; erodibility.

The soils are not rated in table 6 for suitability for terraces, but terraces and other erosion control practices are needed on sloping, cultivated soils. Terraces are suitable on most soils in the county on slopes up to 6 percent. Exceptions are stony soils and soils that are shallow to bedrock. Adequate outlets need to be constructed for safe disposal of surface runoff from terraces, diversions, and other draingeways. Vegetation is needed in these waterways.

Formation and Classification of Soils

The factors that have affected the formation and composition of soils in Transylvania County are discussed in this section. Table 7 shows the classification of the soils by higher categories.

Factors of Soil Formation

Soil is the product of the combined effect of parent material, climate, plant and animal life, relief, and time. The characteristics of a soil at any given place depend upon a combination of these five environmental factors. All these factors affect the formation of every soil, but in many places, one or two of the factors are dominant.

Parent material

Parent material is the weathered material from which a soil has formed and is the primary factor in determining the chemical and mineralogical composition of a soil. The parent material of the soils in Transylvania County consists of (1) material residual from the weathering of rocks in place, and (2) material transported by water or gravity and laid down as deposits of sand, silt, clay, or as large rock fragments. The residual material is directly related to the underlying rock from which it weathered, and the transported material is related to the soil or rock from which it washed or rolled. The parent rock in Transylvania County consists primarily of granites, gneisses, and schists. Parent material has been one of the important factors in soil formation in Transylvania County.

The Ashe, Edneyville, and Chester soils formed in residuum from granite and gneiss. The Fannin, Watauga, Talladega, and Chandler soils formed in residuum from mica gneiss or schist and are high in mica content.

Rosman, Suncook, Augusta, Toxaway, Tate, and Tusquitee soils formed in alluvium or colluvial deposits. Ponzer soils formed in part in alluvial deposits and in part in decaying vegetation that grew before the soils had been drained. These soils are scattered throughout the county, and they occur along streams and in draws, in depressions, and on foot slopes of uplands.

Many differences in the soils reflect the original differences in the characteristics of the geological materials. Parent material has been an important factor causing differences in the soils of Transylvania County.

Climate

Climate affects the physical, chemical, and biological relationships of soil, primarily through the influence of precipitation and temperature. Water is necessary for biological activity, and it dissolves minerals and transports them along with organic residues through the soil profile. The amount of water that actually percolates through the soil over a broad area is dependent on the amount and duration of rainfall, relative humidity, evapotranspiration, and the length of the frost-free period. Temperature influences the kind and the growth of organisms and the speed of physical and chemical reaction in the soils.

TABLE 7.—*Soil series classified into higher categories*

Series [1]	Family	Subgroup	Order
Ashe	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Augusta, cool variant	Fine-loamy, mixed, mesic	Aeric Ochraquults	Ultisols.
Brandywine	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Brevard	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Burton	Coarse-loamy, mixed, mesic	Typic Haplumbrepts	Inceptisols.
Chandler	Coarse-loamy, micaceous, mesic	Typic Dystrochrepts	Inceptisols.
Chester	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Delanco	Fine-loamy, mixed, mesic	Aquic Hapludults	Ultisols.
Edneyville	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Fannin	Fine-loamy, micaceous, mesic	Typic Hapludults	Ultisols.
Fletcher [2]	Fine-silty, mixed, mesic	Typic Hapludults	Ultisols.
Hayesville	Clayey, oxidic, mesic	Typic Hapludults	Ultisols.
Haywood	Coarse-loamy, mixed, mesic	Cumulic Haplumbrepts	Inceptisols.
Ponzer, cool variant	Acid, loamy, mesic	Terric Medisaprists	Histosols.
Porters	Fine-loamy, mixed, mesic	Humic Hapludults	Ultisols.
Rosman	Coarse-loamy, mixed, mesic	Fluventic Haplumbrepts	Inceptisols.
Suncook	Mixed, mesic	Typic Udipsamments	Entisols.
Talladega	Loamy-skeletal, mixed, mesic	Ruptic-Lithic Entic Hapludults	Ultisols.
Tate	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols.
Toxaway	Fine-loamy, mixed, acid, mesic	Cumulic Humaquepts	Inceptisols.
Transylvania	Fine-loamy, mixed, mesic	Cumulic Haplumbrepts	Inceptisols.
Tusquitee	Fine-loamy, mixed, mesic	Humic Hapludults	Ultisols.
Watauga	Fine-loamy, micaceous, mesic	Typic Hapludults	Ultisols.

[1] The placement of soil series into the soil classification system is updated to July 16, 1970.

[2] These soils are taxadjuncts to the Fletcher series because they have sufficient coarse fragments to put them outside the defined range for the series.

The average annual rainfall in Transylvania County is relatively high. This has had a general effect of leaching out the soluble bases of the soils and causing the soils to be less fertile and more acid.

Temperatures within the county are variable because of the range in elevation. As the elevation increases, the humus content of the soil generally increases. Humus increases most rapidly under cool, moist conditions. The Burton soil, which is high in organic-matter content, is at elevations exceeding 5,000 feet in most places. In contrast, the Hayesville soil, which is low to medium in organic-matter content, occurs at lower elevations.

The most important influences of climate on the formation of soils is the alteration of parent material by temperature changes, precipitation, and the effects on plant and animal life.

Plant and animal life

Plant and animal life, in or on the soil, modify to some extent the formation of soil. The kinds and numbers of organisms that exist are determined to a large extent by the climate and to a varying degree by parent material, relief, and age of the soil. Bacteria, fungi, and other microscopic organisms help to weather rock and decompose organic matter. The larger plants and animals furnish organic matter and transfer elements from the subsoil to the surface soil.

The activity of fungi and micro-organisms in the soils of Transylvania County is generally confined to the upper few inches. Earthworms and other small invertebrates carry on a slow but continued cycle of soil mixing, mostly in the upper few inches of the soil. Rodents have had little effect on soil formation in this county.

Transylvania County was originally covered by a forest that consisted of a wide variety of hardwoods and several kinds of conifers. These trees took up elements from the subsoil, and when they died, they contributed organic matter as their leaves, roots, twigs, and eventually the whole plant were deposited on the surface of the soil. These materials decayed and were acted upon by micro-organisms, earthworms, and other forms of life, as well as by direct chemical reactions. Organic matter decays fairly rapidly, particularly in well-drained soils, such as Edneyville soils. Because excess water retards oxidation of organic matter, decay is slow in wet soils, such as Toxaway and Ponzer soils.

Plants and animals for the most part determine the kinds of organic matter added to the soil and the way in which it is incorporated into the soil. They transfer nutrient elements from one horizon to another and, in many places, transport soil material from one horizon to another. Plants and animals also affect the gains and losses in organic-matter content, gains and losses of nitrogen and other plant nutrients, soil structure, porosity, and may also affect some other soil characteristics.

Relief

Relief is largely determined by the geological history of the region, including the underlying rock formations, crustal movements and dissection by rivers and streams, and changes in the landscape caused by the formation and development of slope. Relief influences soil formation through its effect on moisture relations, erosion, temperature, and plant cover. The influence of topography is modified by the other factors of soil formation.

Relief has been an important factor in the formation of the soils of Transylvania County. The soils, such as Talladega soils, that occur on narrow convex ridges and in the steeper areas, where geologic erosion may be removing soil material as rapidly as it forms, have thinner profiles than soils in other areas. Soils, such as Hayesville soils, that are on the broader ridges and milder side slopes have thicker profiles.

Relief largely determines natural drainage of a soil. The very poorly drained Toxaway soils are nearly level soils of the flood plains.

Time

The length of time required for a soil to develop depends on the other factors of soil formation. Less time is required for a soil to develop in a humid, warm region covered with lush vegetation than in a dry, cold region that has sparse vegetation.

The age of soils varies considerably. Old soils generally have better defined horizons than young soils. In Transylvania County the older soils are on the broader ridges and the smoother topography. They have well developed profiles. The alluvial soils, such as Suncook soils, have not been in place long enough to develop well-defined profiles.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and the revised later (*8*). The system currently used by the National Cooperative Soil Survey was developed in the early sixties and was adopted for general use in 1965 (*10*). It was supplemented in March 1967 and September 1968. The system is under continual study, and readers interested in the development of the system should refer to the latest literature available.

The current system of classification has six categories (*7*). Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 7 shows the classification of each soil series of

Transylvania County by family, subgroup, and order, according to the current system.

ORDER: Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Four of the 10 soil orders occur in Transylvania County: Entisols, Inceptisols, Ultisols, and Histosols.

Entisols are recent soils in which there has been little, if any, horizon development. This order is represented in this county by soils of the Suncook series.

Inceptisols occur mostly on young, but not recent, land surfaces. This order is represented by soils of the Ashe, Brandywine, Burton, Chandler, Haywood, Rosman, Toxaway, and Transylvania series.

Ultisols have a clay-enriched B horizon but are low in base saturation. This order is represented by soils of the Augusta, cool variant, Brevard, Chester, Delanco, Edneyville, Fannin, Fletcher, Hayesville, Porters, Talladega, Tate, Tusquitee, and Watauga series.

Histosols have a high organic-matter content. They developed from plant remains and some mineral matter, in water. This order is represented by soils of the Ponzer series, cool variant.

SUBORDER: Each order is divided into suborders, primarily on the basis of soil characteristics that indicate genetic similarity. The suborders have a narrower climatic range than the order. The criteria for suborders reflect either the presence or absence of waterlogging or soil differences resulting from climate or vegetation.

GREAT GROUP: Suborders are divided into great groups on the basis of uniformity in kind and sequence of genetic horizons. The great group is not shown in table 7, because the name of the great group is the same as the last word in the name of the subgroup.

SUBGROUP: Great groups are divided into subgroups, one representing the central (typic) concept of a group, and other groups, called intergrades, that have properties of one great group but also one or more properties of another great group.

FAMILIES: Families are established within subgroups, primarily on the basis of properties important to plant growth. Some of these properties are texture, mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES: A series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile.

General Nature of the County

At the close of the Revolutionary War, practically all the western part of North Carolina was claimed by the Cherokee Indians. Later a few immigrants moved across the Blue Ridge Mountains. The first significant settlements were in the Davidson River and Cherryfield sections.

Transylvania County was formed in 1861 from parts of Henderson and Jackson Counties.

The early settlers first saw the now relatively fertile bottom lands along the French Broad River and its major tributaries as swamps and bogs covered with native marsh grass and canebrakes. These early settlers grew corn, potatoes, and other garden vegetables. Corn was used instead of cash for trading. These crops were comparatively well suited to bottom-land soils that had been drained. Livestock on farms were cattle, hogs, sheep, and poultry.

In the early days the county had mainly farming enterprises and was wood product oriented. Today there is a good balance between industry, farming, and tourism. There is a trend in the county toward the building of summer homes by out-of-State residents. The population has been increasing for the last 25 years by an average of about 2,000 persons each 10-year period.[7]

In the early days there were few roads, and transportation was provided by horse- and ox-drawn vehicles or boats. The first railroad came to Transylvania County by way of Hendersonville in 1895. Around the turn of the century, a turnpike from Brevard to Lake Toxaway was constructed. At present the county is served by two major U.S. highways, by a branch of the Southern Railroad, and by the Asheville-Hendersonville Airport, which is an all-weather, 24-hour facility.

The first major industry was lumbering, and the first to provide off-the-farm employment was the Silversteen sawmill at Rosman. Around the turn of the century, hotels were built along the turnpike from Brevard to Lake Toxaway, and the county became a popular summer resort. At present the six largest industries in the county employ about 4,400 people. They produce cigarette paper, textile parts, photographic products, thread, and wearing apparel. Other industries include retail and service businesses, sawmilling, and pulpwood harvesting. There is also a radar satellite-tracking facility.

Physiography, Relief, and Drainage

Transylvania County is in the Appalachian Mountains. There are many deep, narrow valleys between the mountains and a broad valley through the east-central part. The general slope of the southwestern part is to the south, and that of the northern and southern parts is toward the east-central part of the county. In consequence, there is a trough-like depression in the form of a level to gently rolling plateau valley, ¼ mile to 4 miles wide, along the French Broad River. The approximate range in elevation in the county is 1,265 feet to 6,043 feet. The western and northern boundaries are formed by a chain of mountains embracing the Tanasee and Pisgah Ridges, in which are found the highest peaks in the county. The Blue Ridge Mountain chain is in the southern part of the county.

In the northern, central, and southwestern parts is a series of mountains which, together with the Tanasee

[7] NORTH CAROLINA STATE UNIVERSITY. TARGET 2. EXTENSION SERVICE LONG-RANGE PLAN OF PROGRESS. Agr. Ext. Serv. 1966.

and Pisgah Ridges, are by far the roughest areas in the county. The sides of these mountains are, in many places, very steep. The small streams have carved out deep, narrow gorges in their rapid descent. Some perpendicular walls of solid rock rise 400 to 700 feet.

The southern part is less mountainous than the northern but is rather steep and somewhat more mountainous near the French Broad River. Practically all the level and gently rolling acreage is along the French Broad, Davidson, and Little Rivers.

Except for about 80 square miles in the southwestern part, the county is in the Tennessee River basin and has excellent drainage through the French Broad River and its tributaries. The French Broad River originates within the county; its tributaries consist of the West, North, and East Forks. The French Broad River flows northeastward out of the county and has considerable fall. The southwestern part of the county also has excellent drainage through the Toxaway, Horsepasture, and Thompson Rivers and their tributaries, which form the headwaters for the Savannah River Basin.

Water Supply

The abundant water supply in Transylvania County is one of its most valuable resources. The water for municipal and industrial use is obtained largely from surface streams, but the water for rural residences is obtained from wells and springs. The ground water is suitable for most uses.

Water from streams on the federally owned land is used by the town of Brevard and by industry. These watersheds are well protected from runoff, and a minimum of sediment settlement is required. The water in Transylvania County is soft and generally pure, but the French Broad River from the mouth of the Davidson River to where it leaves the county is polluted by industrial waste.

Climate [8]

The topography of Transylvania County is mountainous, and the elevation above mean sea level ranges from 1,265 feet to 6,043 feet. The climate is correspondingly variable. The highest elevations are along the northwestern border and along the Tanasee Ridge and Pisgah Ridge near the Blue Ridge Parkway. Southeastward from this border toward the French Broad River valley, the mountains are progressively lower. Southward beyond the French Broad River to the South Carolina line, the landscape is mountainous but the highest peaks reach only about 3,500 feet.

The climate of Transylvania County is determined mainly by its latitude, its location on the continent, and its topography. Other related, influencing factors are average storm paths and windflow patterns. Prevailing southerly winds pass over the warm waters of the Gulf of Mexico and sometimes the Caribbean Sea before reaching North Carolina. When these moisture-bearing winds are forced to rise higher and higher in passing over the mountains, they are cooled by lowering atmospheric pressure to the point of condensation and form heavy clouds. The clouds in some parts of Transylvania and adjoining counties along the South Carolina and Georgia borders produce heavier annual precipitation than is produced elsewhere in the United States, except for certain areas near the Pacific Ocean.

Fair weather is most likely to result from winds that blow from the northwest quadrant. These winds come from drier source regions and bear less moisture, and they lose a large part of the moisture they do carry in passing over the higher mountains. The higher mountains extend in a northeast-southeast direction along and beyond the northwestern border of Transylvania County.

On an average, about 1 day in 3 is essentially fair, 1 is cloudy with significant precipitation, and 1 is partly cloudy, sometimes with light showers. The proportion of rainy days is a little higher than this late in spring and early in summer and a little lower in fall and early in winter. At any season of the year, wet spells may occur when rain falls every day for 1 or 2 weeks or more and occasional periods may occur when no rain falls for a similar length of time.

Temperature data shown in table 8 are based on observations at Brevard and Pisgah Forest, at elevations between 2,100 and 2,200 feet above mean sea level. For the more populated areas of the county, the tabular data give a good indication of both average temperature and average variability of temperature. For other elevations an approximation can be made by lowering the temperature 3°F. for each 1,000 feet of higher elevation or by raising it 3° for each 1,000 feet lower. The lowest temperature of record at Brevard or Pisgah Forest is 20° below zero. In the higher temperature ranges there is no record of any 100° weather, but it probably occurs occasionally in the lowest valleys of the southwestern part of the county.

The data on probabilities of low temperatures in spring and fall presented in figures 10 and 11 are best applicable to open, level areas at elevations between 2,000 and 2,500 feet. In mountainous country, it is difficult to calculate or estimate the probability of frost or freezing temperature at any given point. Cold air moving in on northerly winds strikes first and coldest at the highest elevations. In calm, clear weather, which often follows the invasion of cold winds, open and unsheltered earth surfaces radiate their heat to outer space at night; the surfaces cool rapidly and, in turn, cool the layer of air in contact with them. Air thus cooled is heavier than warmer air and runs downhill to accumulate in such closed basins as may exist. Continued radiation and drainage during a clear night may cause very low minimum temperatures in the lowest places.

Late in spring and early in fall, frost and freezing temperature in a valley can result from radiation and drainage and freezing can result from cold winds on the higher mountains. Intermediate elevations sometimes escape both influences and remain above freezing. When this happens so repeatedly or consistently that a strip of mountainside has a longer growing season than the areas above and below it, this strip is sometimes called a thermal belt. If sufficiently persistent or dependable, such a belt is highly valued for orchards and gardens.

[8] By A. V. HARDY, climatologist for North Carolina, National Weather Service, U. S. Department of Commerce.

TABLE 8.—*Temperature and precipitation data*

Based on central location 2,100 feet above mean sea level]

Month	Temperature				Precipitation					Average soil temperature at depth of 4 inches, for bare, level soil (estimated)
	Average daily maximum	Average daily minimum	Two years in 10 will have at least four days with—		Average total	One year in 10 will have—		Number of days with snow cover	Average depth of snow on days with snow cover	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—			
	°F.	°F.	°F.	°F.	Inches	Inches	Inches		Inches	°F.
January	51	27	60	7	5.6	2.0	10.7	4	2	40
February	53	28	63	8	5.6	2.8	9.2	3	2	41
March	60	34	70	18	6.2	3.4	10.0	2	3	47
April	69	41	82	27	5.0	2.0	8.9	(1)	(1)	56
May	77	49	86	37	4.8	2.3	8.0	0	----------	65
June	83	57	89	45	5.5	1.7	8.0	0	----------	72
July	84	60	90	51	6.5	3.0	10.7	0	----------	74
August	84	60	89	50	6.0	3.0	10.3	0	----------	74
September	79	54	86	40	4.5	1.1	9.8	0	----------	68
October	71	43	77	25	4.3	1.0	8.6	0	----------	60
November	61	31	73	20	4.0	1.5	8.4	(1)	(1)	48
December	52	26	62	9	5.5	2.4	9.7	2	1	41
Year	69	43	[2] 93	[3] 0	63.5	52.7	75.8	11	2	57

[1] Less than one-half.
[2] Average annual highest maximum.
[3] Average annual lowest minimum.

The soil temperatures listed in table 8 are estimates based on average monthly air temperatures at elevations from 2,000 to 2,500 feet. These approximations should be applied only to open, nearly level areas. Soil temperatures may vary significantly with slope and amount of shading and, to a lesser degree, with differences in surface color and texture of the soil.

Transylvania may be the wettest county in North Carolina, but records are not sufficient to be conclusive. During the 10-year period ending in 1960, there were five stations recording precipitation within the county and one just across the county line in Haywood. Precipitation averaged more than 60 inches per year at all six stations, more than 70 inches at four stations, and more than 80 inches at two stations. Four of the stations were at elevations between 2,000 and 3,000 feet, one between 3,000 and 4,000 feet, and one between 5,000 and 6,000 feet. In general, with certain variations that are possibly associated with direction of slope, the amount of precipitation tends to increase with height. In 1964, however, a total of 129 inches of precipitation at Rosman (elevation 2,220 feet) exceeded that at all other stations in North Carolina; nearly 35 inches of this fell in a single 7-day period.

The precipitation data presented in table 8 were recorded at stations in the French Broad River valley at elevations between 2,000 and 2,200 feet. These data give the best available representation of precipitation conditions in the most populous areas of Transylvania County. Some upward modification of precipitation amounts would probably be necessary to make them applicable to higher elevations. It would be inaccurate to try to generalize with close estimates, because of such important local factors as direction of slope and position of sheltering peaks.

The snow-cover data in table 8 are applicable to open, level ground at or a little above 2,000 feet. In general, the higher the peaks the more days with snow cover and the greater the average depth. In some winters, the highest peaks may remain snow covered continuously for a month or more. In the usual winter, however, most of the precipitation comes when southerly winds bring rising temperatures along with their heavy burden of moisture; consequently, rain is the predominant form of precipitation in all seasons.

Summer thunderstorms in Transylvania County cause damage more frequently than other storms. They can bring a heavy downpour of rain that, in the rough terrain, may cause flash flooding of small streams and occasionally substantial flooding of the French Broad River. The heaviest electrical force of the storms is expended on the mountain peaks, where the damage is usually limited or unnoticed. In rare instances of dry weather, lightning may start a forest fire. Hail and damaging winds resulting from thunderstorms are usually highly localized and are rarely reported in the limited farming areas of the county. There is no record of a tornado causing damage in Transylvania County. Tropical hurricanes seldom have damaging winds this far inland, but they may occasionally cause an increase in precipitation.

Other storms that do affect the weather are winter cold fronts and sleet or glaze. The cold fronts are usually much weakened by passing over the high elevations in the northwest, but the southwesterly winds in advance of them account for much precipitation. Sleet

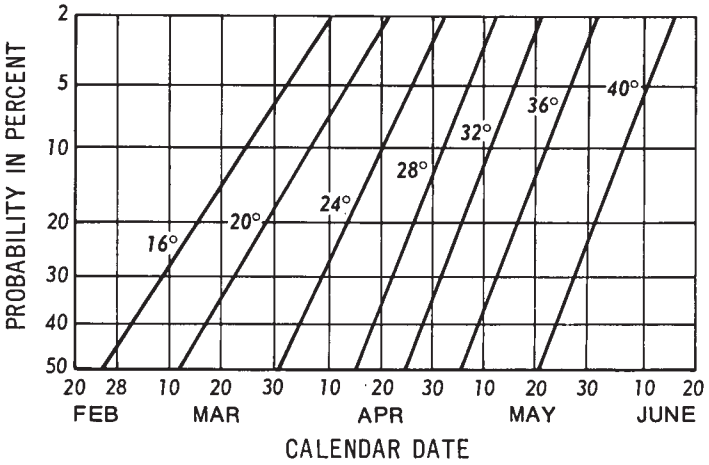

Figure 10.—**Probability that the temperature will be 16°, 20°, 24°, 28°, 32°, 36°, or 40° F. after the dates indicated in spring. (Representative of open level areas at elevations between 2,000 and 2,500 feet.)**

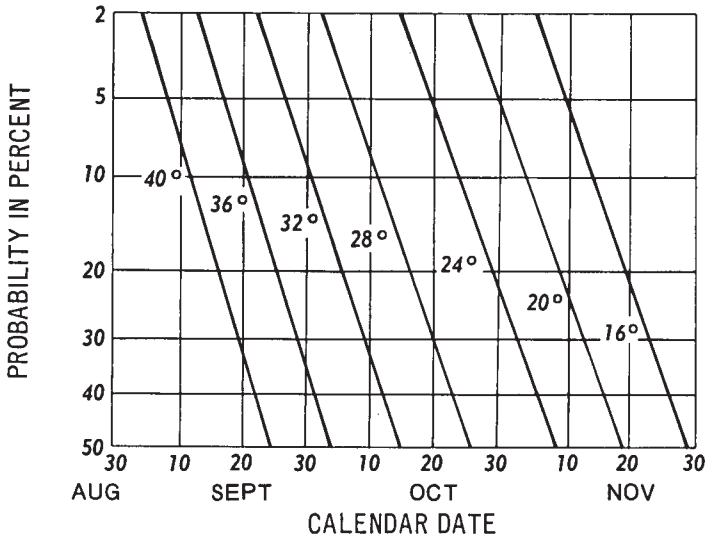

Figure 11.—**Probability that the temperature will be 16°, 20°, 24°, 28°, 32°, 36°, or 40° F. after the dates indicated in fall. (Representative of open level areas at elevations between 2,000 and 2,500 feet.)**

consists of frozen raindrops that reach the ground in solid form and accumulate on the surface like snow. Glaze results when liquid rain freezes on outdoor surfaces and forms an increasing layer of ice. Periods of glaze, sometimes called ice storms, occur less frequently in the southern mountains than in the northern, but they do occasionally cause breakage to tree limbs, shrubs, and transmission lines.

The prevailing windflow in Transylvania County is southerly. Because the moisture-bearing southerly winds rise up the slopes that are increasingly higher with increasing distance toward the north, abundant precipitation normally falls in this county. Winds near the earth's surface are channeled by topography, and in a given locality their flow may differ considerably from the general flow. Even the general flow may vary at any time from the prevailing direction, and winds from the northeast, north, and northwest are not uncommon. The windspeed is also affected by the rough terrain, but on an average, it is less than 10 miles per hour near the surface. On a typical day, it may range from 15 miles per hour at midday to nearly 0 in the hours between midnight and dawn. Windiness usually increases with elevation, and on the peaks that extend above their surroundings, the average windspeed may be somewhat higher. At times, however, winds funneled between peaks reach higher speeds than elsewhere. Like other weather factors, winds vary greatly in the mountains.

The sun shines a little less than half the daylight hours, because cloudiness comes with prevailing southerly winds. Fair weather is more likely if the winds are northerly to westerly. These winds blow somewhat less than half the time. Relative humidity averages 70 to 75 percent the year around and ranges on a daily average from about 55 percent at midafternoon to 95 percent at sunrise.

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Glossary

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.

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.

Diversion, or diversion terrace. A ridge of earth, generally a terrace that is built to divert runoff from its natural course and, thus, to protect areas downslope from the effects of such runoff.

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 a uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and in Podzolic soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

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.

Mapping unit. Areas of soil of the same kind outlined on the soil map and identified by a symbol.

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.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality of a soil horizon that enables water or air to move through it. 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		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Residuum. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Sand. Individual rock or mineral fragments in soils having diameters ranging 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.

Saprolite. A thoroughly weathered, disintegrated, or rotten rock that remains in its place of origin.

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.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

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 (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surplus runoff so that it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

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."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

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