USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with United States Department of Agriculture, Forest Service; North Carolina Department of Environment, Health, and Natural Resources; North Carolina Agricultural Research Service; North Carolina Cooperative Extension Service; Clay Soil and Water Conservation District; and Clay County Board of Commissioners

Soil Survey of Clay County, North Carolina

How To Use This Soil Survey

General Soil Map

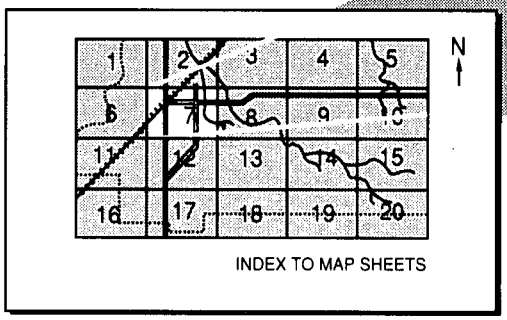
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

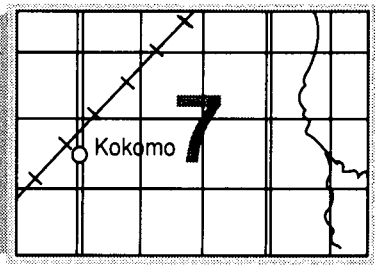
Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.

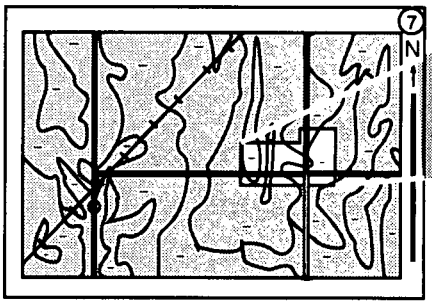


INDEX TO MAP SHEETS

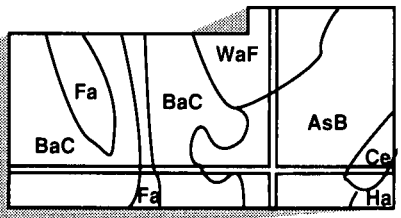


MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the North Carolina Agricultural Research Service, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1988. Soil names and descriptions were approved in 1991. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This soil survey was made cooperatively by the Natural Resources Conservation Service; the United States Department of Agriculture, Forest Service; the North Carolina Department of Environment, Health, and Natural Resources; the North Carolina Agricultural Research Service; the North Carolina Cooperative Extension Service; the Clay Soil and Water Conservation District; and the Clay County Board of Commissioners. It is part of the technical assistance furnished to the Clay Soil and Water Conservation District. The Clay County Board of Commissioners provided financial assistance for the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

The first soil survey of Clay County was published in 1941 by the U.S. Department of Agriculture. This survey updates the first survey, provides more detailed maps on aerial photographs, and contains more interpretive information *(9)*.

All programs and services of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: The Clay County Courthouse is in the town of Hayesville, which is the business and cultural center of the county. The site is in an area of Braddock-Urban land complex, 2 to 15 percent slopes.

Contents

Issued 1998

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Clay County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service.

Richard A. Gallo
State Conservationist
Natural Resources Conservation Service

Soil Survey of Clay County, North Carolina

By Douglas J. Thomas, Natural Resources Conservation Service

Soils surveyed by Douglas J. Thomas, Jon D. Vrana, and Bruce P. Smith, Jr., Natural Resources Conservation Service; Thomas N. Schmitt, Harold Owen, and Kirk McEachern, North Carolina Department of Environment, Health, and Natural Resources; Sara A. Browning, U.S. Forest Service; and Jack King, U.S. Forest Service contract

United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with
United States Department of Agriculture, Forest Service; North Carolina Department of Environment, Health, and Natural Resources; North Carolina Agricultural Research Service; North Carolina Cooperative Extension Service; Clay Soil and Water Conservation District; and Clay County Board of Commissioners

CLAY COUNTY is in the southwestern part of North Carolina (fig. 1). The county has a total area of 141,126 acres. In 1989, the county had a population of about 7,300 *(15)*. In 1980, Hayesville, the county seat, had a population of 376.

Clay County is in the Mountain physiographic region. It is bounded on the north by Cherokee and Macon Counties, North Carolina, on the east by Macon County, North Carolina, on the south by Rabun, Towns, and Union Counties, Georgia, and on the west by Cherokee County, North Carolina. Elevations range from about 1,600 feet where the Hiwassee River flows into Cherokee County to 5,499 feet at the top of Standing Indian Mountain.

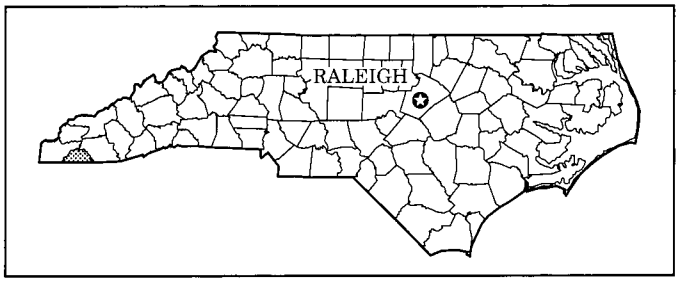


Figure 1.—Location of Clay County in North Carolina.

General Nature of the County

This section gives general information about Clay County. It describes the history and development; economic development; water resources; physiography, relief, and drainage; and climate.

History and Development

The Cherokee Indian Nation was occupying the survey area when the first white settlers arrived. Several Cherokee towns were located in the valley of the Hiwassee River. The land was ceded by the Cherokee in 1839. In 1861, Clay County was formed from part of Cherokee County. In 1872, it was enlarged by the annexation of a small part of Macon County *(9)*.

Most of the early settlers of Clay County were of Scottish, Scotch-Irish, or English decent. Others were of German, Dutch, French, or African descent. Most of the settlers had lived in other parts of North Carolina or Georgia and had moved because of land opportunity.

The county's population declined after World War II but has been growing since about 1965. People have

remained in the county because of better economic opportunities, many people have retired to the county, and many part-time residents maintain homes in the county.

Economic Development

Originally, Clay County was mainly agricultural and self-sufficient. In the 1880's, railroads allowed the development of large-scale mining and timber operations in the county. By the 1950's, the timber resources had been largely exhausted. In addition, most of the minerals mined in the county could be mined more economically elsewhere or could be replaced with manmade substitutes. The need for the railroads declined, and the tracks in Clay County were eventually removed.

Agriculture is important in Clay County. Typically, farms are specialized, small in size, and produce high-value crops. Areas on flood plains and in coves are used for tomatoes, landscaping plants, and tobacco. The county also has a few dairy or beef cattle operations.

The timber industry also is important in the county. The county includes about 64,000 acres of U.S. Forest Service land. Much of the land is managed for timber production and provides a reliable supply of quality hardwoods for the furniture industry.

Tourism is now a major industry in the county. Highways have replaced the railroads in this new economic climate. The county offers many scenic views, clear streams, a pleasant summer climate, and spectacular fall colors. It also offers opportunities for golfing, fishing, hiking, rafting, camping, and sightseeing. Chatuge Lake, which is controlled by the Tennessee Valley Authority (TVA), provides a wide range of water-related recreational activities. The U.S. Forest Service land in Clay County also provides outdoor recreational opportunities.

Water Resources

Clay County has an abundant supply of water, including Chatuge Lake, Hiwassee River, many smaller streams, and ground water. Chatuge Lake provides opportunities for boating, fishing, and swimming. High-quality waters flowing through watersheds managed by the U.S. Forest Service are important to the county's tourism. Streams flowing through watersheds in areas having many roads, homes, or farms generally have lower-quality water. Sedimentation is the main problem. Stream quality can be improved by soil and water conservation practices. Drilled wells are the most common source of domestic water, but some natural springs are used for water supplies.

Physiography, Relief, and Drainage

Clay County is located in the mountains of southwestern North Carolina. The terrain varies greatly from low rolling hills to almost vertical rock cliffs (fig. 2). The physiography of the county consists of high, intermediate, or low mountains, low rolling hills, high stream terraces, low stream terraces, and flood plains.

The high mountains are above 4,800 feet in elevation. These areas include a few mountaintops, such as Standing Indian and Tusquitee Bald. They are exposed to cold temperatures and high winds. Soils in these areas are very deep to shallow, well drained, and strongly sloping to very steep. They have a topsoil that is acid and has a very high content of organic matter.

The intermediate mountains range from 3,500 to 4,800 feet in elevation. They make up the most extensive landscape in the county. Soils in these areas generally are very deep to shallow, well drained to excessively drained, and strongly sloping to very steep. Very deep, well drained, gently sloping to very steep soils are in coves and drainageways. The soils on north- to east-facing, cool aspects and the soils in coves and drainageways have a topsoil that is acid and has a high content of organic matter.

The low mountains range from 1,700 to 3,500 feet in elevation. Soils in these areas generally are very deep to shallow, well drained, and gently sloping to very steep. Very deep, well drained, gently sloping to steep soils are in coves and drainageways.

The low rolling hills and high stream terraces range from 1,700 to 2,500 feet in elevation. Their largest area occurs around Chatuge Lake. Smaller areas occur in and around the towns of Hayesville, Brasstown, and Warne. The soils of the low rolling hills and high stream terraces generally are very deep, well drained, and gently sloping to moderately steep. They are eroded in places. Very deep, well drained, gently sloping to strongly sloping soils are in coves and drainageways.

The flood plains and low stream terraces range from 1,600 to 2,200 feet elevation. They occur along streams, such as the Hiwassee River, Brasstown Creek, Tusquitee Creek, and Shooting Creek. Flash flooding is a potential hazard on the flood plains. Soils of the flood plains and low stream terraces are very deep, well drained to very poorly drained, and nearly level or gently sloping. These soils have a topsoil that is acid and has a high content of organic matter.

Relief is a measure of the difference in elevation from the highest to lowest parts of the landscape. Relief

Figure 2.—One of the many small areas of rock outcrop in the rugged mountains of Clay County.

varies greatly from one landscape to another in the county. The mountain landscapes have strong relief and dominantly steep and very steep slopes. The mountain ridgetops, low rolling hills, high stream terraces, and coves have moderate relief and are mainly gently sloping to moderately steep. The low stream terraces and flood plains have low relief and are nearly level to moderately steep.

Most of Clay County is in the Hiwassee River Watershed. Smaller areas are in the Nantahala River and Tallulah River Watersheds. The headwaters of the Hiwassee River originate in Georgia. Some of the larger streams feeding this river are Brasstown Creek, Fires Creek, Tusquitee Creek, and Shooting Creek. The Nantahala River is in the eastern part of the county and is part of the Little Tennessee River system. The Tallulah River Watershed is part of the Savannah River system and drains the southeastern corner of the county.

Climate

In Clay County, the climate of the high mountains differs greatly from that of the low rolling hills and flood plains of the valleys. The climate is influenced by elevation, aspect, and the moisture-rich winds from the Gulf of Mexico. For example, annual rainfall averages about 63 inches around the town of Hayesville and about 85 inches at the higher elevations on Standing Indian Mountain. Generally, the amount of rainfall increases to the west of Hayesville and decreases to the east. The data in tables 1, 2 and 3 reflect the climate of the valleys in the central part of the county. Areas at higher elevations have lower temperatures, more rainfall and snowfall, and shorter growing seasons.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Hayesville, North Carolina, in the period 1959 to 1976. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 37 degrees F and the average daily minimum temperature is 24 degrees. The lowest temperature on record, which occurred at Hayesville on January 31, 1966, is -14 degrees. In summer, the average temperature is 78 degrees and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Hayesville on July 1, 1959, is 95 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 63 inches. Of this, 30 inches, or 48 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 26 inches. The heaviest 1-day rainfall during the period of record was 4.64 inches at Hayesville on May 28, 1973. Thunderstorms occur on about 56 days each year. Heavy rains from prolonged storms can occur any time of the year, occasionally cover the entire area, and cause severe flooding in the valleys.

The average seasonal snowfall is 8 inches. The greatest snow depth at any one time during the period of record was 8 inches. On an average of 1 day per year, at least 1 inch of snow is on the ground.

The average relative humidity in midafternoon is about 55 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 65 percent of the time possible in summer and 42 to 45 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 8 miles per hour, in spring.

How This Survey Was Made

This survey was made to provide information about the soils in Clay County. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the depth, texture, and color of the soil; steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They studied many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. It extends from the surface down into the material from which the soil formed.

Soils occur in an orderly pattern that results from the combined influence over time of climate, parent material, relief, and plants and animals. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. This model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify

predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify the soils. After describing the soils and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. The data from these analyses and tests and from field-observed characteristics and soil properties are used to predict behavior of the soils under different uses. Interpretations are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a relatively high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will be at a specific level in the soil on a specific date.

Soil boundaries are drawn on aerial photographs and each delineation is identified as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in accurately locating boundaries.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soils for which it is named and some soils that belong to other taxonomic classes. In the detailed soil map units, these latter soils are called inclusions or included soils. In the general soil map units, they are called minor soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas that cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are identified in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soils on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in areas that are less than 2 to 5 acres in size.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the general soil map is not suitable for planning the management of a farm or field or for selecting a site for a road or a building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Loamy Soils That Formed in Alluvium; on the Flood Plains and Low Stream Terraces

1. Rosman-Reddies-Arkaqua-French

Nearly level, well drained to somewhat poorly drained soils that are very deep to moderately deep to strata of sand, gravel, and cobbles; on flood plains

In this map unit, the landscape mainly consists of flood plains but includes some low stream terraces along rivers and major creeks. Slopes range from 0 to 3 percent.

This map unit makes up about 4 percent of the survey area. It is about 14 percent Rosman soils, 12 percent Reddies soils, 12 percent Arkaqua soils, 11 percent French soils, and 51 percent soils of minor extent (fig. 3). The minor soils include Dellwood, Nikwasi, and Toxaway soils on flood plains and Dillard, Hemphill, and Statler soils on low stream terraces.

Rosman soils are deep or very deep to strata of sand, gravel, and cobbles. These nearly level, well drained to moderately well drained soils are on flood plains along large streams. Flooding is frequent or rare. Typically, the surface layer is dark brown fine sandy loam. The subsoil is dark yellowish brown fine sandy loam.

Reddies soils are moderately deep to sand, gravel, and cobbles. These nearly level, moderately well drained soils are on flood plains along the smaller streams. Flooding is frequent. Typically, the surface layer is very dark brown loam. The subsoil is yellowish brown loam and gravelly sandy loam. The underlying material is multicolored very cobbly loamy sand.

The very deep, nearly level, somewhat poorly drained Arkaqua soils are on the lower, wetter parts of flood plains along major streams. Flooding is frequent or rare. Typically, the surface layer is very dark grayish brown loam. The subsoil is brown loam in the upper part, mottled yellowish brown and grayish brown loam in the next part, and brownish gray clay loam in the lower part. The underlying material is mottled brownish yellow and grayish brown loam.

French soils are moderately deep to sand, gravel, and cobbles. These nearly level, moderately well drained to somewhat poorly drained soils are on flood plains along the smaller streams. Flooding is frequent. Typically, the surface layer is dark yellowish brown fine sandy loam. The upper part of the subsoil is dark yellowish brown loam, and the lower part is dark grayish brown fine sandy loam. The upper part of the underlying material is dark gray sandy loam, and the lower part is multicolored cobbly loamy sand.

Most of this map unit is cleared and used for pasture or crops. The rest is used for recreation, woodland, or urban uses, especially along the Hiwassee River from Chatuge Dam to Cherokee County.

Most of the well drained and moderately well drained minor soils are intensively used for crops, such as silage corn, tomatoes, strawberries, landscaping plants, and hay. Some areas of these soils are also used as pasture. Most undrained areas of the poorly drained or very poorly drained minor soils are used as woodland. Yellow-poplar, American sycamore, eastern white pine, black birch, and eastern hemlock are the common trees.

The Rosman and Reddies soils are intensively used

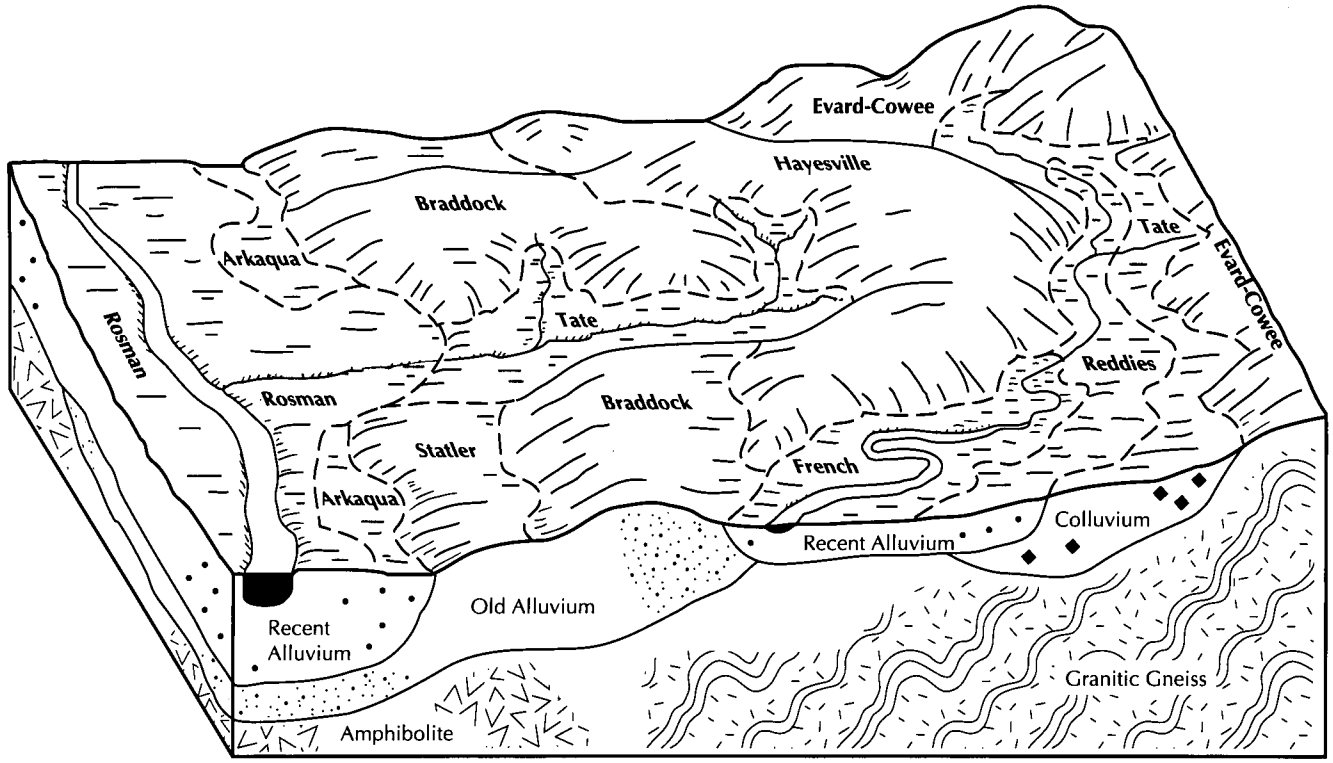


Figure 3.—Typical relationship of soils, landscape position, and parent material in the Rosman-Reddies-Arkaqua-French general soil map unit on flood plains and in the Braddock-Tate general soil map unit on low rolling hills.

for crops, such as silage corn, tomatoes, strawberries, landscaping plants, and hay. Large areas of these soils also are used as pasture. Areas of the Arkaqua and French soils are commonly drained by ditches and tile and are used for silage corn, landscaping plants, or hay. Undrained areas of these soils are mainly used as pasture. The flooding and wetness are the main limitations affecting crops and pasture.

Some areas of this map unit are used for outdoor recreational development, such as camping sites and parks, because they are near streams and are nearly level. The flooding and the wetness are limitations affecting some of these uses.

Some areas of this map unit are used for building sites, particularly along the Hiwassee River from Chatuge Dam to Cherokee County. These areas are favored for riverfront building sites because they are protected from flooding by the Tennessee Valley Authority system. The wetness and flooding in unprotected areas are the main limitations affecting urban uses.

Clayey and Loamy Soils That Formed in Material Weathered From High-Grade Metamorphic Rocks, Colluvium, or Old Alluvium; on the Low Rolling Hills

2. Braddock-Tate

Gently sloping to strongly sloping, very deep, well drained soils; on toe slopes, on high stream terraces, and in drainageways

In this map unit, the landscape consists of broad ridgetops, short side slopes, toe slopes, and drainageways. Most slopes range from 2 to 15 percent. The drainageways are along intermittent streams. Some creeks and branches cut through this unit.

This map unit makes up about 3 percent of the survey area. It is about 65 percent Braddock soils, 10 percent Tate soils, and 25 percent soils of minor extent (fig. 3). The minor soils include Brasstown, Hayesville, and Junaluska soils on short, upland side slopes and French, Reddies, and Rosman soils on the lower flood plains.

The gently sloping to strongly sloping, very deep

Braddock soils are on ridgetops and side slopes of high stream terraces. Typically, the surface layer is yellowish red clay loam. The subsoil is red clay and clay loam.

The gently sloping to strongly sloping, very deep Tate soils are on toe slopes and in drainageways. Typically, the surface layer is dark brown and dark yellowish brown loam. The subsoil is yellowish brown and strong brown clay loam in the upper part and strong brown gravelly loam in the lower part. The underlying material is strong brown colluvium of cobbly fine sandy loam.

Most of this map unit is cleared and used for hay and pasture. The rest is used for cropland, specialty crops, landscaping plants, or woodland. Many areas are urbanized in and around Hayesville.

The Braddock soils that have a surface layer of loam and the Tate soils are commonly used for hay, silage corn, specialty crops, or landscaping plants. The moderately eroded Braddock soils are commonly used for pasture and hay. The slope and a hazard of erosion are the main limitations.

Some of the moderately steep minor soils on side slopes are used as woodland. Scarlet oak, chestnut oak, hickory, Virginia pine, shortleaf pine, and white oak are the common trees.

This map unit is important for building site development because it has much gentler slopes than the mountainous areas. Installing and maintaining access roads are generally less difficult and expensive in this unit than in other areas of the county. The main limitations affecting urban uses are the slope, the hazard of erosion, and a high content of clay in the subsoil of the Braddock soils.

3. Hayesville-Tate

Gently sloping to moderately steep, very deep, well drained soils; on low rolling hills, in coves, on toe slopes, and along drainageways in the low mountains

In this map unit, the landscape consists of moderately broad ridgetops, short side slopes, short toe slopes, coves, and drainageways. Slopes range from 2 to 30 percent.

This map unit makes up about 3 percent of the survey area. It is about 63 percent Hayesville soils, 17 percent Tate soils, and 20 percent soils of minor extent. The minor soils include Cowee and Evard soils on low mountains, Fannin soils in areas that have a high content of mica on low mountains, and French, Reddies, and Nikwasi soils on flood plains.

The gently sloping to moderately steep Hayesville soils are on ridgetops and side slopes on low rolling hills. Typically, the surface layer is reddish brown clay loam. The subsoil is red clay, clay loam, and loam. The underlying material is multicolored saprolite of loam.

The gently sloping to moderately steep, very deep Tate soils are on toe slopes, in coves, and along drainageways in the low mountains. Typically, the surface layer is dark brown and dark yellowish brown loam. The subsoil is yellowish brown and strong brown clay loam in the upper part and strong brown gravelly loam in the lower part. The underlying material is strong brown colluvium of cobbly fine sandy loam.

This map unit is used about equally for hay and pasture and for woodland. Some areas are used for cropland, specialty crops, or landscaping plants. Many areas in and around Hayesville are urbanized.

The Tate soils are commonly used for hay, silage corn, specialty crops, or landscaping plants. The moderately eroded Hayesville soils are commonly used for pasture and hay. The slope and a hazard of erosion are the main limitations.

Many areas of the Hayesville soils around Chatuge Lake are used as woodland. Scarlet oak, chestnut oak, hickory, Virginia pine, shortleaf pine, and white oak are the common trees. The slope and the hazard of erosion are the main limitations.

This map unit is important for building site development because it has much gentler slopes than the mountainous areas. Installing and maintaining access roads are generally less difficult and expensive in this unit than in other areas of the county. The slope, the hazard of erosion, and a high content of clay in the subsoil of the Hayesville soils are the main limitations.

4. Fannin-Tate

Gently sloping to moderately steep, very deep, well drained soils; on low mountains, in coves, on toe slopes, and along drainageways

In this map unit, the landscape consists of moderately broad ridgetops, short side slopes, short toe slopes, coves, and drainageways. Slopes range from 2 to 30 percent. The drainageways are commonly along intermittent streams or small branches.

This map unit makes up about 1 percent of the survey area. It is about 65 percent Fannin soils, 17 percent Tate soils, and 18 percent soils of minor extent. The minor soils include Cowee and Evard soils on low mountains, Hayesville soils in areas that have a lower content of mica on low mountains, and French, Reddies, and Nikwasi soils on flood plains.

The gently sloping to moderately steep, very deep Fannin soils are on ridgetops and side slopes in the low mountains. Typically, the surface layer is yellowish red fine sandy loam. The subsoil is red clay loam and loam. The underlying material is red and multicolored sandy loam.

The gently sloping to moderately steep, very deep Tate soils are on toe slopes, in coves, and along drainageways. Typically, the surface layer is dark brown and dark yellowish brown loam. The subsoil is yellowish brown and strong brown clay loam in the upper part and strong brown gravelly loam in the lower part. The underlying material is strong brown colluvium of cobbly fine sandy loam.

Most of this map unit is cleared and used for hay and pasture. The rest is used for cropland, specialty crops, landscaping plants, or woodland. Many areas in and around Hayesville are urbanized.

The Tate soils are commonly used for hay, silage corn, specialty crops, or landscaping plants. The Fannin soils are commonly used for pasture and hay. The slope and a hazard of erosion are the main limitations.

Some of the moderately steep soils on side slopes are used as woodland. Scarlet oak, chestnut oak, hickory, Virginia pine, shortleaf pine, and white oak are the common trees. The slope and the hazard of erosion are the main limitations.

Some areas of this map unit have been urbanized. Homes and commercial building sites are commonly concentrated in the least sloping areas. The Fannin soils are limited by a high content of mica and require special designs that can prevent load failure. The slope and the hazard of erosion are additional limitations.

Loamy Soils That Formed in Material Weathered From High-Grade Metamorphic Rocks or Colluvium; Predominantly in the Low and Intermediate Mountains

5. Evard-Cowee

Gently sloping to very steep, very deep to moderately deep, well drained soils; on low mountains

In this map unit, the landscape consists mainly of rugged, dissected low mountains that have long side slopes and narrow, winding ridgetops and drainageways. Some areas are less rugged and have short side slopes and moderately broad ridgetops and drainageways. Slopes range from 2 to 95 percent. Numerous drainageways join and form creeks, which eventually join rivers. Streams flow in winding courses through bowl- and finger-shaped coves, through narrow and moderately wide flood plains, and through a few gorges that have small rock outcrops.

This map unit makes up about 19 percent of the survey area. It is about 56 percent Evard soils, 14 percent Cowee soils, and 30 percent soils of minor extent (fig. 4). The minor soils include Dellwood, French, Nikwasi, and Reddies soils on flood plains; Cullasaja, Tate, and Tuckasegee soils in coves; Chestnut and Edneyville soils on intermediate mountains; Trimont soils on cool side slopes; and Fannin soils in areas that have a higher content of mica on low rolling hills. Also included in this unit are rock outcrops.

The gently sloping to very steep, very deep Evard soils are on ridgetops and side slopes that are commonly south- to west-facing. Typically, the surface layer is yellowish red gravelly loam. The subsoil is red clay loam and gravelly loam. The underlying material is multicolored saprolite of fine sandy loam.

The gently sloping to very steep, moderately deep Cowee soils are on ridgetops and side slopes that are commonly south- to west-facing. Typically, the surface layer is yellowish red gravelly loam. The subsoil is yellowish red gravelly clay loam and gravelly loam. The underlying material is multicolored saprolite of fine sandy loam. The underlying bedrock is multicolored, weathered, fractured gneiss.

Many areas of this map unit are forested and used for timber production. Large areas are in the Nantahala National Forest. Recreation and homesite development are important uses of this unit. Some of the less sloping areas are used for pasture or crops.

In this map unit, scarlet oak, chestnut oak, hickory, shortleaf pine, Virginia pine, and white oak are dominant on mountain ridgetops and south- to west-facing slopes. Yellow-poplar, northern red oak, black cherry, black birch, and white oak are dominant on north- to east-facing slopes. Yellow-poplar is dominant in coves, on toe slopes, and in drainageways. Woodland productivity is affected by variations in rainfall. The soils in coves, on toe slopes, in drainageways, and on north- to east-facing side slopes are the most productive. Logging is difficult on the steep and very steep slopes. Access roads are difficult and expensive to install and maintain on the steep and very steep slopes.

The less sloping areas outside the Nantahala National Forest are commonly cleared and used for pasture, hay, or crops. The Evard and Cowee soils are commonly used for pasture and hay. The minor soils in coves, on toe slopes, and on flood plains are commonly used for hay, landscaping plants, or burley tobacco. The slope and a hazard of erosion are the main limitations.

Areas of this map unit in the Nantahala National Forest are also used for outdoor recreational activities, such as hiking, camping, fishing, hunting, and sightseeing. Large streams having high-quality water that flow through densely wooded watersheds are good for trout production.

Privately owned areas are commonly used for homesites. Access roads are difficult and expensive to

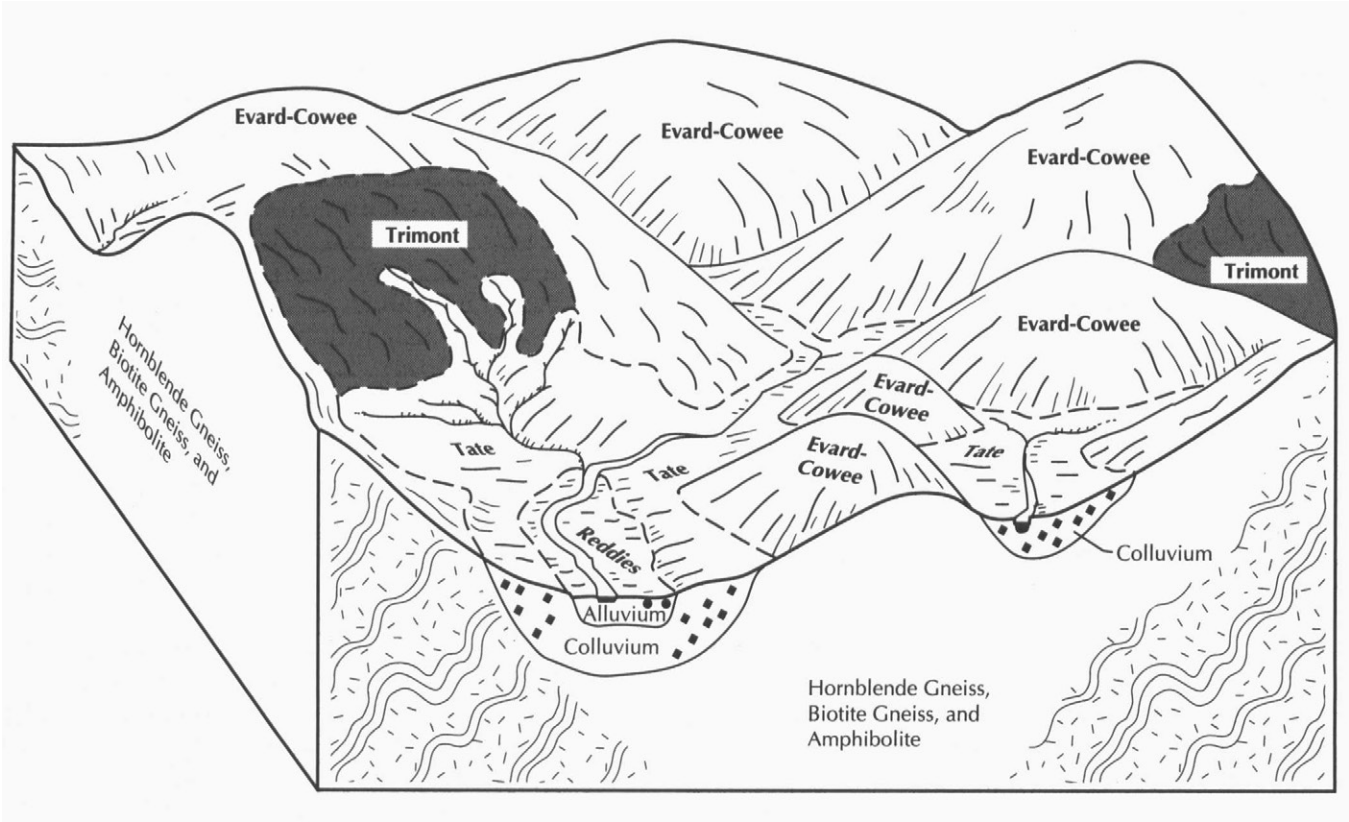


Figure 4.—Typical relationship of soils, aspect, landscape position, and parent material in the Evard-Cowee general soil map unit in the low mountains.

install in the steep and very steep areas. The slope and the hazard of erosion are the main limitations. The moderate depth to bedrock is an additional limitation in areas of the Cowee soils.

6. Edneyville-Plott-Chestnut-Cullasaja

Strongly sloping to very steep, very deep to moderately deep, well drained soils; in coves and along drainageways in the intermediate mountains

In this map unit, the landscape consists of rugged, dissected intermediate mountains that have long side slopes and narrow, winding ridgetops and drainageways. Slopes range from 8 to 95 percent. The numerous drainageways join and form creeks and rivers. Streams flow in winding courses through bowl- and finger-shaped coves, along toe slopes, and through narrow flood plains and gorges that have small rock outcrops.

This map unit makes up about 26 percent of the survey area. It is about 23 percent Edneyville soils, 18 percent Plott soils, 15 percent Chestnut soils, 14 percent Cullasaja soils, and 30 percent soils of minor extent (fig. 5). The minor soils include Dellwood, Nikwasi, and Reddies soils on flood plains; Tuckasegee soils in coves and on toe slopes; Cowee and Evard soils on low mountains; and Cleveland soils in areas around small rock outcrops on mountains.

The moderately steep to very steep, very deep Edneyville soils are on ridgetops and side slopes that are south- to west-facing on intermediate mountains. Typically, the surface layer is dark brown fine sandy loam and dark yellowish brown loam. The subsoil is strong brown loam and fine sandy loam in the upper part and strong brown cobbly fine sandy loam in the lower part. The underlying material is multicolored saprolite of cobbly sandy loam.

The moderately steep to very steep, very deep Plott soils are in the intermediate mountains, on north- to east-facing side slopes and on ridgetops in the higher areas. Typically, the surface layer is very dark brown and dark brown fine sandy loam. The upper part of the subsoil is brown fine sandy loam, and the lower part is dark yellowish brown cobbly fine sandy loam. The underlying material is multicolored saprolite of cobbly sandy loam.

The moderately steep to very steep, moderately deep Chestnut soils are in the intermediate mountains, on

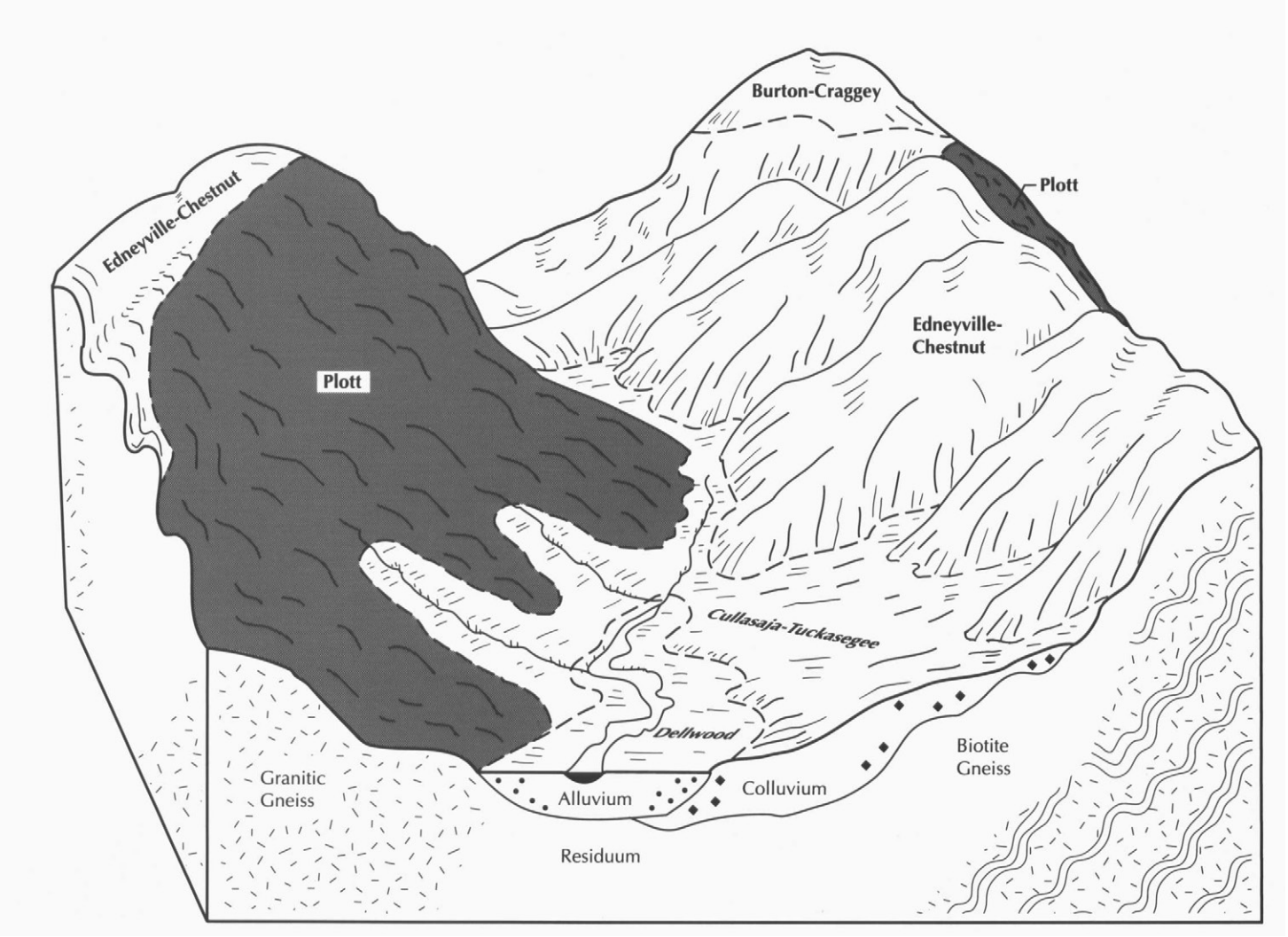


Figure 5.—Typical relationship of soils, aspect, landscape position, and parent material in the Edneyville-Plott-Chestnut-Cullasaja general soil map unit in the intermediate mountains.

ridgetops and side slopes that are south- to west-facing. Typically, the surface layer is very dark grayish brown fine sandy loam. The subsoil is dark yellowish brown cobbly fine sandy loam and yellowish brown cobbly sandy loam. The underlying bedrock is multicolored, weathered, fractured gneiss.

The strongly sloping to very steep, very deep Cullasaja soils are in coves, on toe slopes, and along drainageways. Typically, the surface layer is very dark brown cobbly fine sandy loam and dark brown cobbly loam. The subsoil is dark yellowish brown cobbly fine sandy loam and cobbly sandy loam.

Most of this map unit is forested and used for timber production (fig. 6). Large areas are in the Nantahala National Forest. Recreation is an important use of this unit. Privately owned areas are commonly used for vacation homes, and some of the less sloping areas are cleared and used for pasture or landscaping plants.

The natural vegetation in this map unit is mostly hardwoods, but eastern white pine and eastern hemlock are dominant in a few areas. Scarlet oak, chestnut oak, hickory, pitch pine, and eastern white pine are dominant on mountain ridgetops and south- to west-facing slopes. Northern red oak, black cherry, black birch, sugar maple, and yellow-poplar are dominant on north- to east-facing slopes. Yellow-poplar is dominant in coves, on toe slopes, and along drainageways. Productivity is highest in areas that have higher rainfall, on north- to east-facing side slopes, in the cool, moist coves, on toe slopes, and in drainageways. Logging is difficult on the

very steep slopes. Access roads are difficult and expensive to install on the steep and very steep slopes. However, because the soil material and saprolite of these soils pack well, this unit is the best suited unit in the county for year-round logging.

The less sloping areas outside the Nantahala National Forest are commonly cleared and used for pasture or landscaping plants. These areas include the strongly sloping to moderately steep Edneyville and Chestnut soils on moderately broad mountain ridgetops and side slopes and the strongly sloping to moderately steep Cullasaja soils and minor colluvial soils in coves and on toe slopes. The slope, a hazard of erosion, the moderate depth to bedrock in the Chestnut soils, and rock fragments in the Cullasaja soils are the main limitations.

Areas of this map unit in Nantahala National Forest are also used for outdoor recreational activities, such as hiking, camping, fishing, hunting, and sightseeing. Large streams having high-quality water that flow through densely wooded watersheds are good for trout production.

Privately owned areas are commonly used for vacation homes. The slope, the moderate depth to bedrock in the Chestnut soils, and large amounts of rock fragments in the Cullasaja soils are the main limitations. In addition, access roads are difficult and expensive to install on the steep and very steep slopes.

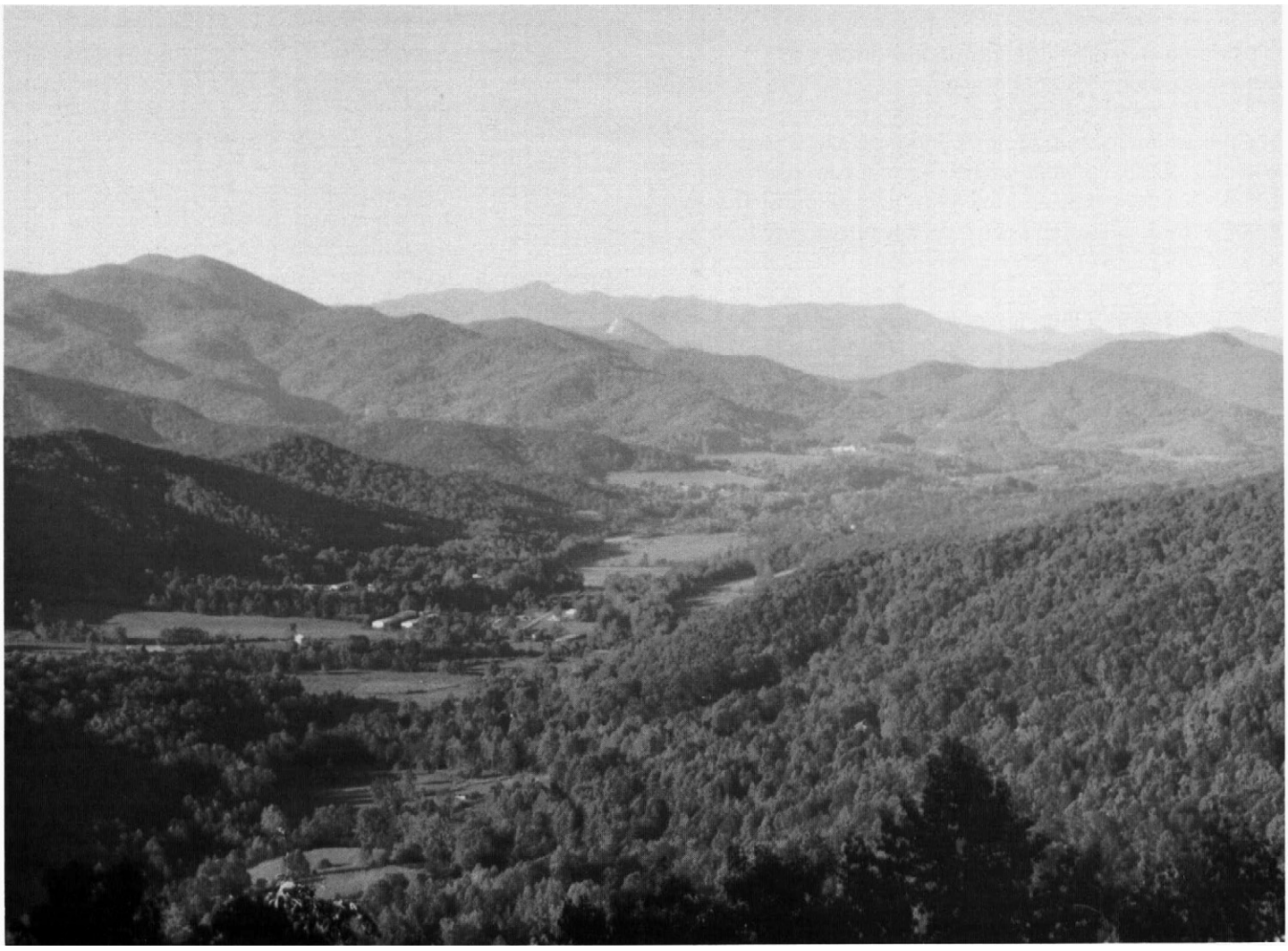


Figure 6.—Woodland in an area of the Edneyville-Plott-Chestnut-Cullasaja general soil map unit.

7. Chestnut-Rock outcrop-Cleveland

Moderately steep to very steep, moderately deep to shallow, well drained to somewhat excessively drained soils; on intermediate mountains

In this map unit, the landscape is characterized by rugged mountains that have rounded tops and long side slopes with rock cliffs. Most areas include long side slopes that are scattered throughout with small rock outcrops. Some areas have moderately broad ridgetops and nearly vertical rock faces. The rock outcrops commonly are nearly vertical but have slopes that range to moderately steep. Slopes range from 15 to 95 percent.

This map unit makes up about 3 percent of the survey area. It is about 38 percent Chestnut soils, 22 percent Rock outcrop, 20 percent Cleveland soils, and 20 percent soils of minor extent. The minor soils include Cullasaja soils in drainageways and Burton and Craggey soils on high mountains.

The moderately steep to very steep, moderately deep Chestnut soils are on ridgetops and side slopes that are commonly south- to west-facing. Typically, the surface layer is very dark grayish brown fine sandy loam. The subsoil is dark yellowish brown cobbly fine sandy loam and yellowish brown cobbly sandy loam. The underlying bedrock is multicolored, weathered, fractured gneiss.

The moderately steep to very steep, shallow Cleveland soils are on ridgetops and side slopes. Typically, the surface layer is dark brown gravelly fine sandy loam. The subsoil is yellowish brown gravelly fine sandy loam. The underlying bedrock is multicolored, hard weathered, fractured gneiss.

Most of this map unit is woodland and is in the Nantahala National Forest. It is not suited to timber production because the trees have been severely stunted by wind and ice. Scarlet oak, chestnut oak, hickory, pitch pine, and eastern white pine are dominant on ridgetops and south- to west-facing slopes. Northern red oak, black cherry, black birch, sugar maple, and eastern white pine are dominant on north- to east-facing slopes. The slope, the depth to bedrock, and very poor tree growth are the main limitations.

Large areas of this map unit in the Nantahala National Forest are used for outdoor recreational activities, such as hiking, camping, hunting, and sightseeing.

Privately owned areas are occasionally used for vacation homes because of the scenic value of this unit. The main limitations affecting use and management are the slope, the shallowness to bedrock, the stones, the numerous rock outcrops, and a hazard of erosion in areas where the soils have been disturbed. Access roads are extremely difficult and expensive to install and maintain.

Loamy Soils That Formed in Material Weathered From Metasedimentary or High-Grade Metamorphic Rocks; In the High Mountains

8. Oconaluftee-Burton-Craggey

Moderately steep to very steep, very deep to shallow, well drained to somewhat excessively drained soils; on high mountains

In this map unit, the landscape consists of rugged, dissected mountain peaks and the upper parts of side slopes at elevations above 4,800 feet. Slopes range from 15 to 95 percent.

This map unit makes up about 1 percent of the survey area. It is about 44 percent Oconaluftee soils, 18 percent Burton soils, 13 percent Craggey soils, and 25 percent soils of minor extent. The minor soils include Spivey, Santeetlah, Cullasaja, and Tuckasegee soils in drainageways. Also included in this unit are small rock outcrops.

The moderately steep and steep, very deep Oconaluftee soils are on ridgetops and side slopes. Typically, the surface layer is black and very dark brown channery loam. The subsoil is dark brown channery loam. The underlying material is multicolored saprolite of flaggy fine sandy loam.

The moderately steep to very steep, moderately deep Burton soils are on ridgetops and side slopes. Typically, the surface layer is very dark brown and dark brown sandy loam. The subsoil is dark yellowish brown fine sandy loam and yellowish brown sandy loam. The underlying bedrock is hard, fractured gneiss.

The moderately steep to very steep, shallow Craggey soils are on ridgetops and side slopes. Typically, the surface layer is very dark brown sandy loam and very dark grayish brown fine sandy loam. The subsoil is dark yellowish brown fine sandy loam. The underlying bedrock is hard, fractured gneiss.

Most of this map unit is woodland and is in the Nantahala National Forest. It is not suited to timber production because the trees have been severely stunted, twisted, and sculpted by wind and ice. The slope and the depth to bedrock are additional problems. Northern red oak is the dominant tree. It is mixed with yellow birch, black cherry, black birch, and sugar maple.

Large areas of this map unit in the Nantahala National Forest are used for outdoor recreational activities, such as hiking, camping, hunting, and sightseeing.

The main limitations affecting use and management of this map unit are the slope, the depth to bedrock in

the Craggey and Burton soils, stones, numerous rock outcrops, and a hazard of erosion where the soils have been disturbed.

Loamy Soils That Formed in Material Weathered From Metasedimentary Rocks or Colluvium; Predominantly in the Low Rolling Hills

9. Junaluska-Brasstown-Lonon

Gently sloping to steep, very deep to moderately deep, well drained soils; in coves, on toe slopes, and along drainageways in the low mountains

In this map unit, the landscape is characterized by rugged, dissected hills. Most areas have moderately broad ridgetops and drainageways with short side slopes. Some areas that are adjacent to major streams have steep slopes. Slopes range from 8 to 50 percent. The drainageways are commonly along intermittent streams or small branches.

This map unit makes up about 10 percent of the survey area. It is about 37 percent Junaluska soils, 32 percent Brasstown soils, 10 percent Lonon soils, and 21 percent soils of minor extent. The minor soils include French, Nikwasi, and Reddies soils on flood plains and Tsali soils on low mountains.

The strongly sloping to steep, moderately deep Junaluska soils are on ridgetops and side slopes in the low mountains. Typically, the surface layer is strong brown channery fine sandy loam. The subsoil is strong brown loam and yellowish red clay loam. The underlying bedrock is multicolored, weathered, fractured metasandstone and phyllite.

The strongly sloping to steep, deep Brasstown soils are on ridgetops and side slopes in the low mountains. Typically, the surface layer is dark yellowish brown fine sandy loam. The subsoil is strong brown loam and yellowish red clay loam in the upper part and red loam in the lower part. The underlying material is multicolored saprolite of sandy loam. The underlying bedrock is multicolored, weathered, fractured metasandstone.

The gently sloping to moderately steep, very deep Lonon soils are in coves, on toe slopes, and along drainageways. Typically, the surface layer is dark brown loam. The subsoil is yellowish red clay loam and strong brown loam.

This map unit is used about equally for hay and pasture and for woodland. Some areas are used for cropland, specialty crops, or landscaping plants.

Most of the moderately steep or steep soils in this map unit are used as woodland. Scarlet oak, chestnut oak, hickory, shortleaf pine, Virginia pine, and white oak are dominant on uplands. Yellow-poplar is dominant in coves, on toe slopes, and in drainageways. Areas in coves, on toe slopes, and in drainageways have a high potential for timber production. Logging is difficult and access roads are difficult and expensive to maintain on the steep slopes. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

The less sloping areas of this map unit are commonly cleared and used for pasture or crops. These areas include the strongly sloping to moderately steep Brasstown and Junaluska soils on moderately broad ridgetops and the gently sloping to strongly sloping Lonon soils in coves and on toe slopes. The Brasstown and Junaluska soils are commonly used for pasture and hay. The Lonon soils are commonly used for burley tobacco or landscaping plants. The slope and a hazard of erosion are the main limitations affecting pasture and cropland.

Some of the minor soils in this map unit are a major source of income for landowners. The well drained and moderately well drained minor soils on the flood plains are commonly used for burley tobacco, and the somewhat poorly drained soils are used for water-tolerant, landscaping plants.

Homesites have been established in some areas of this map unit, but access roads are difficult and expensive to install and maintain on the steep slopes. The slope, the hazard of erosion, and the depth to bedrock in the Junaluska soils are limitations. In addition, seams of rock that have a high content of sulfur may be unearthed by construction. These materials are highly acidic, and sediments washed into adjacent streams may increase stream acidity and harm aquatic life. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas. The possibility of landslides is a problem in areas of deep cuts.

Loamy Soils That Formed in Material Weathered From Metasedimentary Rocks or Colluvium; Predominantly in the Low and Intermediate Mountains

10. Junaluska-Tsali-Spivey

Strongly sloping to very steep, very deep to shallow, well drained soils; in coves, on toe slopes, and along drainageways in the low mountains

In this map unit, the landscape consists of rugged, dissected low mountains that have long side slopes and narrow, winding ridgetops and drainageways. Slopes range from 8 to 95 percent. The numerous drainageways join and form creeks, which eventually join rivers. Streams flow in winding courses through bowl- and finger-shaped coves, through narrow and

moderately wide flood plains, and through a few gorges that have small rock outcrops.

This map unit makes up about 10 percent of the survey area. It is about 39 percent Junaluska soils, 21 percent Tsali soils, 13 percent Spivey soils, and 27 percent soils of minor extent. The minor soils include Dellwood, French, Nikwasi, and Reddies soils on flood plains; Lonon and Santeetlah soils in coves and on toe slopes; and Soco and Stecoah soils on intermediate mountains. Also included in this unit are rock outcrops.

The strongly sloping to very steep, moderately deep Junaluska soils are on ridgetops and side slopes in the low mountains. Typically, the surface layer is strong brown channery fine sandy loam. The subsoil is strong brown loam and yellowish red clay loam. The underlying bedrock is multicolored, weathered, fractured metasandstone and phyllite.

The strongly sloping to very steep, shallow Tsali soils are on ridgetops and side slopes in the low mountains. Typically, the surface layer is strong brown channery fine sandy loam. The subsoil is yellowish red channery loam. The underlying bedrock is multicolored, weathered, fractured metasandstone and phyllite.

The strongly sloping to very steep, very deep Spivey soils are in coves, on toe slopes, and along drainageways. Typically, the surface layer is black or very dark brown very flaggy loam. The upper part of the subsoil is brown flaggy fine sandy loam, and the lower part is brown flaggy sandy loam.

Most of this map unit is forested. Many areas are used for timber production. Recreation and homesite development are important uses of this unit. Many of the less sloping soils are cleared and used for pasture or crops.

In this map unit, scarlet oak, chestnut oak, hickory, shortleaf pine, Virginia pine, and white oak are the dominant trees on uplands. Yellow-poplar is dominant in coves, on toe slopes, and in drainageways. Areas in coves, on toe slopes, and in drainageways are the most productive for timber. Logging is difficult and access roads are difficult and expensive to install and maintain on the steep and very steep slopes. Seams of rock that have a high content of sulfur may be unearthed by road construction. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

The less sloping areas are commonly cleared and used for pasture or crops. These areas include the strongly sloping to moderately steep Junaluska and Tsali soils on ridgetops and the strongly sloping to moderately steep Spivey soils in coves, on toe slopes, and along drainageways. The Junaluska and Tsali soils are commonly used for pasture. The Spivey soils are used for burley tobacco or landscaping plants. The slope, a hazard of erosion in areas where the soils have been disturbed, the shallowness to bedrock in the Tsali soils, and rock fragments in the Spivey soils are the main management concerns.

Some of the minor soils in this unit are a major source of income for landowners. The well drained and moderately well drained minor soils on flood plains, in coves, and on toe slopes are commonly used for burley tobacco, tomatoes, or landscaping plants.

Areas of this map unit in the Nantahala National Forest are used for outdoor recreational activities, such as hiking, camping, fishing, hunting, and sightseeing. Large streams having high-quality water that flow through densely wooded watersheds are good for trout production.

Homesites have been established in some privately owned areas of this map unit, but access roads are difficult and expensive to install and maintain on the steep and very steep slopes. The slope, the hazard of erosion, rock fragments, the moderate depth to bedrock in the Junaluska soils, the shallowness to bedrock in the Tsali soils, and the potential for landslides in areas of deep cuts are the major concerns. In addition, seams of rock that have a high content of sulfur may be unearthed by road construction. These materials are highly acidic, and sediments washed into adjacent streams may increase stream acidity and harm aquatic life. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

11. Soco-Stecoah-Cheoah-Spivey

Strongly sloping to very steep, very deep to moderately deep, well drained soils; in coves, on toe slopes, and along drainageways in the intermediate mountains

In this map unit, the landscape consists of rugged, dissected intermediate mountains that have long side slopes and very narrow, winding ridgetops and drainageways. Slopes range from 8 to 95 percent. The numerous drainageways join and become creeks, which eventually join rivers. Streams flow in winding courses through bowl- and finger-shaped coves, through narrow flood plains, and through gorges that have small rock outcrops.

This map unit makes up about 16 percent of the survey area. It is about 29 percent Soco soils, 19 percent Stecoah soils, 16 percent Cheoah soils, 11 percent Spivey soils, and 25 percent minor soils. The minor soils include Dellwood, French, Nikwasi, and Reddies soils on flood plains; Santeetlah soils in coves and on toe slopes; and Junaluska and Tsali soils on south- to west-facing, mountain side slopes.

The moderately steep to very steep, moderately deep Soco soils are in the intermediate mountains on ridgetops and side slopes that are commonly south- to

west-facing. Typically, the surface layer is dark yellowish brown channery loam. The subsoil is brownish yellow channery sandy loam. The underlying bedrock is multicolored, weathered, fractured, interbedded metasandstone and phyllite.

The moderately steep to very steep, deep Stecoah soils are in the intermediate mountains on ridgetops and side slopes that are commonly south- to west-facing. Typically, the surface layer is dark yellowish brown fine sandy loam. The subsoil is yellowish brown loam and light yellowish brown channery loam. The underlying material is multicolored saprolite of channery fine sandy loam. The underlying bedrock is multicolored, weathered, fractured, interbedded metasandstone and phyllite.

The steep to very steep, deep Cheoah soils are in the intermediate mountains on side slopes that are commonly north- to east-facing. Typically, the surface layer is very dark grayish brown and dark brown channery loam. The subsoil is yellowish brown loam and channery sandy loam. The underlying material is multicolored saprolite of flaggy sandy loam. The underlying bedrock is multicolored, weathered, fractured, interbedded metasandstone and phyllite.

The strongly sloping to very steep, very deep Spivey soils are in coves, on toe slopes, and along drainageways. Typically, the surface layer is black or very dark brown very flaggy loam. The upper part of the subsoil is brown flaggy fine sandy loam. The lower part is brown flaggy sandy loam.

Most of this map unit is forested and used for timber production. Large areas are in the Nantahala National Forest. Recreation and homesite development are important uses of this unit. Some of the less sloping soils are cleared and used for pasture or crops.

In this map unit, scarlet oak, chestnut oak, black oak, hickory, pitch pine, and Virginia pine are the dominant trees on ridgetops and south- to west-facing slopes. Northern red oak, black cherry, black birch, sugar maple, and yellow-poplar are dominant on north- to east-facing slopes. Yellow-poplar is dominant in coves, on toe slopes, and in drainageways. Productivity generally is highest in areas that have higher amounts of rainfall. The soils on north- to east-facing slopes, in coves, on toe slopes, and in drainageways are the most productive for timber. Logging is difficult on the steep and very steep slopes. Access roads are difficult and expensive to install and maintain on the steep and very steep slopes. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

The privately owned, less sloping areas are commonly cleared and used for crops or pasture. These areas include the moderately steep Soco and Stecoah soils on ridgetops and the strongly sloping to moderately steep Santeetlah and Spivey soils in coves and on toe slopes. The Soco and Stecoah soils are commonly used for pasture and hay. The Spivey and Santeetlah soils are commonly used for landscaping plants or hay. The slope, the hazard of erosion, and rock fragments in the Spivey soils are limitations.

Some of the minor soils in this unit are a major source of income for landowners. The well drained and moderately well drained minor soils on flood plains, in coves, and on toe slopes are commonly used for burley tobacco or landscaping plants.

Large areas of this map unit in the Nantahala National Forest are used for outdoor recreational activities, such as hiking, camping, fishing, hunting, and sightseeing. Large streams having high-quality water that flow through densely wooded watersheds are good for trout production.

Privately owned areas are commonly used for homesites, but access roads are difficult and expensive to maintain. The slope is the main limitation affecting use and management of this map unit. The hazard of erosion is a major management concern for uses that disturb the soils. Additional problems are the moderate depth to bedrock in the Soco soils, a greater than 35 percent content of rock fragments in the Spivey soils, and the potential for landslides. Also, seams of rock that have a high content of sulfur may be unearthed by road construction. These materials are highly acidic, and sediments washed into adjacent streams may increase stream acidity and harm aquatic life. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

12. Sylco-Cataska-Spivey

Moderately steep to very steep, shallow to very deep, well drained and excessively drained soils; in coves, on toe slopes, and along drainageways in the intermediate mountains

In this map unit, the landscape consists of rugged intermediate mountains that have very long side slopes and very narrow, winding ridgetops and drainageways. Slopes range from 30 to 95 percent. The drainageways join and form creeks, which flow in winding courses through small coves.

This map unit makes up about 4 percent of the survey area. It is about 25 percent Sylco soils, 23 percent Cataska soils, 15 percent Spivey soils, and 37 percent soils of minor extent. The minor soils include Santeetlah soils in drainageways and Cheoah soils on north-facing side slopes. Also included in this unit are rock outcrops.

The moderately steep to very steep, moderately deep Sylco soils are on ridgetops and side slopes in the

intermediate mountains. Typically, the surface layer is dark brown and dark yellowish brown channery loam. The subsoil is strong brown very channery loam. The underlying bedrock is hard weathered slate.

The moderately steep to very steep, shallow Cataska soils are on ridgetops and side slopes in the intermediate mountains. Typically, the surface layer is dark brown channery loam. The subsoil is dark yellowish brown very channery loam. The underlying bedrock is hard weathered slate.

The moderately steep to very steep, very deep Spivey soils are in coves, on toe slopes, and along drainageways. Typically, the surface layer is black or very dark brown very flaggy loam. The upper part of the subsoil is brown flaggy fine sandy loam. The lower part is brown flaggy sandy loam.

Most of this map unit is forested and is in the Nantahala National Forest. Large areas are used for wildlife habitat. Some areas are used for timber production. Recreation and development for vacation homesites are other important uses of this unit.

In this map unit, scarlet oak, chestnut oak, and hickory are the dominant trees on ridgetops and south- to west-facing slopes. Pitch pine and Virginia pine grow in some areas. Yellow-poplar is dominant in coves, on toe slopes, and in drainageways, but eastern hemlock, black birch, black cherry, and yellow buckeye are also common. Productivity is very low on the upland soils. It is good in coves, on toe slopes, and along drainageways. These areas are important for timber production. Logging is difficult on the steep and very steep slopes. Access roads are extremely difficult and expensive to install and maintain on the steep and very steep slopes. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

Large areas of this map unit are in the Nantahala National Forest and are used for outdoor recreational activities, such as hiking, camping, hunting, and sightseeing.

Privately owned areas are commonly used for vacation homes because of the scenic value of this map unit. The major concerns are the slope, a hazard of erosion in areas where the soils have been disturbed, the shallowness to bedrock in the Cataska soils, the moderate depth to bedrock in the Sylco soils, a greater than 35 percent content of rock fragments in the major soils, and the potential for landslides. In addition, highly acidic rock that has a high content of sulfur may be exposed in areas of deep cuts. Access roads are extremely difficult and expensive to install and maintain. Measures are needed to control runoff, erosion, and sedimentation and to vegetate bare areas.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of the dominant soils within the map unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under the heading "Use and Management of the Soils."

The map units on the detailed soil maps represent areas on the landscape and consist mainly of the dominant soils for which the units are named.

Symbols identifying the soils precede the map unit names in the map unit descriptions. The descriptions include general facts about the soils and give the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying material, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, wetness, frequency of flooding, degree of erosion, and other characteristics, such as exposure to strong winds, that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are named as phases of soil series. The name of a soil phase commonly indicates a feature or features that affect use or management. For example, Hayesville clay loam, 2 to 8 percent slopes, eroded, is a map unit name in the Hayesville series that identifies texture of the surface layer, the slope group, and the degree of erosion.

Some map units are made up of two or more major soils. These map units are called soil complexes, soil associations, or undifferentiated groups.

A *soil complex* consists of two or more contrasting soils, or miscellaneous land areas, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Evard-Cowee complex, 30 to 50 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soils. Such differences could significantly affect use and management of the soils in the map unit. Most included soils are identified in each map unit description. In some cases, small areas of strongly contrasting soils may be identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Rock outcrop part of the map unit Rock outcrop-Cleveland complex, windswept, 30 to 95 percent slopes, is an example. Some miscellaneous areas are very small and are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and suitabilities for many uses. The Glossary defines many of the terms used in describing the soils.

AkA—Arkaqua loam, 0 to 2 percent slopes, rarely flooded. This nearly level, very deep, somewhat poorly drained soil is in depressions on flood plains. This map unit occurs along the Hiwassee River, from Chatuge Dam to the mouth of Tusquitee Creek. It is protected from flooding by the Tennessee Valley Authority system. Individual areas occur as long bands that parallel areas of well drained soils along the river. They range from 2 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Arkaqua soil are as follows—

Surface layer:

0 to 11 inches—very dark grayish brown loam

Subsoil:

11 to 20 inches—brown loam that has brownish yellow mottles

20 to 28 inches—brown loam that has brownish yellow and grayish brown mottles
28 to 40 inches—mottled yellowish brown and grayish brown loam
40 to 51 inches—grayish brown clay loam that has brownish yellow mottles

Underlying material:
51 to 60 inches—mottled brownish yellow and grayish brown loam

Permeability is moderate. Surface runoff is slow. Flooding is rare and occurs for very brief periods. The high water table is at a depth of 1.5 to 2.0 feet. The content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Dillard, Rosman, Statler, and Toxaway soils. Dillard soils are moderately well drained. Rosman soils are moderately well drained or well drained. Statler soils are well drained. Toxaway soils are poorly drained or very poorly drained. Dillard and Statler soils are on small elevated knolls. Rosman soils are along stream channels. Toxaway soils are in depressions. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops or woodland.

This Arkaqua soil is moderately suited to pasture and hayland. The main limitation is wetness. Soil compaction and streambank damage are additional management concerns. Land shaping helps to open outlets and rapidly drain surface water from depressions. Tile drainage may be needed in the wettest areas. Grazing when the soil is wet causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can prevent streambank damage and improve water quality.

This soil is moderately suited to cultivated row crops. The wetness is the main limitation, and the rare flooding is an additional concern. Runoff from the adjacent higher areas also is a management concern. Silage corn is the most common crop. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Drainage tile helps to remove excess water. Grassed field borders and grassed waterways can safely divert water from the higher areas around row crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter. Frost can significantly damage sensitive crops because of cold air drainage. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to woodland management. The wetness and the equipment limitation are moderate management problems. Yellow-poplar is the most common tree. It is in stands mixed with river birch, black cherry, and American sycamore.

This soil is moderately suited or poorly suited to most recreational uses because of the wetness and the flooding. It is rarely used for these purposes.

This soil is poorly suited to building site development because of the wetness and the flooding. It is rarely used for this purpose.

This soil is poorly suited to access roads because of low strength. Runoff and sediments from the adjacent higher areas are additional problems. Building roads in elevated areas helps to minimize flood damage to the road surface and to safely divert runoff. Wet areas should be drained prior to road construction. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIIw in drained areas and IVw in undrained areas. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12W.

ArA—Arkaqua loam, 0 to 2 percent slopes, frequently flooded. This nearly level, very deep, somewhat poorly drained soil is in depressions on flood plains along the major streams, except along the Hiwassee River from Chatuge Dam to the mouth of Tusquitee Creek. Individual areas occur as long bands that parallel areas of well drained soils along the streams. They range from 2 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Arkaqua soil are as follows—

Surface layer:
0 to 11 inches—very dark grayish brown loam

Subsoil:
11 to 20 inches—brown loam that has brownish yellow mottles
20 to 28 inches—brown loam that has brownish yellow and grayish brown mottles
28 to 40 inches—mottled yellowish brown and grayish brown loam
40 to 51 inches—grayish brown clay loam that has brownish yellow mottles

Underlying material:
51 to 60 inches—mottled brownish yellow and grayish brown loam

Permeability is moderate. Surface runoff is slow. Flooding is frequent and occurs for very brief periods. The high water table is at a depth of 1.5 to 2.0 feet. The

content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Dillard, Rosman, Statler, and Toxaway soils. Dillard soils are moderately well drained. Rosman soils are moderately well drained or well drained. Statler soils are well drained. Toxaway soils are poorly drained or very poorly drained. Dillard and Statler soils are on small elevated knolls. Rosman soils are along stream channels. Toxaway soils are in depressions. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops or woodland.

This Arkaqua soil is moderately suited to pasture and hayland. Wetness and flooding are the main limitations. Soil compaction and streambank damage are additional management concerns. Land shaping helps to open outlets and rapidly drain surface water from depressions. Tile drainage may be needed in wet areas. Grazing when the soil is wet causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is moderately suited to cultivated row crops. The wetness and the flooding are the main limitations. Runoff from the adjacent higher areas is an additional management concern. Silage corn is the most common crop. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Drainage tile is recommended to remove excess water. Grassed field borders and grassed waterways can safely divert water from the higher areas around row crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter. Frost can significantly damage sensitive crops because of cold air drainage. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to woodland management. The wetness, the flooding, and the equipment limitation are moderate management problems. Yellow-poplar is the most common tree. It is in stands mixed with river birch, black cherry, and American sycamore.

This soil is moderately suited to poorly suited to most recreational uses because of the wetness and flooding. It is rarely used for these purposes.

This soil is poorly suited to building site development because of the wetness and flooding. It is rarely used for this purpose.

This soil is poorly suited to access roads because of the flooding and low strength. Runoff and sediments from the adjacent higher areas are additional problems. Building roads in elevated areas helps to minimize flood damage to the road surface and to safely divert runoff. Wet areas should be drained prior to road construction. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIIw in drained areas and IVw in undrained areas. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12W.

BdB—Braddock loam, 2 to 8 percent slopes. This gently sloping, very deep, well drained soil is on high stream terraces, generally in depressions. Individual areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Braddock soil are as follows—

Surface layer:
0 to 11 inches—dark brown loam

Subsoil:
11 to 18 inches—yellowish red loam
18 to 32 inches—red clay
32 to 60 inches—red clay loam

Permeability is moderate. Surface runoff is medium. Crusting can occur if the soil is worked when wet. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Tate soils that have a brown, loamy subsoil. These soils are in drainageways. Also included are some soils that are similar to the Braddock soil but have a gravelly surface layer or a browner subsoil, or both. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used for cultivated row crops. Some areas are used for pasture and hayland, building sites, recreation, or woodland.

This Braddock soil is well suited to cultivated row crops. Controlling erosion is a management concern in the more sloping areas. Silage corn is the most common crop. Other crops include sweet corn, tomatoes, strawberries, and burley tobacco. Irrigation is needed for some crops during dry periods and to provide frost protection for high-value crops. Mulch is used on strawberries to conserve moisture, control erosion and weeds, and keep the berries clean. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from

depressions. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to pasture and hayland. Soil compaction is a management concern. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to building site development. The main limitations are the shrink-swell potential, the moderate permeability, and the clayey subsoil.

This soil is well suited to most recreational uses, such as camping sites and picnic areas. It is commonly used for these purposes in areas around Lake Chatuge.

This soil is well suited to woodland management. Common trees are northern red oak, southern red oak, white oak, yellow-poplar, black cherry, and American beech. This map unit also includes a few black walnut trees.

This soil is poorly suited to access roads because of low strength. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff water is properly diverted. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 4A.

BdC—Braddock loam, 8 to 15 percent slopes. This strongly sloping, very deep, well drained soil is on high stream terraces. Individual areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Braddock soil are as follows—

Surface layer:
0 to 11 inches—dark brown loam

Subsoil:
11 to 18 inches—yellowish red loam
18 to 32 inches—red clay
32 to 60 inches—red clay loam

Permeability is moderate. Surface runoff is rapid. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Tate soils that have a brown, loamy subsoil. These soils are in drainageways. Also included are some soils that are similar to the Braddock soil but that have a gravelly surface layer or a browner subsoil, or both. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, building sites, recreation, or woodland.

This Braddock soil is well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to cultivated row crops. The hazard of erosion is the main limitation. The slope and runoff are additional problems. Silage corn is the most common crop. Irrigation is needed for some high-value crops during dry periods and to provide frost protection. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to building site development. The slope, the shrink-swell potential, the moderate permeability, and the clayey subsoil are the main limitations. Runoff and a hazard of erosion are additional management concerns. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled.

This soil is moderately suited to most recreational uses, such as camping sites and picnic areas. It is commonly used for these purposes in areas around Lake Chatuge. The slope is the main limitation. Controlling erosion is an additional management concern.

This soil is well suited to woodland management. Common trees are northern red oak, southern red oak, white oak, yellow-poplar, black cherry, and American beech. This map unit also includes a few black walnut trees.

This soil is poorly suited to access roads because of low strength. The slope, the hazard of erosion, and runoff are management concerns. Because unsurfaced

roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff is properly diverted. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 4A.

BkB2—Braddock clay loam, 2 to 8 percent slopes, eroded. This gently sloping, very deep, well drained soil is on high stream terraces. Individual areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Braddock soil are as follows—

Surface layer:

0 to 6 inches—yellowish red clay loam

Subsoil:

6 to 36 inches—red clay

36 to 60 inches—red clay loam

Further erosion is a severe hazard where the soil is bare and unprotected. Permeability is moderate. Surface runoff is medium. Good tilth is difficult to maintain because of a high content of clay, a low content of organic matter, and poor soil structure in the surface layer. If unvegetated, the surface layer crusts after rains. If the soil is worked when wet, clods form and are difficult to crush. Crusting and clods interfere with seed germination. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is low. The shrink-swell potential is moderate.

Included in this unit in mapping are small areas of Tate soils that have a brown, loamy subsoil. These soils are in drainageways. Also included are some soils that are similar to the Braddock soil but that have a gravelly or cobbly surface layer. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for building sites, recreation, cultivated row crops, or woodland.

This Braddock soil is well suited to pasture and hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when the soil is wet causes severe soil compaction, increases runoff, and reduces the infiltration rate. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to building site development. The high content of clay in the subsoil, the moderate shrink-swell potential, and the severe hazard of erosion during construction are management concerns. Septic tank absorption fields may need to be larger in this map unit because of the moderate permeability resulting from the high content of clay in the subsoil. The moderate shrink-swell potential may affect the design of foundations. In addition, many areas around building sites have been severely compacted. Soil compaction increases landscaping costs.

This soil is moderately suited to cultivated row crops. The hazard of erosion is the main limitation. The slope and poor tilth are additional management concerns. Silage corn is the most common crop. Irrigation is necessary for the production of high-value crops, such as strawberries. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to recreational uses, such as camping sites and picnic areas. It is commonly used for these purposes in areas around Lake Chatuge.

This soil is moderately suited to woodland management. The high content of clay in the surface layer is a problem, and the equipment limitation is a moderate management concern. The map unit includes a few wooded areas, which support northern red oak, scarlet oak, chestnut oak, black oak, white oak, eastern white pine, Virginia pine, and hickory.

This soil is poorly suited to access roads because of low strength. The content of clay and a hazard of erosion are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 4C.

BkC2—Braddock clay loam, 8 to 15 percent slopes, eroded. This strongly sloping, very deep, well drained soil is on high stream terraces. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the sequence, depth, and composition of the layers of this Braddock soil are as follows—

Surface layer:
0 to 6 inches—yellowish red clay loam

Subsoil:
6 to 36 inches—red clay
36 to 60 inches—red clay loam

Permeability is moderate. Surface runoff is rapid. Good tilth is difficult to maintain because of the high content of clay, a low content of organic matter, and poor soil structure in the surface layer. If unvegetated, the surface layer crusts after rains. Crusting increases the rate of runoff. If the soil is worked when wet, clods form and are difficult to crush. Crusting and clods interfere with seed germination. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is low.

Included in this unit in mapping are small areas of Tate soils that have a brown, loamy subsoil. These soils are in drainageways. Also included are some soils that are similar to the Braddock soil but have a gravelly surface layer. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for building sites, recreation, cultivated row crops, or woodland.

This Braddock soil is well suited to pasture and hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when the soil is wet causes soil compaction, increases runoff, and reduces the infiltration rate. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to building site development. The shrink-swell potential, the high content of clay in the subsoil, the slope, and the moderate permeability are the main limitations. Controlling erosion is an additional management concern.

This soil is poorly suited to cultivated row crops because of the hazard of erosion. The slope, poor tilth, and droughtiness are additional management concerns. Silage corn is the most common crop. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to recreational uses, such as camping sites and picnic areas. It is commonly used for these purposes in areas around Lake Chatuge. The slope and the hazard of erosion are management concerns.

This soil is moderately suited to woodland management. The high content of clay in the surface layer and the equipment limitation are moderate management problems. The map unit includes a few wooded areas, which support northern red oak, scarlet oak, chestnut oak, black oak, white oak, eastern white pine, Virginia pine, and hickory.

This soil is poorly suited to access roads because of low strength. The content of clay and the hazard of erosion are additional problems in building roads. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on northern red oak as the indicator species, the woodland ordination symbol is 4C.

BrC—Braddock-Urban land complex, 2 to 15 percent slopes. This map unit consists of areas of a very deep, gently sloping to strongly sloping, well drained Braddock soil and areas of Urban land. The Braddock soil formed in old alluvium on high stream terraces. This unit occurs mostly in and around the town of Hayesville. Individual areas range from about 5 to 60 acres in size. Typically, this unit is about 30 to 40 percent Braddock soil and 20 to 30 percent Urban land. The rest of this unit mainly consists of areas where most of the natural soil has been altered or covered as the result of grading and digging. The Braddock soil and Urban land occur as areas so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Braddock soil are as follows—

Surface layer:
0 to 6 inches—yellowish red clay loam

Subsoil:
6 to 36 inches—red clay
36 to 60 inches—red clay loam

Urban land consists of areas where the original soil has been cut, filled, graded, or paved and covered with an impervious surface. It includes streets, buildings, sidewalks, and parking lots.

The Braddock soil has moderate permeability. The content of organic matter is low. Surface runoff in this map unit is very rapid because of the impervious surfaces of buildings, streets, and parking lots. Runoff is particularly heavy during intense rain storms. Channel flow is common during storms. Runoff causes severe erosion when the soil is not protected. Erosion-control

practices are needed to control runoff, flooding, and pollution from sediments. Heavy traffic during construction has severely compacted the soil in some areas and reduced the permeability. Vegetation is difficult to establish where clayey or compacted materials are at the surface. The soil properties are so variable in this map unit that onsite investigation is necessary to determine the suitability and limitations of specific sites for selected uses.

Included in this unit in mapping are small areas of highly disturbed soils and small areas of Evard, Hayesville, and Tate soils. Evard and Tate soils have a loamy subsoil. Hayesville soils formed in material weathered from underlying rock. Tate soils are in drainageways. Evard soils are in areas where the slope changes sharply. Also included are areas that are stony and areas where the slope is more than 15 percent. Some of this map unit has been cut or filled, or both, and then revegetated. Contrasting inclusions make up about 25 percent of this map unit.

This Braddock soil is likely to be used for commercial and residential buildings and other associated urban development, such as streets and parking lots. Generally, areas of this map unit have little remaining topsoil. Landscaping in this unit involves the use of soil material generally having a high content of clay and poor physical properties. In some areas, the soil material has been compacted, thus increasing the difficulty of landscaping. The use of drought-resistant plants, irrigation, and supplemental applications of fertilizer and lime may be needed to establish landscaping plants. Water management should consider the potential of ponding. Concave areas that formed during landscaping can pond if outlets for surface water runoff are obstructed. Outlets should be developed for these areas, or plants that can tolerate ponded conditions should be selected.

The capability subclass is IVe in areas of the Braddock soil and VIIIs in areas of the Urban land. This map unit was not assigned a woodland ordination symbol.

BsC—Brasstown-Junaluska complex, 8 to 15 percent slopes. This map unit consists of a strongly sloping, deep Brasstown soil and a strongly sloping, moderately deep Junaluska soil. These soils are well drained. This unit is in the western part of the county on ridgetops of low rolling hills. Individual areas range from 5 to 30 acres in size. Typically, this unit is about 60 to 70 percent Brasstown soil and 15 to 25 percent Junaluska soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Brasstown soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 12 inches—strong brown loam
12 to 27 inches—yellowish red clay loam
27 to 38 inches—red loam

Underlying material:
38 to 54 inches—multicolored sandy loam

Bedrock:
54 to 60 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils.

Included in this unit in mapping are small areas of Soco, Stecoah, and Tsali soils. Soco and Stecoah soils have less clay in the subsoil than the Brasstown and Junaluska soils. Tsali soils are shallow to soft weathered bedrock. Soco and Stecoah soils are on north- to east-facing slopes, and Tsali soils are on nose slopes. Also included are some soils that are similar to the Brasstown and Junaluska soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for woodland, building sites, or recreation.

These Brasstown and Junaluska soils are well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas.

Maintaining pasture and hayland in good condition helps to control erosion.

These soils are well suited to woodland management. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields.

The production of hardwoods is favorable for stands that have good sprout potential and hardwood seedlings in areas where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are moderately suited to building site development. The slope, the depth to bedrock, and the moderate permeability are the main limitations. Controlling erosion is an additional management concern. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Junaluska soil. Areas of the Junaluska soil may be too shallow to be used for septic tank absorption fields.

These soils are well suited to hiking trails. They are moderately suited to most other recreational uses. The slope is the main limitation. Controlling erosion is an additional management concern. Freezing and thawing increase the need for trail maintenance on south and west slopes.

These soils are not used for row or specialty crops. The slope and a hazard of erosion are problems affecting cultivation.

These soils are moderately suited to access roads. The main limitations are low strength, the slope, and frost action. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating disturbed areas is a management concern, especially in areas on south and west aspects that freeze and thaw in spring and fall.

The capability subclass is IVe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 4A in areas of the Brasstown soil and 3D in areas of the Junaluska soil.

BuD—Burton-Craggey-Rock outcrop complex, windswept, 15 to 30 percent slopes, stony. This map unit occurs as areas of a moderately steep, moderately deep Burton soil and a moderately steep, shallow Craggey soil and areas of Rock outcrop. The Burton soil is well drained, and the Craggey soil is somewhat excessively drained. This unit is in the southeastern part of the county on moderately broad ridgetops of high mountains. These windswept high mountain areas are subject to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas are irregular in shape and range from 5 to 40 acres in size. Typically, this unit is about 35 to 45 percent Burton soil, 25 to 35 percent Craggey soil, and 10 to 20 percent Rock outcrop. The Burton and Craggey soils and Rock outcrop occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping. In addition, most areas are difficult and dangerous to traverse.

Typically, the sequence, depth, and composition of the layers of this Burton soil are as follows—

Surface layer:
0 to 7 inches—very dark brown sandy loam
7 to 17 inches—dark brown sandy loam

Subsoil:
17 to 25 inches—dark yellowish brown fine sandy loam

Underlying material:
25 to 38 inches—yellowish brown sandy loam

Bedrock:
38 inches—unweathered mica gneiss

Typically, the sequence, depth, and composition of the layers of this Craggey soil are as follows—

Surface layer:
0 to 7 inches—very dark brown sandy loam
7 to 15 inches—very dark grayish brown fine sandy loam

Subsoil:

15 to 18 inches—dark yellowish brown fine sandy loam

Bedrock:

18 inches—hard unweathered mica gneiss

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Burton and Craggey soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer is very high. The climate is severe in this map unit. Winter is cold, icy, and windy, and the rest of the year is rainy, foggy, and cool. These soils stay frozen for long periods in winter.

Included in this unit in mapping are small areas of very deep soils in saddles. Also included are some soils that are similar to the Burton and Craggey soils but have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the unit has fewer surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this unit is used as woodland. A few balds are covered with rhododendron and blueberry. Some areas are used for recreation or building sites.

Although most areas are forested, this map unit is unsuited to commercial timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The stones, numerous rock outcrops, and a hazard of erosion are additional management concerns. Northern red oak is the most common tree. It is in stands mixed with sugar maple, black birch, and yellow birch.

This map unit is poorly suited to recreational uses, such as overlooks and hiking trails. The slope, the depth to bedrock, and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance.

This map unit is poorly suited to building site development because of the depth to bedrock and the slope. The stones, numerous rock outcrops, and the hazard of erosion are additional management concerns. Cold winter temperatures and high winds reduce the desirability of this unit as a site for year-round homes. The unit is rarely used for this purpose. The risk of ground-water contamination or stream pollution is great. Because of the depth to which the soil freezes and the depth to bedrock, selecting sites for septic tank absorption fields is difficult. Septic tank absorption fields should be dug by hand because of the slope. Excavation for dwellings with basements is hindered by the depth to bedrock. Revegetating disturbed areas is difficult and expensive. Hydroseeding can successfully be used to revegetate steep banks. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

This map unit is not used for crops or pasture because of the slope and the cold climate. The stones, the depth to bedrock, and the hazard of erosion are additional management concerns.

This map unit is poorly suited to access roads because of the depth to bedrock and the slope. Numerous rock outcrops, freezing and thawing of roadbanks, and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. The damage to road surfaces is severe because of the harsh climate. Because of the limited amount of soil material, grading roadbeds is difficult. Drilling and blasting of hard rock are commonly needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, mostly because of the freezing and thawing in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe in areas of the Burton soil, VIIs in areas of the Craggey soil, and VIIIs in areas of the Rock outcrop. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R in areas of the Burton soil and 2D in areas of the Craggey soil. The Rock outcrop was not assigned a woodland ordination symbol.

BuF—Burton-Craggey-Rock outcrop complex, windswept, 30 to 95 percent slopes, stony. This map unit occurs as areas of a steep and very steep, moderately deep Burton soil and a steep and very steep, shallow Craggey soil and areas of Rock outcrop. The Burton soil is well drained, and the Craggey soil is somewhat excessively drained. This unit is in the southeastern part of the county on side slopes and ridgetops of high mountains. These windswept high mountain areas are subject to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 10 to 80 acres in size. Typically, this unit is about 35 to 45 percent Burton soil, 25 to 35 percent Craggey soil, and 10 to 20 percent Rock outcrop. The Burton and Craggey soils and Rock outcrop occur as areas so intricately mixed and so small in size that it is not practical to separate them in

mapping. Most areas are difficult and dangerous to traverse.

Typically, the sequence, depth, and composition of the layers of this Burton soil are as follows—

Surface layer:
0 to 7 inches—very dark brown sandy loam
7 to 17 inches—dark brown sandy loam

Subsoil:
17 to 25 inches—dark yellowish brown fine sandy loam

Underlying material:
25 to 38 inches—yellowish brown sandy loam

Bedrock:
38 inches—hard unweathered mica gneiss

Typically, the sequence, depth, and composition of the layers of this Craggey soil are as follows—

Surface layer:
0 to 7 inches—very dark brown sandy loam
7 to 15 inches—very dark grayish brown fine sandy loam

Subsoil:
15 to 18 inches—dark yellowish brown fine sandy loam

Bedrock:
18 inches—hard unweathered mica gneiss

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Burton and Craggey soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed and in areas of rock outcrops. The content of organic matter in the surface layer is very high. The climate is severe in this map unit. Winter is cold, icy, and windy, and the rest of the year is rainy, foggy, and cool. These soils stay frozen for long periods in winter.

Included in this unit in mapping are small areas of Cullasaja soils. These soils are very deep and are in drainageways. They contain more than 35 percent rock fragments in the subsoil. Also included are some soils that are similar to the Burton and Craggey soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick or have fewer surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. A few balds are covered with rhododendron and blueberry. Some areas are used for recreation or building sites.

Although most areas are forested, this map unit is unsuited to commercial timber production. It is not used for timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The slope, the depth to bedrock, stones, numerous rock outcrops, and a hazard of erosion are additional management concerns. Northern red oak is the most common tree. It is in stands mixed with sugar maple, black birch, and yellow birch.

This map unit is poorly suited to recreational uses, such as overlooks and hiking trails. The slope, the depth to bedrock, and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance and erosion control.

This map unit is poorly suited to building site development because of the depth to bedrock and the slope. The stones, numerous rock outcrops, and the hazard of erosion are additional management concerns. Cold winter temperatures and high winds reduce the desirability of this unit as a site for year-round homes. The unit is rarely used for this purpose. The risk of ground-water contamination or stream pollution is great. Because of the depth to which the soil freezes and the depth to bedrock, selecting sites for septic tank absorption fields is difficult. Septic tank absorption fields should be dug by hand because of the slope. Excavation for dwellings with basements is hindered by the depth to bedrock. Revegetating disturbed areas is difficult and expensive. Hydroseeding can successfully be used to revegetate steep banks. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

This map unit is not used for crops or pasture. The slope is the main limitation. The stones, the depth to bedrock, numerous rock outcrops, and the hazard of erosion are additional management concerns.

This map unit is poorly suited to access roads because of the slope and the depth to bedrock. The numerous rock outcrops, freezing and thawing of the roadbanks, and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. The damage to road surfaces is severe because of the harsh climate. Because of the limited amount of soil material, grading roadbeds is difficult. Drilling and blasting of hard rock are commonly needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, mostly because of the freezing and thawing in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe in areas of the Burton soil, VIIs in areas of the Craggey soil, and VIIIs in areas of the Rock outcrop. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R in areas of the Burton and Craggey soils. The Rock outcrop was not assigned a woodland ordination symbol.

CbF—Cataska-Rock outcrop complex, 30 to 95 percent slopes. This map unit consists of areas of a steep and very steep, shallow, excessively drained Cataska soil and areas of Rock outcrop. This map unit is on side slopes in the intermediate mountains. Almost all of the unit occurs in the Fires Creek Watershed. Individual areas range from 5 to 50 acres in size. Typically, this unit is about 50 to 60 percent Cataska soil and 25 to 35 percent Rock outcrop. The Cataska soil and Rock outcrop occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping. Most areas are difficult and dangerous to traverse.

Typically, the sequence, depth, and composition of the layers of this Cataska soil are as follows—

Surface layer:
0 to 5 inches—dark brown channery loam

Subsoil:
5 to 14 inches—dark yellowish brown very channery loam

Bedrock:
14 to 21 inches—multicolored, soft weathered slate
21 inches—hard unweathered slate

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Cataska soil. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer ranges from low to moderate. Seams of rock that have a high content of sulfur may underlie this soil. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Soco and Spivey soils and small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders. Soco soils are moderately deep. Spivey soils are very deep. They have a dark surface layer that is thicker than that of the Cataska soil. Soco soils are on foot slopes, and Spivey soils are in drainageways. Also included are some soils that are similar to the Cataska soil but have a redder subsoil or less rock fragments, or both. Contrasting inclusions make up about 15 percent of this map unit.

Almost all of this map unit is used as woodland.

This map unit is not used for commercial timber production. Trees are stunted. Slopes are generally more than 70 percent. The slope, the depth to bedrock, numerous rock outcrops, and a hazard of erosion are management concerns. The common trees on south to west aspects include scarlet oak, chestnut oak, Virginia pine, and hickory. The common trees on north to east aspects include northern red oak, eastern white pine, black birch, and eastern hemlock.

The main recreational uses of this map unit are hunting and sightseeing. The slope, the depth to bedrock, and the numerous rock outcrops make the unit impractical for pasture, building sites, access roads, and crops.

The capability subclass is VIIs in areas of the Cataska soil and VIIIs in areas of the Rock outcrop. Based on chestnut oak as the indicator species, the woodland ordination symbol is 2R in areas of the Cataska soil. The Rock outcrop was not assigned a woodland ordination symbol.

ChE—Cheoah channery loam, 30 to 50 percent slopes. This steep, deep, well drained soil is on north- to east-facing head slopes and side slopes of low and intermediate mountains. The soil is in the northern and western parts of the county. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the sequence, depth, and composition of the layers of this Cheoah soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown channery loam
4 to 13 inches—dark brown channery loam

Subsoil:
13 to 28 inches—yellowish brown loam
28 to 34 inches—yellowish brown channery sandy loam

Underlying material:
34 to 47 inches—multicolored flaggy sandy loam

Bedrock:
47 to 54 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer is high or very high. Seams of rock that have a high content of sulfur may underlie this soil. Landslides may occur during wet periods when the soil material slides

off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Santeetlah, Soco, Spivey, and Stecoah soils. Santeetlah soils are very deep, and Soco soils are moderately deep over weathered bedrock. Stecoah soils have a surface layer that is thinner or lighter colored, or both, than that of the Cheoah soil. Spivey soils have more than 35 percent rock fragments in the subsoil. Soco and Stecoah soils are on south- to west-facing slopes. Spivey and Santeetlah soils are in drainageways. Also included are small areas of rock outcrops and some soils that are similar to the Cheoah soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites or recreation.

This Cheoah soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The soil, however, is desirable for timber production because it has high productivity and supports valuable species. Common trees include yellow-poplar, northern red oak, black cherry, black birch, and sugar maple. Yellow-poplar is common at the lower elevations. Yellow birch, American beech, and eastern hemlock are common at the higher elevations. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. Where stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Care is needed during all forestry operations to prevent soil compaction. The use of wheeled and tracked equipment is difficult because of the slope. The use of heavy equipment should be restricted to the drier periods. When the soil is wet, skid trails and unsurfaced roads are highly erodible and very slick.

This soil is poorly suited to building site development because of the slope. Controlling erosion is an additional management concern. The long, cold winters reduce the desirability of this soil as a site for year-round homes, although some areas are used for second homes. Septic tank absorption fields should be dug by hand because of the slope. Revegetating disturbed areas is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks.

This soil is poorly suited to recreational uses, such as hiking trails. The slope and the hazard of erosion are management concerns. Trails are slick during rainy periods.

This soil is not used for crops or pasture. The slope and the hazard of erosion are management concerns.

This soil is poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. The underlying bedrock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on this soil because banks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 5R.

ChF—Cheoah channery loam, 50 to 95 percent slopes. This very steep, deep, well drained soil is on north- to east-facing head slopes and side slopes of low and intermediate mountains. The soil is in the northern and western parts of the county. Individual areas are irregular in shape and range from 10 to 150 acres in size.

Typically, the sequence, depth, and composition of the layers of this Cheoah soil are as follows—

Surface layer:

0 to 4 inches—very dark grayish brown channery loam

4 to 13 inches—dark brown channery loam

Subsoil:

13 to 28 inches—yellowish brown loam

28 to 34 inches—yellowish brown channery sandy loam

Underlying material:
34 to 47 inches—multicolored flaggy sandy loam

Bedrock:
47 to 54 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer is high or very high. Seams of rock that have a high content of sulfur may underlie this soil. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Santeetlah, Soco, Spivey, and Stecoah soils. Santeetlah soils are very deep, and Soco soils are moderately deep over weathered bedrock. Stecoah soils have a surface layer that is thinner or lighter colored, or both, than that of the Cheoah soil. Spivey soils have more than 35 percent rock fragments in the subsoil. Soco and Stecoah soils are on south- to west-facing slopes. Spivey and Santeetlah soils formed in colluvium and are in drainageways. Also included are small areas of rock outcrops and some soils that are similar to the Cheoah soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

This Cheoah soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The soil, however, is desirable for timber production because it has high productivity and supports valuable species. Common trees include yellow-poplar, northern red oak, black cherry, black birch, and sugar maple. Yellow-poplar is common at the lower elevations. Yellow birch, American beech, and eastern hemlock are common at the higher elevations. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

When the soil is wet, unsurfaced roads are highly erodible and very slick. The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

This soil is poorly suited to recreational uses, such as hiking trails. The slope and the hazard of erosion are management concerns. Trails are very slick during rainy periods.

This soil is not used for pasture, building sites, or crops. The slope and the hazard of erosion are the main limitations.

This soil is poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Access roads are difficult and expensive to build and maintain. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on this soil because banks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 5R.

CmD—Chestnut-Cleveland-Rock outcrop complex, windswept, 15 to 30 percent slopes, stony. This map unit occurs as areas of a moderately steep, moderately deep Chestnut soil and a moderately steep, shallow Cleveland soil and areas of Rock outcrop. The Chestnut soil is well drained, and the Cleveland soil is somewhat excessively drained. This unit is in the southeastern part of the county on moderately broad ridgetops of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 10 to 40 acres in size. Typically, this unit is about 40 to 50 percent Chestnut soil, 10 to 20 percent Cleveland soil, and 10 to 20 percent Rock outcrop. The Chestnut and Cleveland soils and Rock outcrop occur as areas so intricately mixed and so

small in size that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Cleveland soil are as follows—

Surface layer:
0 to 8 inches—dark brown gravelly fine sandy loam

Subsoil:
8 to 15 inches—yellowish brown gravelly fine sandy loam

Bedrock:
15 to 19 inches—multicolored, soft weathered gneiss
19 inches—hard unweathered gneiss

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Chestnut and Cleveland soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer ranges from low to high. Landslides occur during wet periods when the soil material slides off the contact with rock.

Included in this unit in mapping are small areas of very deep Edneyville soils in saddles. Also included are soils that are similar to the Chestnut and Cleveland soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 15 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

This map unit is poorly suited to timber production because of the harsh climate and is not used for commercial timber. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The stones, the depth to bedrock, numerous rock outcrops, and a hazard of erosion are additional management concerns. Common trees include scarlet oak, chestnut oak, eastern white pine, pitch pine, hickory, and northern red oak.

This map unit is moderately suited to recreational uses, such as overlooks and hiking trails. The slope, the depth to bedrock, and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance.

This map unit is not used for crops, pasture, or building sites. The slope, stones, the depth to bedrock, numerous rock outcrops, and the hazard of erosion are management concerns.

This map unit is poorly suited to access roads because of the depth to bedrock and the slope. The numerous rock outcrops and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Because of the limited amount of soil material, grading roadbeds is very difficult. Drilling and blasting of hard rock are commonly needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is VIe in areas of the Chestnut soil, VIIe in areas of the Cleveland soil, and VIIIs in areas of the Rock outcrop. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R in areas of the Chestnut soil and 2D in areas of the Cleveland soil. The Rock outcrop was not assigned a woodland ordination symbol.

CmE—Chestnut-Cleveland-Rock outcrop complex, windswept, 30 to 50 percent slopes, stony. This map unit occurs as areas of a steep, moderately deep Chestnut soil and a steep, shallow Cleveland soil and areas of Rock outcrop. The Chestnut soil is well drained, and the Cleveland soil is somewhat excessively drained. This map unit is in the southeastern part of the county on side slopes and moderately broad ridgetops of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 10 to 80 acres in size. Typically, this unit is about 40 to 50 percent Chestnut soil, 10 to 20 percent Cleveland soil, and 10 to 20 percent Rock outcrop. The Chestnut and Cleveland soils and Rock outcrop occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping. Most areas are difficult and dangerous to traverse.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Cleveland soil are as follows—

Surface layer:
0 to 8 inches—dark brown gravelly fine sandy loam

Subsoil:
8 to 15 inches—yellowish brown gravelly fine sandy loam

Bedrock:
15 to 19 inches—multicolored, soft weathered gneiss
19 inches—hard unweathered gneiss

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Chestnut and Cleveland soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer ranges from low to high. Landslides occur during wet periods when the soil material slides off the contact with rock.

Included in this unit in mapping are small areas of Cullasaja, Edneyville, and Plott soils. These soils are very deep. Cullasaja and Plott soils have a dark surface layer that is thicker than that of the Chestnut and Cleveland soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. They are in drainageways. Edneyville soils are on south- to west-facing slopes, and Plott soils are on north- to east-facing slopes. Also included are soils that are similar to the Chestnut and Cleveland soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

This map unit is poorly suited to woodland management because of the slope and the harsh climate. It is not used for timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The stones, the depth to bedrock, numerous rock outcrops, and a hazard of erosion are additional management concerns. The common trees on south and west aspects include scarlet oak, chestnut oak, eastern white pine, pitch pine, Virginia pine, and hickory. The common trees on north and east aspects include northern red oak, black birch, and eastern hemlock.

This map unit is poorly suited to recreational uses, such as overlooks and hiking trails. The slope, the depth to bedrock, and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance.

This map unit is not used for crops, pasture, or building sites. The slope, stones, the depth to bedrock, numerous rock outcrops, and the hazard of erosion are management concerns.

This map unit is poorly suited to access roads because of the depth to bedrock and the slope. The numerous rock outcrops and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Because of the limited amount of soil material, grading roadbeds is very difficult. Drilling and blasting of hard rock are commonly needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is VIIe in areas of the Chestnut and Cleveland soils and VIIIs in areas of the Rock outcrop. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R in areas of the Chestnut and Cleveland soils. The Rock outcrop was not assigned a woodland ordination symbol.

CmF—Chestnut-Cleveland-Rock outcrop complex, windswept, 50 to 95 percent slopes, stony. This map unit occurs as areas of a very steep, moderately deep Chestnut soil and a very steep, shallow Cleveland soil and areas of Rock outcrop. The Chestnut soil is well drained, and the Cleveland soil is somewhat excessively drained. This unit is in the southeastern part of the county on head slopes of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 20 to 100 acres in size. Typically, this unit is about 35 to 45 percent Chestnut soil, 15 to 25 percent Cleveland soil, and 15 to 25 percent Rock outcrop. The Chestnut

and Cleveland soils and Rock outcrop occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping. Most areas are difficult and dangerous to traverse.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Cleveland soil are as follows—

Surface layer:
0 to 8 inches—dark brown gravelly fine sandy loam

Subsoil:
8 to 15 inches—yellowish brown gravelly fine sandy loam

Bedrock:
15 to 19 inches—multicolored, soft weathered gneiss
19 inches—hard unweathered gneiss

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Permeability is moderately rapid in the Chestnut and Cleveland soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer ranges from low to high. Landslides occur during wet periods when the soil material slides off the contact with rock.

Included in this unit in mapping are small areas of Cullasaja, Edneyville, and Plott soils. These soils are very deep. Cullasaja and Plott soils have a dark surface layer that is thicker than that of the Chestnut and Cleveland soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. They are in drainageways. Edneyville soils are on south- to west-facing slopes, and Plott soils are on north- to east-facing slopes. Also included are soils that are similar to the Chestnut and Cleveland soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

All of this map unit is used as woodland.

This map unit is poorly suited to woodland management because of the slope and the harsh climate. It is not used for timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The stones, the depth to bedrock, numerous rock outcrops, and a hazard of erosion are additional management concerns. The common trees on south and west aspects include scarlet oak, chestnut oak, eastern white pine, pitch pine, Virginia pine, and hickory. The common trees on north and east aspects include northern red oak, black birch, and eastern hemlock.

This map unit is not used for crops, pasture, or building sites. The slope is the main limitation, but stones, the depth to bedrock, the numerous rock outcrops, and the hazard of erosion also are management concerns.

This map unit is poorly suited to access roads because of the slope and the depth to bedrock. The numerous rock outcrops and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Because of the limited amount of soil material, grading roadbeds is very difficult. Drilling and blasting of hard rock are commonly needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is VIIe in areas of the Chestnut and Cleveland soils and VIIIs in areas of the Rock outcrop. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R in areas of the Chestnut and Cleveland soils. The Rock outcrop was not assigned a woodland ordination symbol.

CnD—Chestnut-Edneyville complex, windswept, 15 to 30 percent slopes, stony. This map unit consists of a moderately steep, moderately deep Chestnut soil and a moderately steep, very deep Edneyville soil. These soils are well drained. This unit is in the southeastern part of the county on moderately broad ridgetops of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas are long and narrow and range from 5 to 60 acres in size. Typically, this unit is about 40 to 50 percent Chestnut soil and 30 to 40 percent Edneyville soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
0 to 4 inches—dark brown fine sandy loam
4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
8 to 31 inches—strong brown loam
31 to 39 inches—strong brown fine sandy loam
39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
50 to 60 inches—multicolored cobbly sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Evard, and Plott soils. Cleveland soils are shallow to hard unweathered bedrock. Cowee and Evard soils have more clay in the subsoil than the Chestnut and Edneyville soils. Plott soils have a dark surface layer that is thicker than that of the Chestnut and Edneyville soils. Cleveland soils are in areas around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Plott soils are in saddles or on the lower part of side slopes. Also included are soils that are similar to the Chestnut and Edneyville soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites, recreation, or pasture.

These Chestnut and Edneyville soils are poorly suited to timber production because of the harsh climate and are not used for commercial timber. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, pitch pine, Virginia pine, hickory, and northern red oak.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. The stones and a hazard of erosion are additional management concerns. Cold winter temperatures and high winds reduce the desirability of these soils as sites for year-round homes, although some areas are used for second homes. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Chestnut soil. Areas of the Chestnut soil may be too shallow to be used for septic tank absorption fields. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

These soils are moderately suited to recreational uses, such as overlooks and hiking trails. The slope is the main limitation. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are only moderately suited to pasture. The slope is the main limitation, but the stones and the hazard of erosion also are management concerns. Access may be difficult in some areas because of the surrounding steep terrain. Large stones should be removed in areas used as pasture. Operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion. Cool-season grasses, such as tall fescue and orchardgrass, can maintain growth into summer and provide late-season pasture.

These soils are not used for crops because of the slope, stones, and the hazard of erosion.

These soils are poorly suited to access roads because of the slope. Freezing and thawing of the surface layer, stones, and the hazard of erosion are additional management concerns. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

CnE—Chestnut-Edneyville complex, windswept, 30 to 50 percent slopes, stony. This map unit consists of a steep, moderately deep Chestnut soil and a steep, very deep Edneyville soil. These soils are well drained. This unit is in the southeastern part of the county on south- to west-facing side slopes and ridgetops of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 10 to 80 acres in size. Typically, this unit is about 40 to 50 percent Chestnut soil and 30 to 40 percent Edneyville soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
0 to 4 inches—dark brown fine sandy loam
4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
8 to 31 inches—strong brown loam
31 to 39 inches—strong brown fine sandy loam
39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
50 to 60 inches—multicolored cobbly sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Cullasaja, Evard, and Plott soils. Cleveland soils are shallow to hard unweathered bedrock. Cowee and Evard soils have more clay in the subsoil than the Chestnut and Edneyville soils. Cullasaja and Plott soils have a dark surface layer that is thicker than that of the Chestnut and Edneyville soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cleveland soils are in areas around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Cullasaja soils are in drainageways. Plott soils are on north- to east-facing head slopes. Also included are soils that are similar to the Chestnut and Edneyville soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, recreation, or building sites.

These Chestnut and Edneyville soils are poorly suited to woodland management and are not used for timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, pitch pine, Virginia pine, hickory, and northern red oak.

These soils are poorly suited to pasture because of the slope. The stones and a hazard of erosion are additional management concerns. Operating farm equipment on these soils is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Maintaining pasture in good condition helps to control erosion. Cool-season grasses, such as tall fescue and orchardgrass, can maintain growth into summer and provide late-season pasture.

These soils are poorly suited to recreational uses, such as hiking trails and overlooks. The slope and the hazard of erosion are management concerns.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. The stones and the hazard of erosion are additional management concerns. Cold winter temperatures and high winds reduce the desirability of these soils as sites for year-round homes, although some areas are used for second homes. Revegetating disturbed areas is difficult and expensive mainly because of the slope. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Chestnut soil. Areas of the Chestnut soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

These soils are not used for crops. The slope is the main limitation, but stones and the hazard of erosion also are management concerns.

These soils are poorly suited to access roads because of the slope. Freezing and thawing also are limitations. Access roads are difficult and expensive to build and maintain on these soils. Unvegetated or unsurfaced areas quickly erode. Roads require surfacing and continuous maintenance for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Ditches are impractical on these soils because the long, steep banks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large areas of cuts and fills is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

CnF—Chestnut-Edneyville complex, windswept, 50 to 95 percent slopes, stony. This map unit consists of a very steep, moderately deep Chestnut soil and a very steep, very deep Edneyville soil. These soils are well drained. This unit is in the southeastern part of the county on south- to west-facing side slopes of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Stones and boulders are scattered over the surface. Individual areas range from 20 to 80 acres in size. Typically, this unit is about 35 to 45 percent Chestnut soil and 35 to 45 percent Edneyville soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
4 to 16 inches—dark yellowish brown cobbly fine sandy loam
16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
32 to 40 inches—multicolored, soft weathered gneiss

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
0 to 4 inches—dark brown fine sandy loam
4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
8 to 31 inches—strong brown loam
31 to 39 inches—strong brown fine sandy loam
39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
50 to 60 inches—multicolored cobbly sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Cullasaja, Evard, and Plott soils. Cleveland soils are shallow to hard unweathered bedrock. Cowee and Evard soils have more clay in the subsoil than the Chestnut and Edneyville soils. Cullasaja and Plott soils have a dark surface layer that is thicker than that of the Chestnut and Edneyville soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cleveland soils are in areas around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Cullasaja soils are in drainageways. Plott soils are on north- to east-facing head slopes. Also included are soils that are similar to the Chestnut and Edneyville soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

These Chestnut and Edneyville soils are poorly suited to woodland management and are not used for timber production. The main problem is that trees are very stunted, twisted, and sculptured by the winter winds and ice. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, pitch pine, Virginia pine, hickory, and northern red oak.

These soils are poorly suited to pasture because of the slope. The stones and a hazard of erosion are additional management concerns. Operating farm equipment on these soils is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Maintaining pasture in good condition helps to control erosion. Cool-season grasses, such as tall fescue and orchardgrass, can maintain

growth into summer and provide late-season pasture.

These soils are poorly suited to recreational uses, such as hiking trails and overlooks. The slope and the hazard of erosion are management concerns.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. The stones and the hazard of erosion are additional management concerns. Cold winter temperatures and high winds reduce the desirability of these soils as sites for year-round homes, although some areas are used for second homes. Revegetating disturbed areas is difficult and expensive, mainly because of the slope. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Chestnut soil. Areas of the Chestnut soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation, but stones and the hazard of erosion also are management concerns.

These soils are poorly suited to access roads because of the slope. Freezing and thawing also are limitations. Access roads are difficult and expensive to build and maintain on these soils. Unvegetated or unsurfaced areas quickly erode. Roads require surfacing and continuous maintenance for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Ditches are impractical on these soils because the long, steep banks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large areas of cuts and fills is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

CuD—Cullasaja-Tuckasegee complex, 15 to 30 percent slopes, stony. This map unit consists of moderately steep, very deep, well drained soils in coves, in drainageways, and on toe slopes in the intermediate mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 4 to 60 acres in size. Typically, this unit is about 45 to 55 percent Cullasaja soil and 25 to 35 percent Tuckasegee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Tuckasegee soil is between drainageways or along toe slopes and the Cullasaja soil is along drainageways.

Typically, the sequence, depth, and composition of the layers of this Cullasaja soil are as follows—

Surface layer:
- 0 to 12 inches—very dark brown cobbly fine sandy loam
- 12 to 17 inches—dark brown cobbly loam

Subsoil:
- 17 to 23 inches—dark yellowish brown cobbly fine sandy loam
- 23 to 60 inches—dark yellowish brown cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Tuckasegee soil are as follows—

Surface layer:
- 0 to 7 inches—very dark brown loam
- 7 to 12 inches—dark brown loam

Subsoil:
- 12 to 30 inches—dark yellowish brown loam
- 30 to 47 inches—yellowish brown loam
- 47 to 62 inches—yellowish brown cobbly fine sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high (fig. 7). Tillage is difficult in areas of the Cullasaja soil because of the stones. The Tuckasegee soil is friable and can be tilled throughout a fairly wide range in moisture content.

Included in this unit in mapping are small areas of Edneyville soils. These soils have a surface layer that is thinner or lighter colored, or both, than that of the Cullasaja and Tuckasegee soils. They are on small knolls. Also included are small areas of moderately well drained or somewhat poorly drained soils around springs and seeps, small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders, and soils that are similar to the Cullasaja and Tuckasegee soils. These similar soils

Figure 7.—Topsoil in the Cullasaja-Tuckasegee complex, 15 to 30 percent slopes, stony. The content of organic matter is high or very high in the surface layer of these soils.

have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for recreation, pasture, building sites, or specialty crops.

These Cullasaja and Tuckasegee soils are moderately suited to woodland management. The slope is the main limitation, and a hazard of erosion and the equipment limitation are moderate management problems. The stones and runoff from the adjacent higher areas are additional problems. The soils are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American

beech, yellow buckeye, eastern hemlock, and eastern white pine at the lower elevations. Black cherry, black birch, northern red oak, sugar maple, and American basswood are more numerous in stands at the higher elevations. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

In cleared areas, eastern white pine can be successfully established. Planted, genetically improved trees produce a better stand than naturally seeded white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When the soil is wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are poorly suited to most recreational uses, such as camping sites and trailer parks, because of the slope and surface stones. Controlling erosion is an additional management concern. Water sources, such as springs, are common in this map unit.

These soils are moderately suited to pasture. The slope is the main limitation, but stones, the hazard of erosion, runoff from the adjacent higher areas, and streambank damage also are management concerns. Operating farm equipment on these soils is difficult. The stones can damage farm equipment used to establish and maintain pasture and hayland, and large stones should be removed where the soils are converted to pasture or hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the slope, the large stones, and caving of cutbanks. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. A water table may be at a depth of 6 to 10 feet. The Tuckasegee soil is better suited to building site development than the Cullasaja soil. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. If possible, areas of seeps, springs, and runoff and areas of the Cullasaja soil should not be selected as sites for septic tank absorption fields.

These soils are poorly suited to specialty crops, such as landscaping plants. The stones, the slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, and Norway spruce. Although Fraser fir is not commonly grown, the soils have good potential for its production. Large stones should be removed in areas converted to cropland. Preparing plant beds and digging up plants during harvesting are difficult in the Cullasaja soil because of the many stones. The Cullasaja soil is suited to the production of Fraser firs that are sold as cut trees. Plants and trees are easily dug and ball and burlap harvested in areas of the Tuckasegee soil. Operating farm equipment on these soils is difficult. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

These soils are not used for cultivated row crops. The slope is the main limitation, but stones, runoff from the higher areas, and the hazard of erosion also are management concerns.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating areas of cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted away from roads. The number of culverts needed per mile of road is higher on these soils than on upland soils.

The capability subclass is VIIs in areas of the Cullasaja soil and VIe in areas of the Tuckasegee soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

CuE—Cullasaja-Tuckasegee complex, 30 to 50 percent slopes, stony. This map unit consists of steep, very deep, well drained soils in coves, in drainageways, and on toe slopes in the intermediate mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 5 to 40 acres in size. Typically, this unit is about 45 to 55 percent Cullasaja soil and 25 to 35 percent Tuckasegee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Tuckasegee soil is between drainageways or along toe slopes and the Cullasaja soil is along drainageways.

Typically, the sequence, depth, and composition of the layers of this Cullasaja soil are as follows—

Surface layer:

0 to 12 inches—very dark brown cobbly fine sandy loam

12 to 17 inches—dark brown cobbly loam

Subsoil:

17 to 23 inches—dark yellowish brown cobbly fine sandy loam

23 to 60 inches—dark yellowish brown cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Tuckasegee soil are as follows—

Surface layer:

0 to 7 inches—very dark brown loam

7 to 12 inches—dark brown loam

Subsoil:

12 to 30 inches—dark yellowish brown loam

30 to 47 inches—yellowish brown loam

47 to 62 inches—yellowish brown cobbly fine sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, and Plott soils. Chestnut and Edneyville soils have a surface layer that is thinner or lighter colored, or both, than that of the Cullasaja and Tuckasegee soils. Chestnut soils are moderately deep to soft weathered bedrock. Chestnut, Edneyville, and Plott soils are on small knolls and spur ridges. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Cullasaja and Tuckasegee soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps also are common in areas of this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for recreation, pasture, or building sites.

These Cullasaja and Tuckasegee soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The stones and runoff from the adjacent higher areas are additional problems. These soils, however, are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, yellow buckeye, eastern hemlock, and eastern white pine at the lower elevations. Black cherry, black birch, northern red oak, and sugar maple are more numerous in stands at the higher elevations. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

In cleared areas, eastern white pine can be successfully established. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of wheeled and tracked equipment is difficult because of the slope. The use of heavy equipment should be restricted to the drier periods. When the soils are wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are poorly suited to most recreational uses, such as hiking trails. The slope, stones, and the

hazard of erosion are management concerns. Trails are very slick during wet periods.

These soils are poorly suited to pasture because of the slope. The stones, the hazard of erosion, and runoff from the adjacent higher areas are additional management concerns. Large stones should be removed in areas of farmland or pasture. Operating farm equipment on these soils is dangerous. Erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Seeps, springs, and streams are commonly developed as water sources for livestock. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the slope, the large stones, and caving of cutbanks. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. The Tuckasegee soil is better suited to building site development than the Cullasaja soil. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks.

These soils are not used for crops. The slope is the main limitation, but stones, runoff from the higher areas, and the hazard of erosion also are management concerns.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils.

The capability subclass is VIIs in areas of the Cullasaja soil and VIIe in areas of the Tuckasegee soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

CuF—Cullasaja-Tuckasegee complex, 50 to 95 percent slopes, stony. This map unit consists of very steep, very deep, well drained soils that are commonly at the headwaters of streams in the intermediate mountains. A few areas were mapped downstream from waterfalls. Areas are long and narrow and parallel to the drainageways. Stones and boulders are scattered over the surface. Individual areas range from 5 to 20 acres in size. Typically, this unit is about 60 to 70 percent Cullasaja soil and 10 to 20 percent Tuckasegee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Cullasaja soil is along drainageways and the Tuckasegee soil is along toe slopes.

Typically, the sequence, depth, and composition of the layers of this Cullasaja soil are as follows—

Surface layer:

0 to 12 inches—very dark brown cobbly fine sandy loam

12 to 17 inches—dark brown cobbly loam

Subsoil:

17 to 23 inches—dark yellowish brown cobbly fine sandy loam

23 to 60 inches—dark yellowish brown cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Tuckasegee soil are as follows—

Surface layer:

0 to 7 inches—very dark brown loam

7 to 12 inches—dark brown loam

Subsoil:

12 to 30 inches—dark yellowish brown loam

30 to 47 inches—yellowish brown loam

47 to 62 inches—yellowish brown cobbly fine sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, and Plott soils. Chestnut and Edneyville soils have a surface layer that is thinner or lighter colored, or both, than that of the Cullasaja and Tuckasegee soils. Chestnut soils are moderately deep to soft weathered bedrock. Chestnut, Edneyville, and Plott soils are on nose slopes and spur ridges. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Cullasaja and Tuckasegee soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps also are common in areas of this map unit. Contrasting inclusions make up about 20 percent of this unit.

Almost all of this map unit is used as woodland.

These Cullasaja and Tuckasegee soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The stones and runoff from the adjacent higher areas are additional problems. The soils, however, are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, yellow buckeye, eastern hemlock, and eastern white pine at the lower elevations. Black cherry, black birch, northern red oak, and sugar maple are more numerous in stands at the higher elevations. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity. Unsurfaced roads are slick, soft, and dangerous when wet.

These soils are poorly suited to hiking trails. However, they are commonly used for this purpose because this map unit includes scenic views of streams flowing over rock ledges. The slope, stones, and the hazard of erosion are management concerns.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation. The stones, the hazard of erosion, and runoff are additional management concerns.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Road failures are common. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Ditches are impractical on these soils because banks are subject to slumping. Outsloped roads are a better way to remove water. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils.

The capability subclass is VIIs in areas of the Cullasaja soil and VIIe in areas of the Tuckasegee soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

DgB—Dellwood gravelly fine sandy loam, 0 to 5 percent slopes, frequently flooded. This nearly level and gently sloping, moderately well drained soil is very deep to bedrock and shallow to strata of gravel, cobbles, and sand. This soil is commonly on narrow flood plains downstream from abrupt decreases in stream gradient. The landscape has a very uneven surface, numerous knolls and dips resulting from previous flood scouring and deposition, and depressions caused by stream meandering. Individual areas are oblong and range from 3 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Dellwood soil are as follows—

Surface layer:

0 to 4 inches—very dark grayish brown gravelly fine sandy loam

4 to 14 inches—dark brown gravelly fine sandy loam

Underlying material:

14 to 60 inches—multicolored very cobbly sand

Permeability is moderately rapid in the surface layer and rapid below this layer. Surface runoff is slow. Flash floods are frequent. The high water table is at a depth of 2 to 4 feet. The content of organic matter in the surface layer is moderate or high. Tillage is difficult because of the stoniness.

Included in this unit in mapping are small areas of Nikwasi, Reddies, and Tate soils. Nikwasi soils are poorly drained or very poorly drained. Reddies soils are moderately deep to strata of cobbles, gravel, and sand. Tate soils have more clay in the subsoil than the Dellwood soil. Nikwasi soils are in depressions, Reddies soils are in smooth areas, and Tate soils are on toe slopes. Also included are soils that are similar to the Dellwood soil but have a lighter-colored or thinner surface layer or have a thin subsoil. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, recreation, building sites, or woodland.

This Dellwood soil is moderately suited to pasture and hayland. The stones are the main limitation, but the flooding and the droughtiness also are management concerns. Forage species include tall fescue, ladino clover, and orchardgrass. The removal of large stones is needed where this soil is converted to pasture or hayland. Unless removed, the stones can damage farm equipment used to establish, maintain, and harvest pasture and hayland. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to cultivated row crops because of the flooding. The soil, however, is used for row crops because it is nearly level and gently sloping, is near a source of irrigation water, has very good accessibility, and has good productivity if properly fertilized and irrigated. The stones, the droughtiness, runoff from the adjacent higher areas, and cold air drainage are additional management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Frost can significantly damage sensitive crops because of cold air drainage. Vegetative filter strips improve water quality and provide wildlife habitat. Large stones should be removed in areas used for crops. The remaining small stones make digging root crops and tillage difficult. Some nutrients are easily leached, and split applications of fertilizer are recommended. Plowing patterns should be designed to avoid blocking outlets and forming depressions, which have a wetness problem. Land shaping helps to open outlets and improve drainage. Tile drainage is needed for some crops during wet periods. Diversions, grassed field borders, and grassed waterways can safely divert runoff from the higher areas around row crops. All construction for water management is difficult because of the stoniness and limited amounts of soil material. Irrigation is needed for some crops during dry periods and to provide frost protection for high-value crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer.

This soil is poorly suited to specialty crops because of the flooding. The stoniness, the coarse soil texture, the droughtiness, runoff from the adjacent higher areas, and the wetness in depressions are additional management concerns. The large stones are generally removed when areas are converted to cropland. The stoniness makes preparing the plant bed difficult. The stoniness and the coarse texture make digging and balling landscaping plants difficult. Some nutrients are easily leached, and split applications of fertilizer are recommended. Tile drainage is needed for some crops during wet periods. Irrigation is needed for some crops during dry periods and to provide frost protection.

This soil is poorly suited to most recreational uses because of the flooding. Runoff and sediments from the adjacent higher areas are additional management concerns. This soil, however, is commonly used for camping sites and parks with picnic areas because it is near streams, is shaded, and has good accessibility.

This soil is poorly suited to building site development. The flooding is the main limitation.

This soil is well suited to woodland management, but it is rarely used for commercial timber production because of the small size of individual areas and the higher profits available from crops, pasture, and hay. Yellow-poplar is the most common tree. It is in stands mixed with black birch, eastern hemlock, black cherry, and eastern white pine.

This soil is poorly suited to access roads because of the flooding. However, it is commonly used for access roads to cropland and recreational areas. Runoff and sediments from the adjacent higher areas are management concerns. Building roads in elevated areas helps to minimize flood damage to the road surface and to safely divert runoff. Wet spots need to be drained. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is Vw. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8F.

DrB—Dillard loam, 1 to 6 percent slopes, rarely flooded. This nearly level and gently sloping, very deep, moderately well drained soil is on low stream terraces. Individual areas occur as long bands that

parallel the soils of flood plains. They range from 1 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Dillard soil are as follows—

Surface layer:
0 to 8 inches—dark brown loam

Subsoil:
8 to 21 inches—brownish yellow clay loam
21 to 28 inches—mottled light yellowish brown, strong brown, and pinkish gray clay loam
28 to 45 inches—light gray clay loam that has brownish yellow mottles

Underlying material:
45 to 60 inches—light gray sand

Permeability is moderately slow. Surface runoff is slow or medium. Flooding is rare and occurs for very brief periods. The high water table is at a depth of 2 to 3 feet. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Hemphill and Statler soils. Hemphill soils are very poorly drained, and Statler soils are well drained. Hemphill soils are in depressions, and Statler soils are in slightly elevated areas. Also included are areas of somewhat poorly drained soils in depressions and soils that are similar to the Dillard soil. These similar soils have a surface layer that is gravelly or that is more than 10 inches thick. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used for cultivated row crops. Some areas are used for pasture and hayland, specialty crops, building sites, or woodland.

This Dillard soil is well suited to cultivated row crops. Runoff from the adjacent higher areas, a hazard of erosion, wetness, and cold air drainage are management concerns. Rare flooding may damage crops. Common crops include silage corn, tomatoes, and burley tobacco. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. In depressions, drainage tile is often used to remove excess water. Irrigation is needed for high-value crops during dry periods and for frost protection. Mulch is used on strawberries to conserve moisture, control weeds, and keep the berries clean. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to pasture and hayland. Soil compaction, streambank damage, and the hazard of erosion are management concerns. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Tile drainage may be needed in wet spots.

This soil is well suited to specialty crops, such as landscaping plants. Rare flooding, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, dogwood, boxwood, white birch, Bradford pear, and maples. Plants and trees are easily dug and ball and burlap harvested. The water management practices used for cultivated row crops are also appropriate for specialty crops.

This soil is poorly suited to building site development because of the rare flooding, the wetness, and the moderately slow permeability. Runoff and sediments from adjacent land are additional management concerns. Excavation for dwellings with basements is hindered by underground water, and a drainage system is needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted.

This soil is well suited to woodland management. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, river birch, and American sycamore.

This soil is well suited to moderately suited to most recreational uses. It is occasionally used for camping areas and for parks with picnic areas. The wetness and the rare flooding are management concerns.

This soil is poorly suited to access roads because of low strength. Runoff and flooding are additional management concerns. This soil, however, is used for access roads to building sites and recreational areas. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff from the adjacent higher areas is diverted. Roadbeds should be elevated. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIw. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12A.

EdD—Edneyville-Chestnut complex, 15 to 30 percent slopes, stony. This map unit consists of a moderately steep, very deep Edneyville soil and a moderately steep, moderately deep Chestnut soil. These soils are well drained. The unit is mainly in the eastern part of the county and occurs on moderately broad ridgetops of intermediate mountains. Stones and boulders are scattered over the surface. Individual areas are irregular in shape and range from 5 to 40 acres in size. Typically, this unit is about 40 to 50 percent Edneyville soil and 30 to 40 percent Chestnut soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
- 0 to 4 inches—dark brown fine sandy loam
- 4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
- 8 to 31 inches—strong brown loam
- 31 to 39 inches—strong brown fine sandy loam
- 39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
- 50 to 60 inches—multicolored cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
- 0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
- 4 to 16 inches—dark yellowish brown cobbly fine sandy loam
- 16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
- 32 to 40 inches—multicolored, soft weathered gneiss

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Evard, and Plott soils. Cleveland soils are shallow to bedrock. Cowee and Evard soils have more clay in the subsoil than the Edneyville and Chestnut soils. Plott soils have a dark surface layer that is thicker than that of the Edneyville and Chestnut soils. Cleveland soils are in areas around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Plott soils are on head slopes and foot slopes. Also included are soils that are similar to the Edneyville and Chestnut soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Edneyville and Chestnut soils are moderately suited to woodland management. The slope is the main limitation, and a hazard of erosion and the equipment limitation are moderate management problems. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, and hickory. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

These soils are moderately suited to pasture. The slope is the main limitation, but stones and the hazard of erosion also are management concerns. Large stones should be removed from the fields when sod is established. Operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Cool-season grasses, such as tall fescue and orchardgrass, can maintain growth into summer and provide late-season pasture. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. However, they are commonly used for this purpose. The hazard of erosion and stones are additional management concerns. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for

dwellings with basements may be hindered by the depth to bedrock in the Chestnut soil. Areas of the Chestnut soil may be too shallow to be used for septic tank absorption fields. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

These soils are moderately suited to most recreational uses, such as overlooks and hiking trails. The slope is the main limitation, but the hazard of erosion and stones also are management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops because of the slope and stones.

These soils are poorly suited to access roads because of the slope. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem because of the slope, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12R in areas of the Edneyville soil and 10R in areas of the Chestnut soil.

EdE—Edneyville-Chestnut complex, 30 to 50 percent slopes, stony. This map unit consists of a steep, very deep Edneyville soil and a steep, moderately deep Chestnut soil. These soils are well drained. This unit is mainly in the eastern part of the county and occurs on side slopes and narrow ridgetops of intermediate mountains. Stones and boulders are scattered over the surface. Individual areas are irregular in shape and range from 10 to 100 acres in size. Typically, this unit is about 50 to 60 percent Edneyville soil and 20 to 30 percent Chestnut soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
- 0 to 4 inches—dark brown fine sandy loam
- 4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
- 8 to 31 inches—strong brown loam
- 31 to 39 inches—strong brown fine sandy loam
- 39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
- 50 to 60 inches—multicolored cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
- 0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
- 4 to 16 inches—dark yellowish brown cobbly fine sandy loam
- 16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
- 32 to 40 inches—multicolored, soft weathered gneiss

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Cullasaja, Evard, Plott, and Tuckasegee soils. Cleveland soils are shallow to bedrock. Cowee and Evard soils have more clay in the subsoil than the Edneyville and Chestnut soils. Cullasaja, Plott, and Tuckasegee soils have a dark surface layer that is thicker than that of the Edneyville and Chestnut soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cleveland soils are in areas around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Plott soils are in saddles and on foot slopes. Cullasaja and Tuckasegee soils are in drainageways. Also included are soils that are similar to the Edneyville and Chestnut soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Edneyville and Chestnut soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Soil compaction is an additional management concern. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, Virginia pine, and hickory. Windblown seeds, such as those of yellow-poplar, black locust, red maple, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good

sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

These soils are poorly suited to pasture because of the slope. The hazard of erosion and stones are additional management concerns. In areas of pasture, large stones should be removed from the fields when sod is established. Operating farm equipment on these soils is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Cool-season grasses, such as tall fescue and orchardgrass, can maintain growth into summer and provide late-season pasture. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. The hazard of erosion and stones are additional management concerns. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Chestnut soil. Areas of the Chestnut soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope.

These soils are poorly suited to recreation because of the slope. They are occasionally used as sites for overlooks and hiking trails. The hazard of erosion and stones are additional management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops because of the slope and the hazard of erosion.

These soils are poorly suited to access roads because of the slope. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12R in areas of the Edneyville soil and 10R in areas of the Chestnut soil.

EdF—Edneyville-Chestnut complex, 50 to 95 percent slopes, stony. This map unit consists of a very steep, very deep Edneyville soil and a very steep, moderately deep Chestnut soil. These soils are well drained. This unit is in the eastern part of the county on side slopes of intermediate mountains. Stones and boulders are scattered over the surface. Individual areas are irregular in shape and range from 20 to 150 acres in size. Typically, this unit is about 40 to 50 percent Edneyville soil and 30 to 40 percent Chestnut soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Edneyville soil are as follows—

Surface layer:
- 0 to 4 inches—dark brown fine sandy loam
- 4 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
- 8 to 31 inches—strong brown loam
- 31 to 39 inches—strong brown fine sandy loam
- 39 to 50 inches—strong brown cobbly fine sandy loam

Underlying material:
- 50 to 60 inches—multicolored cobbly sandy loam

Typically, the sequence, depth, and composition of the layers of this Chestnut soil are as follows—

Surface layer:
- 0 to 4 inches—very dark grayish brown fine sandy loam

Subsoil:
- 4 to 16 inches—dark yellowish brown cobbly fine sandy loam
- 16 to 32 inches—yellowish brown cobbly sandy loam

Bedrock:
- 32 to 40 inches—multicolored, soft weathered gneiss

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has

not been disturbed and is rapid or very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Cleveland, Cowee, Cullasaja, Evard, Plott, and Tuckasegee soils. Cleveland soils are shallow to bedrock. Cowee and Evard soils have more clay in the subsoil than the Edneyville and Chestnut soils. Cullasaja, Plott, and Tuckasegee soils have a dark surface layer that is thicker than that of the Edneyville and Chestnut soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cleveland soils are around small rock outcrops. Cowee and Evard soils are on south- to west-facing slopes. Plott soils are in saddles and on foot slopes. Cullasaja and Tuckasegee soils are in drainageways. Also included are soils that are similar to the Edneyville and Chestnut soils but have a redder subsoil or fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

These Edneyville and Chestnut soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, and hickory. Windblown seeds, such as those of yellow-poplar, black locust, red maple, pitch pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting. The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

These soils are poorly suited to recreation because of the slope. They are used for hiking trails. The hazard of erosion and the stones are additional management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation. The hazard of erosion and the stones are additional management concerns.

These soils are poorly suited to access roads because of the slope. Roads are difficult and expensive to build and maintain. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is difficult, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 12R in areas of the Edneyville soil and 10R in areas of the Chestnut soil.

EtE—Eutrochrepts, mined, 30 to 50 slopes, very stony. This map unit consists of steep, well drained, loamy soils on side slopes in one 90-acre area in the Buck Creek Watershed. This area had been previously mined for the mineral dunite. Elevation ranges from 3,200 to 3,600 feet.

Because the soils in this unit are so variable, a typical profile is not described.

Included with this unit in mapping are areas of small rock outcrops, areas of soils having more than 35 percent rock fragments, by volume, and small pits. Inclusions make up about 35 percent of this map unit.

Air and water move through these Eutrochrepts at a moderate rate. Surface runoff is medium. Magnesium is the primary cation in soil solution, and calcium is deficient. The content of organic matter in the surface layer ranges from low to high. The content of coarse fragments is as much as 35 percent. The rooting depth is more than 20 inches.

This map unit is unavailable for cropland, pasture, orchards, and ornamental crops. It occurs as a unique area of ecological value in the Nantahala National Forest. The soils have an imbalance of magnesium and calcium, and a unique vegetation pattern of pitch pine and prairie dropseed has developed. Other vegetation includes scarlet oak, chestnut oak, highbush blueberry, fringed polygala, Indian paintbrush, and golden ragwort. Recently, the larger pines have died because of southern pine beetles. A new stand of pitch pine is growing under the dead canopy.

This map unit is poorly suited to most recreational

uses, such as camping, hiking, and picnicking, because of the slope, the stony surface, and the potential damage to the ecosystem.

This map unit should not be used for access roads because of the potential damage to the ecosystem.

The capability subclass is VIIe. A woodland ordination symbol has not been assigned to this map unit.

EvB—Evard-Cowee complex, 2 to 8 percent slopes. This map unit consists of a gently sloping, very deep Evard soil and a gently sloping, moderately deep Cowee soil. These soils are well drained. They are on moderately broad ridgetops of low mountains. Individual areas range from 2 to 20 acres in size. Typically, this unit is about 50 to 60 percent Evard soil and 20 to 30 percent Cowee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Evard soil are as follows—

Surface layer:
0 to 7 inches—yellowish red gravelly loam

Subsoil:
7 to 21 inches—red clay loam
21 to 36 inches—red clay loam
36 to 49 inches—red gravelly loam

Underlying material:
49 to 60 inches—multicolored fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cowee soil are as follows—

Surface layer:
0 to 6 inches—yellowish red gravelly loam

Subsoil:
6 to 15 inches—yellowish red gravelly clay loam
15 to 20 inches—yellowish red gravelly loam

Underlying material:
20 to 34 inches—multicolored fine sandy loam

Bedrock:
34 to 45 inches—multicolored, soft weathered gneiss

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, and Hayesville soils. Chestnut and Edneyville soils have less clay in the subsoil than the Evard and Cowee soils. Hayesville soils have more clay in the subsoil than the Evard and Cowee soils. Chestnut and Edneyville soils are on north- to east-facing slopes. Hayesville soils are in the smoothest areas. Also included are soils that are similar to the Evard and Cowee soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for woodland or building sites.

These Evard and Cowee soils are well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining a dense vegetative cover can help to control erosion.

These soils are well suited to woodland management. The slope, soil compaction, and the hazard of erosion are management concerns. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields.

These soils are moderately suited to building site development. The main limitations are the hazard of cutbanks caving and the depth to bedrock. The slope and the hazard of erosion are additional management concerns. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Cowee soil and the hazard of cutbanks caving in areas of the Evard soil. Areas of the Cowee soil may be too shallow to be used for septic tank absorption fields.

These soils are well suited to recreational uses, such as camping sites and picnic areas. The slope and the hazard of erosion are management concerns.

These soils are generally not used for crops because of low yields. The slope and the hazard of erosion are management concerns.

These soils are moderately suited to access roads. Frost action is the main limitation. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating disturbed areas is a management concern because of freezing and thawing in spring and fall.

The capability subclass is IIe in areas of the Evard soil and IIIe in areas of the Cowee soil. Based on chestnut oak as the indicator species, the woodland ordination symbol is 4A in areas of the Evard soil and 3D in areas of the Cowee soil.

EvC—Evard-Cowee complex, 8 to 15 percent slopes. This map unit consists of a strongly sloping, very deep Evard soil and a strongly sloping, moderately

deep Cowee soil. These soils are well drained. They are on ridgetops and side slopes of low mountains. Individual areas range from 5 to 40 acres in size. Typically, this unit is about 50 to 60 percent Evard soil and 20 to 30 percent Cowee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Evard soil are as follows—

Surface layer:
0 to 7 inches—yellowish red gravelly loam

Subsoil:
7 to 21 inches—red clay loam
21 to 36 inches—red clay loam
36 to 49 inches—red gravelly loam

Underlying material:
49 to 60 inches—multicolored fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cowee soil are as follows—

Surface layer:
0 to 6 inches—yellowish red gravelly loam

Subsoil:
6 to 15 inches—yellowish red gravelly clay loam
15 to 20 inches—yellowish red gravelly loam

Underlying material:
20 to 34 inches—multicolored fine sandy loam

Bedrock:
34 to 45 inches—multicolored, soft weathered gneiss

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, and Tate soils. Chestnut and Edneyville soils have less clay in the subsoil than the Evard and Cowee soils. Tate soils are very deep and have a brown subsoil. Chestnut and Edneyville soils are on north- to east-facing slopes. Tate soils are in drainageways. Also included are soils that are similar to the Evard and Cowee soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for woodland, building sites, or row crops.

These Evard and Cowee soils are well suited to pasture and hayland. The slope and a hazard of erosion are management concerns. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining a dense vegetative cover can help to control erosion.

These soils are moderately suited to cultivated row crops. The hazard of erosion and the slope are management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Irrigation is needed for high-value crops during dry periods. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

These soils are well suited to woodland management. The slope, soil compaction, and the hazard of erosion are management concerns. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are moderately suited to building site development. The slope, the hazard of cutbanks caving, and the depth to bedrock are the main limitations. Controlling erosion is an additional management concern. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Cowee soil and the hazard of banks caving in areas of the Evard soil. Areas of the Cowee soil may be too shallow to be used for septic tank absorption fields.

These soils are moderately suited to recreational

uses, such as camping sites and picnic areas. However, they are rarely used for these uses because this map unit typically is not close to streams. The slope and the hazard of erosion are the main limitations.

These soils are moderately suited to access roads. The main limitations are the slope and frost action. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a management concern, especially in areas on south to west aspects that freeze and thaw in spring and fall.

The capability subclass is IVe. Based on chestnut oak as the indicator species, the woodland ordination symbol is 4A in areas of the Evard soil and 3D in areas of the Cowee soil.

EVD—Evard-Cowee complex, 15 to 30 percent slopes. This map unit consists of a moderately steep, very deep Evard soil and a moderately steep, moderately deep Cowee soil. These soils are well drained. They are on side slopes and ridgetops of low mountains. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 50 to 60 percent Evard soil and 20 to 30 percent Cowee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Evard soil are as follows—

Surface layer:
0 to 7 inches—yellowish red gravelly loam

Subsoil:
7 to 21 inches—red clay loam
21 to 36 inches—red clay loam
36 to 49 inches—red gravelly loam

Underlying material:
49 to 60 inches—multicolored fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cowee soil are as follows—

Surface layer:
0 to 6 inches—yellowish red gravelly loam

Subsoil:
6 to 15 inches—yellowish red gravelly clay loam
15 to 20 inches—yellowish red gravelly loam

Underlying material:
20 to 34 inches—multicolored fine sandy loam

Bedrock:
34 to 45 inches—multicolored, soft weathered gneiss

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, Tate, and Trimont soils. Chestnut and Edneyville soils have less clay in the subsoil than the Evard and Cowee soils. Trimont soils have a surface layer that is darker than that of the Evard and Cowee soils. Tate soils are very deep and have a subsoil that is browner than that of the Evard and Cowee soils. Chestnut, Edneyville, and Trimont soils are on north- to east-facing slopes. Tate soils are in drainageways. Also included are small areas of rock outcrops and soils that are similar to the Evard and Cowee soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Evard and Cowee soils are moderately suited to woodland management. The main limitation is the slope, which causes a moderate hazard of erosion and the equipment limitation. Soil compaction is an additional management concern. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to

prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are moderately suited to pasture. The slope and the hazard of erosion are the main limitations. In addition, operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the depth to bedrock in the Cowee soil, the slope, and the hazard of cutbanks caving. Controlling erosion is an additional management concern. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Cowee soil and the hazard of banks caving in areas of the Evard soil. Areas of the Cowee soil may be too shallow to be used for septic tank absorption fields.

These soils are moderately suited to most recreational uses, such as overlooks and hiking trails. The slope and the hazard of erosion are the main management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for cultivated row crops. The slope and the hazard of erosion are management concerns.

These soils are poorly suited to access roads because of the slope. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the subsoil. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is IVe. Based on chestnut oak as the indicator species, the woodland ordination symbol is 4A in areas of the Evard soil and 3D in areas of the Cowee soil.

EvE—Evard-Cowee complex, 30 to 50 percent slopes. This map unit consists of a steep, very deep Evard soil and a steep, moderately deep Cowee soil. These soils are well drained. They are on side slopes and narrow ridgetops of low mountains. Individual areas range from 10 to 150 acres in size. Typically, this unit is about 50 to 60 percent Evard soil and 20 to 30 percent Cowee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Evard soil are as follows—

Surface layer:
0 to 7 inches—yellowish red gravelly loam

Subsoil:
7 to 21 inches—red clay loam
21 to 36 inches—red clay loam
36 to 49 inches—red gravelly loam

Underlying material:
49 to 60 inches—multicolored fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cowee soil are as follows—

Surface layer:
0 to 6 inches—yellowish red gravelly loam

Subsoil:
6 to 15 inches—yellowish red gravelly clay loam
15 to 20 inches—yellowish red gravelly loam

Underlying material:
20 to 34 inches—multicolored fine sandy loam

Bedrock:
34 to 45 inches—multicolored, soft weathered gneiss

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, Tate, and Trimont soils. Chestnut and Edneyville soils have less clay in the subsoil than the Evard and Cowee soils. Trimont soils have a surface layer that is darker than that of the Evard and Cowee soils. Chestnut, Edneyville, and Trimont soils are on north- to east-facing slopes. Tate soils are in drainageways. Also included are small areas of rock outcrops and soils that are similar to the Evard and Cowee soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Evard and Cowee soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Soil compaction is an additional management concern. Common trees include scarlet

oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are poorly suited to pasture because of the slope. Controlling erosion is an additional management concern. Operating farm equipment on these soils is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the depth to bedrock in the Cowee soil, the slope, and the hazard of cutbanks caving. Controlling erosion is an additional management concern. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Cowee soil and the hazard of banks caving in areas of the Evard soil. Areas of the Cowee soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope.

These soils are poorly suited to recreation because of the slope. They are occasionally used as sites for overlooks and hiking trails. Controlling erosion is an additional management concern. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops because of the slope and the hazard of erosion.

These soils are poorly suited to access roads because of the slope. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the subsoil. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on chestnut oak as the indicator species, the woodland ordination symbol is 4R in areas of the Evard soil and 3R in areas of the Cowee soil.

EvF—Evard-Cowee complex, 50 to 95 percent slopes. This map unit consists of a very steep, very deep Evard soil and a very steep, moderately deep Cowee soil. These soils are well drained. They are on side slopes of low mountains. Individual areas range from 20 to 100 acres in size. Typically, this unit is about 50 to 60 percent Evard soil and 20 to 30 percent Cowee soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Evard soil are as follows—

Surface layer:
0 to 7 inches—yellowish red gravelly loam

Subsoil:
7 to 21 inches—red clay loam
21 to 36 inches—red clay loam
36 to 49 inches—red gravelly loam

Underlying material:
49 to 60 inches—multicolored fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cowee soil are as follows—

Surface layer:
0 to 6 inches—yellowish red gravelly loam

Subsoil:
6 to 15 inches—yellowish red gravelly clay loam
15 to 20 inches—yellowish red gravelly loam

Underlying material:
20 to 34 inches—multicolored fine sandy loam

Bedrock:
34 to 45 inches—multicolored, soft weathered gneiss

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high.

Included in this unit in mapping are small areas of Chestnut, Edneyville, Tate, and Trimont soils. Chestnut and Edneyville soils have less clay in the subsoil than the Evard and Cowee soils. Trimont soils have a surface layer that is darker than that of the Evard and Cowee soils. Tate soils are very deep and have a subsoil that is browner than that of the Evard and Cowee soils. Chestnut, Edneyville, and Trimont soils are on north- to east-facing slopes. Tate soils are in drainageways. Also included are small areas of rock outcrops and soils that are similar to the Evard and Cowee soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

These Evard and Cowee soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity. Unsurfaced roads are soft and slick when wet because of the content of clay.

These soils are poorly suited to recreation because of the slope. They are occasionally used for hiking trails. Controlling erosion is an additional management concern.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads because of the slope. Roads are difficult and expensive to build and maintain. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the subsoil. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is difficult, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on chestnut oak as the indicator species, the woodland ordination symbol is 4R in areas of the Evard soil and 3R in areas of the Cowee soil.

FaC—Fannin fine sandy loam, 8 to 15 percent slopes. This strongly sloping, very deep, well drained soil is on ridgetops in the low rolling hills. Most areas are along Service Road 1100 between Hayesville and Warne. They range from 5 to 20 acres in size.

Typically, the sequence, depth, and composition of the layers of this Fannin soil are as follows—

Surface layer:
0 to 6 inches—yellowish red fine sandy loam

Subsoil:
6 to 22 inches—red clay loam
22 to 32 inches—red loam

Underlying material:
32 to 40 inches—red sandy loam
40 to 60 inches—multicolored sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. The saprolite has a very high content of mica and is difficult to stabilize and compact.

Included in this unit in mapping are small areas of Cowee and Evard soils. These soils have less mica

than the Fannin soil. Cowee soils are moderately deep over weathered bedrock. Also included are soils that are similar to the Fannin soil but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used as pasture. Some areas are used for building sites, woodland, or row crops.

This Fannin soil is well suited to pasture. The slope and a hazard of erosion are management concerns. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

This soil is moderately suited to building site development. The main limitations are the slope and the moderate permeability. The unstable nature of the saprolite and the hazard of erosion are additional management concerns. Caving is a potential problem during excavations because of the high content of mica in the saprolite. Revegetating disturbed areas is a problem because of the slope, freezing and thawing, and the highly erosive nature of this soil. Hydroseeding can successfully be used to revegetate steep banks. Septic tank absorption fields need to be larger on this soil because of the moderate permeability. Building sites should be quickly revegetated for erosion control.

This soil is well suited to woodland management. The slope, the unstable nature of the saprolite, and the hazard of erosion are management concerns. Common trees include scarlet oak, chestnut oak, black oak, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the high content of mica.

This soil is well suited to most recreational uses, such as hiking trails. Controlling erosion is a management concern. Trails are very slick during rainy periods. Freezing and thawing increase the need for trail maintenance on south and west slopes.

This soil is moderately suited to cultivated row crops. The hazard of erosion and the slope are management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Irrigation is needed for high-value crops during dry periods. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is poorly suited to access roads because of low strength and frost action. The slope, the hazard of erosion, the instability of the saprolite, and the difficulty in compacting are additional problems. Because unvegetated and unsurfaced roadbeds are slick, erode quickly, and make travel difficult, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Fill material is very difficult to compact for roadbeds because of the high content of mica. Ditches are impractical on this soil because banks are subject to slumping. Outsloped roads are a better way to remove water. This soil requires more culverts, broad-based dips, and water bars to control runoff and erosion than soils having less mica. These structures allow water to be removed more often and in smaller amounts. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, especially in areas on south- and west-facing slopes that freeze and thaw in spring and fall.

The capability subclass is VIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 7A.

FaD—Fannin fine sandy loam, 15 to 30 percent slopes. This moderately steep, very deep, well drained soil is on side slopes and ridgetops of low rolling hills. Most areas are along Service Road 1100 between Hayesville and Warne. They range from 5 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Fannin soil are as follows—

Surface layer:

0 to 6 inches—yellowish red fine sandy loam

Subsoil:
6 to 22 inches—red clay loam
22 to 32 inches—red loam

Underlying material:
32 to 40 inches—red sandy loam
40 to 60 inches—multicolored sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. The saprolite has a very high content of mica and is difficult to stabilize and compact.

Included in this unit in mapping are small areas of Cowee, Evard, and Tate soils. These soils have less mica than the Fannin soil. Cowee soils are moderately deep over weathered bedrock. Cowee and Evard soils are on narrow spur ridges, and Tate soils are in drainageways. Also included are soils that are similar to the Fannin soil but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

This Fannin soil is moderately suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are moderate management problems. The unstable nature of the saprolite is a management concern. Common trees include scarlet oak, chestnut oak, black oak, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the high content of mica.

This soil is moderately suited to pasture. The slope and the hazard of erosion are management concerns. In addition, operating farm equipment on this soil is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

This soil is poorly suited to building site development because of the slope. The unstable nature of the saprolite and the hazard of erosion are additional management concerns. Caving is a potential problem during excavations because of the high content of mica in the saprolite. Revegetating disturbed areas is a problem because of the slope, freezing and thawing, and the highly erosive nature of this soil. Hydroseeding can successfully be used to revegetate steep banks. Septic tank absorption fields need to be larger on this soil because of the moderate permeability. Building sites should be quickly revegetated for erosion control.

This soil is moderately suited to most recreational uses, such as hiking trails. The slope and the hazard of erosion are management concerns. Trails become very slick during rainy periods. Freezing and thawing increase the need for trail maintenance on south and west slopes.

This soil is not used for cultivated row crops. The slope and the hazard of erosion are management concerns.

This soil is poorly suited to access roads because of the slope, low strength, and frost action. The hazard of erosion, the instability of the saprolite, and the difficulty in compacting are additional problems. Because unvegetated and unsurfaced roadbeds are slick, erode quickly, and make travel difficult, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Fill material is very difficult to compact for roadbeds because of the high content of mica. Ditches are impractical on this soil because banks are subject to slumping. Outsloped roads are a better way to remove water. This soil requires more culverts, broad-based dips, and water bars to control runoff and erosion than soils having less mica. These structures allow water to be removed more often and in smaller amounts. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem, especially in areas on south- and west-facing slopes that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 7R.

FmC—Fannin-Urban land complex, 2 to 15 percent slopes. This map unit occurs as areas of a gently sloping to strongly sloping, very deep, well drained Fannin soil and areas of Urban land. The unit is on ridgetops of low rolling hills in and around the town of Hayesville. Individual areas range from 5 to 40 acres in size. Typically, this unit is about 55 to 65 percent Fannin soil and 15 to 25 percent Urban land. The Fannin soil and Urban land occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Fannin soil are as follows—

Surface layer:
0 to 6 inches—yellowish red fine sandy loam

Subsoil:
6 to 22 inches—red clay loam
22 to 32 inches—red loam

Underlying material:
32 to 40 inches—red sandy loam
40 to 60 inches—multicolored sandy loam

Urban land consists of areas where the original soil has been cut, filled, or graded and covered with an impervious surface. It includes areas such as streets, buildings, sidewalks, and parking lots.

This Fannin soil has moderate permeability. The content of organic matter in the surface layer ranges from low to high. The saprolite has a very high content of mica and is difficult to stabilize and compact. Heavy traffic has severely compacted the soil in some areas and reduced the permeability. Surface runoff is very rapid because of the impervious surfaces of buildings, streets, and parking lots. Runoff is particularly heavy during intense rain storms. Channel flow is common during storms. Runoff causes severe erosion when the soil is not protected. Erosion-control practices are needed to control runoff, flooding, and pollution from sediments. The soil properties are so variable in this map unit that onsite investigation is necessary to determine the suitability and limitations of specific sites for selected uses.

Included in this unit in mapping are small areas of Hayesville and Tate soils. These soils contain less mica than the Fannin soil. Hayesville soils have a clayey subsoil. Tate soils have a brown subsoil. Hayesville soils are in the smoother areas, and Tate soils are in drainageways. Also included are small areas of cuts and fills and soils that are similar to the Fannin soil but have a gravelly or cobbly surface layer. Contrasting inclusions make up about 20 percent of this map unit.

This map unit is moderately suited to building site development and access roads. The main limitations are the slope, a hazard of erosion, low strength, and the moderate permeability.

The capability subclass is IVe in areas of the Fannin soil and VIIIs in areas of the Urban land. This map unit was not assigned a woodland ordination symbol.

FrA—French fine sandy loam, 0 to 3 percent slopes, frequently flooded. This nearly level, moderately well drained to somewhat poorly drained soil is moderately deep to sandy strata containing large amounts of gravel and cobbles. The soil is beside stream channels on flood plains along the smaller streams. Individual areas occur as long bands and range from 2 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this French soil are as follows—

Surface layer:
0 to 8 inches—dark yellowish brown fine sandy loam

Subsoil:
8 to 16 inches—dark yellowish brown loam
16 to 24 inches—dark grayish brown fine sandy loam

Underlying material:
24 to 32 inches—dark gray sandy loam
32 to 60 inches—multicolored very cobbly loamy sand

Permeability is moderately rapid in the surface layer and subsoil and rapid in the underlying material. Surface runoff is slow. Flooding is frequent and occurs for very brief periods. The high water table is at a depth of 1.0 to 2.5 feet. The content of organic matter in the surface layer ranges from low to moderate. Frost can significantly damage sensitive crops because of cold air drainage.

Included in this unit in mapping are small areas of Dellwood, Nikwasi, and Reddies soils. Dellwood soils are shallow to strata of cobbles, gravel, and sand. Nikwasi soils are poorly drained or very poorly drained, and Reddies soils are moderately well drained. Dellwood soils are in areas scoured by floodwater or where smaller streams cross this unit. Nikwasi soils are in depressions. Reddies soils are on small elevated knolls. Also included are small areas of soils that are similar to the French soil but have a gravelly or cobbly surface layer. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and

hayland. Some areas are used for cultivated row crops, specialty crops, recreation, building sites, or woodland.

This French soil is well suited to pasture and hayland. The flooding, streambank damage, and wetness are management concerns. Land shaping helps to open outlets and rapidly drain surface water from depressions. Tile drainage may be needed in some areas. Grazing when the soil is wet causes soil compaction, increases the wetness in depressions, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can prevent streambank damage.

This soil is moderately suited to cultivated row crops. It has high productivity and is nearly level. The wetness, the flooding, runoff from the adjacent higher areas, and cold air drainage are management concerns. The most common crop is silage corn. Drainage tile is needed to remove excess water. Split applications of fertilizer are recommended. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Irrigation is needed for high-value crops during dry periods and to provide frost protection. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer.

This soil is moderately suited to specialty crops, such as landscaping plants. However, the soil is nearly level and has a high level of productivity. The flooding is the main limitation. Runoff and sediments from the adjacent higher areas and the wetness are additional management concerns. Common, fibrous-rooted landscaping plants are maples, viburnums, oaks, white birch, Bradford pear, and hamamelis. The soil also produces seedlings of these plants. Seedlings can easily be pulled without damage to the roots. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around crops.

This soil is poorly suited to building sites. The flooding is the main limitation.

This soil is well suited to woodland. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, eastern hemlock, and American sycamore.

This soil is poorly suited to most recreational uses. However, it is used for camping sites and parks with picnic areas because it is nearly level and near streams. The flooding and the wetness are management concerns.

This soil is poorly suited to access roads. The flooding is the main limitation. Runoff and sediments from the adjacent higher areas and the wetness are management concerns. Building roads in elevated areas helps to minimize flood damage to the road surface and to safely divert runoff.

The capability subclass is IIIw. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 9W.

HaB—Hayesville loam, 2 to 8 percent slopes. This gently sloping, very deep, well drained soil is on moderately broad ridges in the low rolling hills. Most areas are around Chatuge Lake and owned by the Tennessee Valley Authority. Individual areas are irregular in shape and range from 2 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 5 inches—brown loam

Subsoil:
5 to 9 inches—yellowish red clay loam
9 to 26 inches—red clay
26 to 38 inches—red clay loam
38 to 48 inches—mottled yellowish red and red sandy clay loam

Underlying material:
48 to 60 inches—strong brown fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Evard and Fannin soils. These soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Also included are small areas of soils that have a cobbly surface layer and soils that are similar to the Hayesville soil but have a surface layer that is gravelly or clay loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture and hayland, specialty crops, building sites, recreation, or row crops.

This Hayesville soil is well suited to woodland management. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to cultivated row crops. The hazard of erosion is the main limitation. The slope is an additional management concern. Silage corn is the most common crop. Irrigation is needed for the production of high-value crops, such as strawberries. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to specialty crops, such as apples. The hazard of erosion is the main limitation. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

This soil is moderately suited to building site development. The moderate permeability and the high content of clay in the subsoil are the main limitations. Controlling erosion is an additional management concern.

This soil is well suited to recreational uses, such as camping sites and picnic areas. Areas near Lake Chatuge are commonly used for these purposes.

This soil is well suited to cultivated row crops. Controlling erosion is a management concern.

This soil is moderately suited to access roads. Management problems include low strength, frost action, and the hazard of erosion. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 7A.

HaC—Hayesville loam, 8 to 15 percent slopes. This strongly sloping, very deep, well drained soil is on moderately broad ridges in the low rolling hills. Most areas are around Chatuge Lake and owned by the Tennessee Valley Authority. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 5 inches—brown loam

Subsoil:
5 to 9 inches—yellowish red clay loam
9 to 26 inches—red clay
26 to 38 inches—red clay loam
38 to 48 inches—mottled yellowish red and red sandy clay loam

Underlying material:
48 to 60 inches—strong brown fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Evard and Fannin soils. These soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Also included are soils that have a cobbly surface layer and soils that are similar to the Hayesville soil but have a surface layer that is gravelly or clay loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture and hayland, specialty crops, building sites, recreation, or row crops.

This Hayesville soil is well suited to woodland management. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is well suited to pasture and hayland. The slope and a hazard of erosion are management concerns. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining a dense vegetative cover can help to control erosion.

This soil is poorly suited to cultivated row crops because of the hazard of erosion. The slope is an additional management concern. Silage corn is the most common crop. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is poorly suited to specialty crops because of the hazard of erosion. A small acreage, however, is used for apples. The slope is an additional management concern. Establishing and maintaining sod help to control erosion and runoff.

This soil is moderately suited to building site development. The main limitations are the slope, the moderate permeability, the high content of clay in the subsoil, and the hazard of erosion.

This soil is moderately suited to recreational uses,

such as camping sites and picnic areas. The slope and the hazard of erosion are the main limitations. Areas near Lake Chatuge are commonly used for these purposes.

This soil is moderately suited to access roads. Management problems include the slope, the hazard of erosion, low strength, and frost action. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 7A.

HaD—Hayesville loam, 15 to 30 percent slopes. This moderately steep, very deep, well drained soil is on side slopes and ridgetops in the low rolling hills. Most areas are around Chatuge Lake and owned by the Tennessee Valley Authority. Individual areas are irregular in shape and range from 4 to 20 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 5 inches—brown loam

Subsoil:
5 to 9 inches—yellowish red clay loam
9 to 26 inches—red clay
26 to 38 inches—red clay loam
38 to 48 inches—mottled yellowish red and red sandy clay loam

Underlying material:
48 to 60 inches—strong brown fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Evard, Fannin, and Tate soils. These soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Evard and Fannin soils are in the steeper areas, and Tate soils are in drainageways. Also included are soils that are similar to the Hayesville soil but have a surface layer that is gravelly or clay loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture and hayland, building sites, or recreation.

This Hayesville soil is moderately suited to woodland management. The slope is the main limitation and causes a moderate hazard of erosion and the equipment limitation. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is moderately suited to pasture. The main limitations are the slope and the hazard of erosion. In addition, operating farm equipment on this soil is difficult. Controlling erosion is a problem during the establishment of plants in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining pasture in good condition helps to control erosion.

This soil is poorly suited to building site development because of the slope. A high content of clay in the subsoil, the moderate permeability, and the hazard of erosion are additional management concerns. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks.

This soil is poorly suited to recreational uses, such as camping sites and picnic areas, because of the slope. Areas near Lake Chatuge, however, are commonly used for recreation. Controlling erosion is a management concern.

This soil is not used for crops because of the slope and the hazard of erosion.

This soil is poorly suited to access roads because of the slope. The content of clay, low strength, and frost action are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Road construction results in cuts and fills. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating the disturbed areas is a problem, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 7R.

HbB2—Hayesville clay loam, 2 to 8 percent slopes, eroded. This gently sloping, very deep, well drained soil is on moderately broad ridges in the low rolling hills. Individual areas are irregular in shape and range from 2 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 7 inches—strong brown clay loam

Subsoil:
7 to 23 inches—red clay
23 to 31 inches—red clay loam
31 to 60 inches—mottled yellowish red and red loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Good tilth is difficult to maintain. If unvegetated, the surface layer crusts after rains. If the soil is worked when wet, clods form and are difficult to crush. Crusting and clods interfere with seed germination. The content of organic matter in the surface layer is low.

Included in this unit in mapping are small areas of Evard and Fannin soils intermingled with areas of the Hayesville soil. Evard and Fannin soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Also included are small areas of soils that have a cobbly surface layer and soils that are similar to the Hayesville soil but have a surface layer that is gravelly or loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for specialty crops, building sites, recreation, woodland, or row crops.

This Hayesville soil is well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to specialty crops, such as apples. The hazard of erosion is the main limitation. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

This soil is moderately suited to cultivated row crops. The hazard of erosion is the main limitation. The slope and poor tilth are additional management concerns. Silage corn is the most common crop. Irrigation is needed for the production of high-value crops, such as strawberries. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to building site development. The moderate permeability, the high content of clay in the subsoil, and the hazard of erosion are the main management concerns.

This soil is well suited to recreational uses, such as camping sites and picnic areas.

This soil is moderately suited to woodland management. The main management concern is the high content of clay in the surface layer, which causes a moderate equipment limitation. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is moderately suited to cultivated row crops. The main limitations are the slope, the hazard of erosion, and runoff. Improving tilth is an additional concern.

This soil is moderately suited to access roads. Low strength, frost action, and the hazard of erosion are management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6C.

HbC2—Hayesville clay loam, 8 to 15 percent slopes, eroded. This strongly sloping, very deep, well drained soil is on moderately broad ridges in the low rolling hills. Individual areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 7 inches—strong brown clay loam

Subsoil:
7 to 23 inches—red clay
23 to 31 inches—red clay loam
31 to 60 inches—mottled yellowish red and red loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. Good tilth is difficult to maintain. If unvegetated, the surface layer crusts after rains. If the soil is worked when wet,

clods form and are difficult to crush. Crusting and clods interfere with seed germination. The content of organic matter in the surface layer is low.

Included in this unit in mapping are small areas of Evard and Fannin soils in the more sloping landscape positions. These soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Also included are small areas of soils that have a cobbly surface layer and soils that are similar to the Hayesville soil but have a surface layer that is gravelly or loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for specialty crops, building sites, recreation, woodland, or row crops.

This Hayesville soil is well suited to pasture and hayland. The slope and a hazard of erosion are management concerns. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining a dense vegetative cover can help to control erosion.

This soil is poorly suited to cultivated row crops because of the hazard of erosion. The slope and poor tilth are additional management concerns. Silage corn is the most common crop. Minimum tillage and crop residue management maintain organic residue, which improves infiltration and tilth. Grassed field borders and grassed waterways can safely divert water. Conventional tillage that includes contour farming, stripcropping, and crop rotations helps to conserve soil and water. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is poorly suited to specialty crops because of the hazard of erosion. A small acreage, however, is used for apples. The slope is an additional management concern. Establishing and maintaining sod help to control erosion and runoff.

This soil is moderately suited to building site development. The slope, the hazard of erosion, the moderate permeability, and the high content of clay in the subsoil are management concerns.

This soil is moderately suited to recreational uses, such as camping sites and picnic areas. The slope and the hazard of erosion are the main limitations.

This soil is moderately suited to woodland management. The high content of clay in the surface layer causes a moderate equipment limitation. The soil is not commonly used for timber production because of the small size of individual areas and the higher profits available from crops, building site development, pasture, and hay. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is moderately suited to access roads. The main limitations are the slope, low strength, frost action, and the hazard of erosion. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is VIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6C.

HbD2—Hayesville clay loam, 15 to 30 percent slopes, eroded. This moderately steep, very deep, well drained soil is on side slopes and ridgetops in the low rolling hills. Individual areas are irregular in shape and range from 4 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hayesville soil are as follows—

Surface layer:
0 to 7 inches—strong brown clay loam

Subsoil:
7 to 23 inches—red clay
23 to 31 inches—red clay loam
31 to 60 inches—mottled yellowish red and red loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. Good tilth is difficult to maintain. If unvegetated, the surface layer crusts after rains. If the soil is worked when wet, clods form and are difficult to crush. Crusting and clods interfere with seed germination. The content of organic matter in the surface layer is low.

Included in this unit in mapping are small areas of Evard, Fannin, and Tate soils. These soils have a loamy subsoil. Fannin soils have more mica in the subsoil than the Hayesville soil. Evard and Fannin soils are in the more sloping areas, and Tate soils are in drainageways. Also included are small areas intermingled with the Hayesville soil that have a cobbly surface layer and soils that are similar to the Hayesville soil but have a surface layer that is gravelly or loam, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture. Some areas are used for building sites, recreation, specialty crops, or woodland.

This Hayesville soil is moderately suited to pasture. The slope and a hazard of erosion are management concerns. In addition, operating farm equipment on this

soil is difficult. Controlling erosion is a problem during the establishment of plants in sparsely vegetated or overgrazed areas. Grazing when this soil is wet can cause severe soil compaction, increase runoff, and reduce infiltration. Maintaining pasture in good condition helps to control erosion.

This soil is poorly suited to building site development because of the slope. The high content of clay in the subsoil, the moderate permeability, and the hazard of erosion are additional management concerns. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks.

This soil is poorly suited to recreational uses, such as camping sites and picnic areas, because of the slope. Controlling erosion is a management concern.

This soil is poorly suited to specialty crops because of the hazard of erosion. A few areas, however, are used for apples. The slope is an additional management concern. Operating farm equipment on this soil is difficult. Establishing and maintaining sod help to control erosion and runoff.

This soil is moderately suited to woodland management. The slope, the hazard of erosion, and the equipment limitation are moderate management problems. The soil is not commonly used for timber production because of the small size of individual areas and the higher profits available from crops, building site development, pasture, and hay. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

This soil is not used for crops because of the slope and the hazard of erosion.

This soil is poorly suited to access roads because of the slope. The content of clay, low strength, and frost action are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Road construction results in cuts and fills. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating the disturbed areas is a management concern, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6R.

HmA—Hemphill loam, 0 to 3 percent slopes, rarely flooded. This nearly level, very deep, very poorly drained soil is in depressions on low stream terraces. Individual areas occur as long bands and range from 2 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Hemphill soil are as follows—

Surface layer:
0 to 12 inches—dark brown loam

Subsoil:
12 to 23 inches—grayish brown clay loam that has yellowish brown mottles
23 to 30 inches—gray silty clay loam that has yellowish brown and light gray mottles
30 to 44 inches—gray sandy clay loam that has strong brown mottles

Underlying material:
44 to 60 inches—light brownish gray sandy loam

Permeability is slow. Surface runoff is slow. Crusting increases ponding where outlets have been blocked. Flooding is rare and occurs for very brief periods. The high water table is within a depth of 1 foot. The content of organic matter in the surface layer ranges from moderate to very high. The surface layer is friable. The operation of equipment is extremely difficult when the soil is wet. Surface drainage is necessary.

Included in this unit in mapping are small areas of Dillard and Nikwasi soils. Dillard soils are moderately well drained and have a loamy subsoil. Nikwasi soils are moderately deep to strata of cobbles, gravel, and sand. They are frequently flooded. Dillard soils are on small knolls, and Nikwasi soils are in areas where smaller streams cross this unit. Also included are small areas of somewhat poorly drained soils in the slightly higher landscape positions and soils that are similar to the Hemphill soil but have a thicker surface layer. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops or woodland.

This Hemphill soil is moderately suited to pasture and hayland. Wetness, ponding, soil compaction, runoff from the adjacent higher areas, flooding, and streambank damage are management concerns. When drained, the soil is commonly used as pasture and hayland because it is nearly level and can produce high yields during dry periods. Tile drainage is not very effective because of the slow permeability in the subsoil. Poor outlets are an additional problem. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet

causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can prevent streambank damage and improve water quality.

This soil is moderately suited to cultivated row crops. The ponding, the wetness, crusting, runoff from the adjacent higher areas, and the flooding are management concerns. When drained, some areas of this soil are used for crops because the soil can produce high yields. Tile drainage is not very effective because of the slow permeability in the subsoil. Poor outlets are an additional problem. Land shaping helps to open outlets and rapidly drain surface water from depressions. The most common crop is silage corn. Irrigation is needed for some crops during dry periods and to provide frost protection for high-value crops. Frost commonly occurs on this soil when the higher adjacent areas are frost free. Mulch is used on strawberries to conserve moisture, control weeds, and keep the berries clean. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Diversions, grassed field borders, and grassed waterways can safely divert runoff from the higher areas around row crops. The amount of soil-applied herbicides needed for weed control may be greater than normal because of the high content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is poorly suited to woodland management because of the wetness. The equipment limitation is a severe management problem. Yellow-poplar is the most common tree. Alders and red maple are dominant on sites reverting to woodland.

This soil is poorly suited to building sites because of the wetness, the shrink-swell potential, and the slow permeability. It is rarely used for this purpose. The flooding, runoff from adjacent land, and ponding are additional management concerns.

This soil is poorly suited to recreation because of the wetness and flooding.

This soil is poorly suited to access roads because of the shrink-swell potential, wetness, and flooding. Runoff and ponding are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff from the adjacent higher areas is safely diverted. Roadbeds should be elevated. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVw in drained areas and VIw in undrained areas. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6W.

JbD—Junaluska-Brasstown complex, 15 to 30 percent slopes. This map unit consists of a moderately steep, moderately deep Junaluska soil and a moderately steep, deep Brasstown soil. These soils are well drained. This unit is in the western part of the county on side slopes and narrow ridgetops of low rolling hills. Individual areas range from 5 to 50 acres in size. Typically, this unit is about 45 to 55 percent Junaluska soil and 25 to 35 percent Brasstown soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Brasstown soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 12 inches—strong brown loam
12 to 27 inches—yellowish red clay loam
27 to 38 inches—red loam

Underlying material:
38 to 54 inches—multicolored sandy loam

Bedrock:
54 to 60 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides occur in this map unit.

Included in this unit in mapping are small areas of

Lonon, Soco, Stecoah, and Tsali soils. Lonon soils are very deep. Soco and Stecoah soils have less clay in the subsoil than the Junaluska and Brasstown soils. Tsali soils are shallow to soft weathered bedrock. Lonon soils are on toe slopes. Soco and Stecoah soils are on north- to east-facing slopes. Tsali soils are on nose slopes. Also included are soils that are similar to the Junaluska and Brasstown soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Junaluska and Brasstown soils are moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management concerns. Soil compaction is an additional problem. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are moderately suited to pasture. The main limitations are the slope and the hazard of erosion. In addition, operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the depth to bedrock in the Junaluska soil and the slope. Controlling erosion is an additional problem. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Junaluska soil. Areas of the Junaluska soil may be too shallow to be used for septic tank absorption fields.

These soils are moderately suited to hiking trails. The slope and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for row or specialty crops.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock, difficult access across steep terrain, and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3R in areas of the Junaluska soil and 4R in areas of the Brasstown soil.

JbE—Junaluska-Brasstown complex, 30 to 50 percent slopes. This map unit consists of a steep, moderately deep Junaluska soil and a steep, deep Brasstown soil. These soils are well drained. This unit is in the western part of the county on side slopes and very narrow ridgetops of low rolling hills. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 40 to 50 percent Junaluska soil and 30 to 40 percent Brasstown soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Brasstown soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 12 inches—strong brown loam
12 to 27 inches—yellowish red clay loam
27 to 38 inches—red loam

Underlying material:
38 to 54 inches—multicolored sandy loam

Bedrock:
54 to 60 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Santeetlah, Soco, Spivey, Stecoah, and Tsali soils. Santeetlah and Spivey soils have a dark surface layer that is thicker than that of the Junaluska and Brasstown soils. Soco and Stecoah soils have less clay in the subsoil than the Junaluska and Brasstown soils. Spivey soils have more than 35 percent rock fragments in the subsoil. Tsali soils are shallow to soft weathered bedrock. Santeetlah and Spivey soils are in drainageways. Soco and Stecoah soils are on north- to east-facing slopes. Also included are soils that are similar to the Junaluska and Brasstown soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, recreation, or building sites.

These Junaluska and Brasstown soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Soil compaction is an additional problem. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are poorly suited to pasture because of the slope. The hazard of erosion is an additional limitation. Operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion. Control of weeds and applications of fertilizer and lime are usually done by hand.

These soils are poorly suited to most recreational uses because of the slope. Controlling erosion is an additional problem.

These soils are poorly suited to building site development because of the depth to bedrock in the Junaluska soil and the slope. Controlling erosion is an additional problem. Revegetating disturbed areas is difficult, mainly because of the slope. Hydroseeding can

successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Junaluska soil. Areas of the Junaluska soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope.

These soils are not used for row crops or specialty crops.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3R in areas of the Junaluska soil and 4R in areas of the Brasstown soil.

JtC—Junaluska-Tsali complex, 8 to 15 percent slopes. This map unit consists of a strongly sloping, moderately deep Junaluska soil and a strongly sloping, shallow Tsali soil. These soils are well drained. This unit is in the western part of the county on ridgetops of low mountains. Individual areas range from 5 to 20 acres in size. Typically, this unit is about 55 to 65 percent Junaluska soil and 15 to 25 percent Tsali soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Tsali soil are as follows—

Surface layer:
0 to 10 inches—strong brown channery fine sandy loam

Subsoil:
10 to 16 inches—yellowish red channery loam

Bedrock:
16 to 30 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils.

Included in this unit in mapping are small areas of Brasstown, Soco, and Stecoah soils. Brasstown soils are deep to soft weathered bedrock. Soco and Stecoah soils have less clay in the subsoil than the Junaluska and Tsali soils. Brasstown soils are on foot slopes, and Soco and Stecoah soils are on north- to east-facing slopes. Also included are soils that are similar to the Junaluska and Tsali soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for woodland, building sites, or recreation.

These Junaluska and Tsali soils are well suited to pasture and hayland. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture and hayland in good condition helps to control erosion.

These soils are well suited to woodland management. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields.

Eastern white pine is generally favored for timber production. It also is grown in areas where the sprout

potential is not good and hardwood seedlings are not available and in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are poorly suited to building site development because of the depth to bedrock. Controlling erosion is an additional management concern. Excavation for dwellings with basements may be hindered by the depth to bedrock. Areas of these soils may be too shallow to be used for septic tank absorption fields.

These soils are well suited to hiking trails. They are moderately suited to most other recreational uses because of the slope and the hazard of erosion. Freezing and thawing increase the need for trail maintenance on south and west slopes.

These soils are not used for crops because of low yields. The slope, the hazard of erosion, and droughtiness are management concerns.

These soils are moderately suited to access roads. Low strength, the slope, the depth to bedrock, and frost action are the main limitations. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating disturbed areas is a management concern, especially in areas on south and west aspects that freeze and thaw in spring and fall.

The capability subclass is IVe in areas of the Junaluska soil and VIe in areas of the Tsali soil. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3D in areas of both soils.

JtD—Junaluska-Tsali complex, 15 to 30 percent slopes. This map unit consists of a moderately steep, moderately deep Junaluska soil and a moderately steep, shallow Tsali soil. These soils are well drained. This unit is in the western part of the county on ridgetops and side slopes of low mountains. Individual areas range from 5 to 25 acres in size. Typically, this unit is about 55 to 65 percent Junaluska soil and 15 to 25 percent Tsali soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Tsali soil are as follows—

Surface layer:
0 to 10 inches—strong brown channery fine sandy loam

Subsoil:
10 to 16 inches—yellowish red channery loam

Bedrock:
16 to 30 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils.

Included in this unit in mapping are small areas of Brasstown, Santeetlah, Soco, Spivey, and Stecoah soils. Brasstown soils are deep to soft weathered bedrock, and Santeetlah and Spivey soils are very deep. Soco and Stecoah soils have less clay in the subsoil than the Junaluska and Tsali soils. Brasstown soils are on foot slopes. Santeetlah and Spivey soils are in drainageways. Soco and Stecoah soils are on north- to east-facing slopes. Also included are soils that are similar to the Junaluska and Tsali soils but have a browner subsoil or more surface stones, or both.

Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Junaluska and Tsali soils are moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are management concerns. Soil compaction is an additional problem. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields.

Eastern white pine is generally favored for timber production. It is grown in areas where the sprout potential is not good and hardwood seedlings are not available and in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are moderately suited to pasture. The slope and the hazard of erosion are the main limitations. In addition, operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. Controlling erosion is an additional problem. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock. Areas of these soils may be too shallow to be used for septic tank absorption fields.

These soils are moderately suited to hiking trails. The slope and the hazard of erosion are the main management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock, difficult access across steep terrain, and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3R in areas of the Junaluska soil and 3D in areas of the Tsali soil.

JtE—Junaluska-Tsali complex, 30 to 50 percent slopes. This map unit consists of a steep, moderately deep Junaluska soil and a steep, shallow Tsali soil. These soils are well drained. This unit is in the western part of the county on side slopes and very narrow ridgetops of low mountains. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 40 to 50 percent Junaluska soil and 30 to 40 percent Tsali soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:

0 to 3 inches—strong brown channery fine sandy loam

Subsoil:

3 to 20 inches—strong brown loam

20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Tsali soil are as follows—

Surface layer:
0 to 10 inches—strong brown channery fine sandy loam

Subsoil:
10 to 16 inches—yellowish red channery loam

Bedrock:
16 to 30 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Brasstown, Santeetlah, Soco, Spivey, and Stecoah soils. Brasstown soils are deep to soft weathered bedrock, and Santeetlah and Spivey soils are very deep. Soco and Stecoah soils have less clay in the subsoil than the Junaluska and Tsali soils. Brasstown soils are on foot slopes. Santeetlah and Spivey soils are in drainageways. Soco and Stecoah soils are on north- to east-facing slopes. Also included are soils that are similar to the Junaluska and Tsali soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for building sites or recreation.

These Junaluska and Tsali soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Soil compaction is an additional problem. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields.

Eastern white pine is generally favored for timber production. It is grown in areas where the sprout potential is not good and hardwood seedlings are not available and in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft and slick.

These soils are poorly suited to building site development because of the slope and the depth to bedrock. Controlling erosion is an additional problem. Revegetating disturbed areas is difficult, mainly because of the slope. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock. Areas of these soils may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope.

These soils are poorly suited to most recreational uses because of the slope. Controlling erosion is an additional problem.

These soils are not used for crops or pasture.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under

heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3R.

JtF—Junaluska-Tsali complex, 50 to 95 percent slopes. This map unit consists of a very steep, moderately deep Junaluska soil and a very steep, shallow Tsali soil. These soils are well drained. This unit is in the western part of the county on side slopes of low mountains. Individual areas range from 10 to 40 acres in size. Typically, this unit is about 50 to 60 percent Junaluska soil and 20 to 30 percent Tsali soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Junaluska soil are as follows—

Surface layer:
0 to 3 inches—strong brown channery fine sandy loam

Subsoil:
3 to 20 inches—strong brown loam
20 to 27 inches—yellowish red clay loam
27 to 30 inches—yellowish red channery loam

Bedrock:
30 to 45 inches—multicolored, soft weathered metasandstone

Typically, the sequence, depth, and composition of the layers of this Tsali soil are as follows—

Surface layer:
0 to 10 inches—strong brown channery fine sandy loam

Subsoil:
10 to 16 inches—yellowish red channery loam

Bedrock:
16 to 30 inches—multicolored, soft weathered metasandstone

Permeability is moderate in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid or very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Brasstown, Cataska, Santeetlah, Spivey, Stecoah, and Sylco soils. Brasstown and Stecoah soils are deep to soft weathered bedrock, and Santeetlah and Spivey soils are very deep. Cataska and Sylco soils have more than 35 percent rock fragments in the subsoil. Brasstown and Stecoah soils are on foot slopes. Santeetlah and Spivey soils are in drainageways. Cataska and Sylco soils are on north- to east-facing slopes. Also included are soils that are similar to the Junaluska and Tsali soils but have a browner subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

These Junaluska and Tsali soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Soil compaction is an additional problem. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

Eastern white pine is generally favored for timber production. It is grown in areas where the sprout potential is not good and hardwood seedlings are not available and in areas where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are soft, slick, and dangerous because of the content of clay. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

These soils are poorly suited to recreational uses, such as hiking trails. The slope and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for pasture, building sites,

or crops. The slope and the depth to bedrock are the main limitations. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads. Access roads, however, are necessary in this map unit because the soils are used for timber production. The instability of the underlying rock and the hazard of erosion are limitations. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Access roads are difficult and expensive to build and maintain. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on scarlet oak as the indicator species, the woodland ordination symbol is 3R.

LoB—Lonon loam, 2 to 8 percent slopes. This gently sloping, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains in the western part of the county. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 1 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Lonon soil are as follows—

Surface layer:

0 to 9 inches—dark brown loam

Subsoil:

9 to 17 inches—yellowish red clay loam
17 to 36 inches—yellowish red clay loam
36 to 53 inches—yellowish red clay loam that has strong brown mottles
53 to 60 inches—strong brown loam that has brownish yellow and very pale brown mottles

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Dellwood, French, Nikwasi, and Reddies soils. These soils are subject to flooding. Dellwood soils have more than 35 percent rock fragments in the subsoil and are moderately well drained. French soils are moderately well drained to somewhat poorly drained. Nikwasi soils are poorly drained or very poorly drained. Dellwood, French, Nikwasi, and Reddies soils are along streams. Also included are soils that are similar to the Lonon soil but that have a browner subsoil or a high water table at a depth of 3 to 6 feet, or both. Springs and seeps are common in areas of this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, building sites, recreation, or woodland.

This Lonon soil is well suited to pasture and hayland. Soil compaction, a hazard of erosion, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining a dense vegetative cover can help to control erosion.

This soil is well suited to cultivated row crops. The slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops, such as tomatoes. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to specialty crops, such as landscaping plants. The soil has good yields, is gently sloping, and is desirable for the production of seedlings. The slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Plants and trees are easily dug and ball and burlap harvested. Areas on toe slopes have better air drainage

and are better suited to frost-sensitive crops, such as apples. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff. Mulch can be used to control erosion in cultivated areas where sod cannot be used.

This soil is well suited to building site development. It has a moderate limitation affecting septic tank absorption fields because of the moderate permeability. Runoff from the adjacent higher areas and the hazard of erosion are management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is well suited to most recreational uses, such as camping sites and trailer parks. The slope and the hazard of erosion are management concerns. Water sources, such as springs, are common in this map unit.

This soil is well suited to woodland management. The soil is desirable for timber production because it has very high productivity. The slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. The soil is rarely used for timber production because of the small size of individual areas and the higher profits available from other uses. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, northern red oak, eastern white pine, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, and eastern white pine, reforest former fields.

This soil is well suited to access roads. Runoff from the adjacent higher areas and the hazard of erosion are management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11A.

LoC—Lonon loam, 8 to 15 percent slopes. This strongly sloping, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains in the western part of the county. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 2 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Lonon soil are as follows—

Surface layer:

0 to 9 inches—dark brown loam

Subsoil:

9 to 17 inches—yellowish red clay loam
17 to 36 inches—yellowish red clay loam
36 to 53 inches—yellowish red clay loam that has strong brown mottles
53 to 60 inches—strong brown loam that has brownish yellow and very pale brown mottles

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Dellwood, French, Nikwasi, and Reddies soils. These soils are along the streams and are subject to flooding. Dellwood soils have more than 35 percent rock fragments in the subsoil. Dellwood soils are moderately well drained. French soils are moderately well drained to somewhat poorly drained. Nikwasi soils are poorly drained or very poorly drained. Also included are soils that are similar to the Lonon soil but have a browner subsoil or a high water table at a depth of 3 to 6 feet, or both. Springs and seeps are common in areas of this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, woodland, building sites, recreation, or specialty crops.

This Lonon soil is well suited to pasture and hayland. Soil compaction, a hazard of erosion, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to cultivated row crops. The main limitations are the slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage. Common crops include silage corn, tomatoes, and burley tobacco. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops, such as tomatoes. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to woodland management. The soil is desirable for timber production because it has very high productivity. The slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, northern red oak, eastern white pine, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry and northern red oak is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to building site development. The slope, the moderate permeability, runoff from the adjacent higher areas, and the hazard of erosion are management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is moderately suited to specialty crops. The slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage are management concerns. The soil is commonly used for landscaping plants, such as eastern hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Plants and trees are easily dug and ball and burlap harvested. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff. Mulch can be used to control erosion in cultivated areas where sod cannot be used.

This soil is moderately suited to most recreational uses. The slope and the hazard of erosion are the main limitations. Water sources, such as springs, are common in this map unit.

This soil is moderately suited to access roads. The slope, frost action, the hazard of erosion, springs and seeps, and runoff from the adjacent higher areas are management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11A.

LoD—Lonon loam, 15 to 30 percent slopes. This moderately steep, very deep, well drained soil is in coves at the headwaters of drainageways of low mountains in the western part of the county. Areas are bowl-shaped on the lower part of the landscape and finger into the drainageways. They range from 5 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Lonon soil are as follows—

Surface layer:
0 to 9 inches—dark brown loam

Subsoil:
9 to 17 inches—yellowish red clay loam

17 to 36 inches—yellowish red clay loam
36 to 53 inches—yellowish red clay loam that has strong brown mottles
53 to 60 inches—strong brown loam that has brownish yellow and very pale brown mottles

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Brasstown, Junaluska, and Spivey soils. Brasstown soils are deep, and Junaluska soils are moderately deep to soft weathered bedrock. Spivey soils have more than 35 percent rock fragments in the subsoil. Brasstown and Junaluska soils are on small knolls, and Spivey soils are along streams. Also included are soils that are similar to the Lonon soil but have a browner subsoil or a high water table at a depth of 3 to 6 feet, or both. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, specialty crops, or recreation.

This Lonon soil is moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. Runoff from the adjacent higher areas is an additional problem. The soil is desirable for timber production because it has very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, northern red oak, eastern white pine, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry and northern red oak is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to pasture. The main management concerns are the slope, soil compaction, the hazard of erosion, streambank damage, and runoff from the adjacent higher areas. In addition, operating farm equipment on this soil is difficult. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a problem in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to building site development because of the slope. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is poorly suited to specialty crops because of the hazard of erosion. However, it is used for landscaping plants. The slope and runoff from the adjacent higher areas are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Operating farm equipment on this soil is difficult. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

This soil is moderately suited to poorly suited to most recreational uses because of the slope. It is used for camping sites and hiking trails. Controlling erosion is an additional management concern. Water sources, such as springs, are common in this map unit.

This soil is not used for cultivated row crops because of the slope. The hazard of erosion and runoff from the adjacent higher areas are additional management concerns.

This soil is poorly suited to access roads because of the slope. The hazard of erosion, springs and seeps, and runoff from the adjacent higher areas are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil

material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams and by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is safely diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11R.

NkA—Nikwasi fine sandy loam, 0 to 2 percent slopes, frequently flooded. This nearly level, poorly drained or very poorly drained soil is moderately deep to sandy material that contains large amounts of gravel and cobbles. This soil is in depressions on flood plains along the smaller streams. Individual areas occur as long bands and range from 2 to 20 acres in size.

Typically, the sequence, depth, and composition of the layers of this Nikwasi soil are as follows—

Surface layer:

0 to 9 inches—black fine sandy loam

9 to 17 inches—very dark grayish brown fine sandy loam

17 to 29 inches—very dark grayish brown loamy sand

Underlying material:

29 to 60 inches—dark grayish brown very cobbly sand

Permeability is moderately rapid in the upper part of the profile and rapid in the lower part. Surface runoff is very slow or ponded. Water may pond in concave areas where outlets have been blocked. Flooding is frequent and occurs for very brief periods. The high water table is within a depth of 1 foot. The content of organic matter in the surface layer is high or very high. The surface layer is friable. Tillage is impractical when the soil is wet. Tile drainage is necessary.

Included in this unit in mapping are small areas of Dellwood, French, and Reddies soils. Dellwood and Reddies soils are moderately well drained. Dellwood soils are shallow to strata of cobbles, gravel, and sand. French soils are somewhat poorly drained. Dellwood soils are in areas scoured by floodwater or where smaller streams cross this unit. Reddies soils are on small knolls. Also included are soils that are similar to the Nikwasi soil but have light-colored, recent overwash 4 to 10 inches thick or have a surface layer that is less than 24 inches thick. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture. Some areas are used for woodland or recreation.

This Nikwasi soil is poorly suited to pasture and hayland because of the wetness and flooding. Drained areas, however, are commonly used for pasture because the soil is nearly level. Ponding, soil compaction, runoff from the adjacent higher areas, and streambank damage are additional management concerns. Tile drainage is difficult and expensive to install because of the shallowness to contrasting layers, lack of grade, and poor outlets. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to woodland management because of the wetness and flooding. The equipment limitation is a severe management problem. On wooded sites, the common trees include yellow-poplar, eastern white pine, black birch, and eastern hemlock. In some cutover areas, rhododendrons form a canopy. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

In cleared areas, eastern white pine can be successfully established. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are very slick.

This soil is poorly suited to most recreational uses because of the wetness and flooding. Drainage is difficult and expensive to install because of the shallowness to water, lack of grade, and poor outlets. The water management practices used in pasture management are also appropriate for recreational uses.

This soil is not used for cultivated row crops and building sites. The flooding, the wetness, and ponding are the main limitations.

This soil is poorly suited to access roads because of the wetness and flooding. Runoff and sediments from the adjacent higher areas and ponding are additional management concerns. Building roads in elevated areas helps to provide a suitable roadbed and to minimize flood damage to the road surface. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Roads should be designed so that runoff is diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas.

The capability subclass is VIw. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6W.

OwD—Oconaluftee channery loam, windswept, 15 to 30 percent slopes. This moderately steep, very deep, and well drained soil is on ridgetops in the high mountains. These windswept high mountain areas are subject to a harsh winter climate that includes high winds and extreme cold. This soil occurs only on a few high peaks in the northern part of the county. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Oconaluftee soil are as follows—

Surface layer:
0 to 8 inches—black channery loam
8 to 12 inches—very dark brown channery loam

Subsoil:
12 to 44 inches—dark grayish brown channery loam

Underlying material:
44 to 60 inches—multicolored flaggy fine sandy loam

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer is very high. The climate is severe. Winter is cold, icy, and windy, and the rest of the year is rainy, foggy, and cool. The soil remains frozen for long periods in winter. Seams of rock that have a high content of sulfur may underlie this soil. Landslides occur in this map unit.

Included in this unit in mapping are small areas of soils that have bedrock within a depth of 60 inches and small rock outcrops. Also included are soils that have more than 35 percent rock fragments in the subsoil in drainageways and soils that are similar to the Oconaluftee soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick or have more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

This Oconaluftee soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. This soil is not used for commercial timber production because the trees are very stunted, twisted, and sculptured by winter winds and ice. Northern red oak is the most common tree. It is in stands mixed with small amounts of black birch, yellow birch, American beech, and sugar maple.

This soil is moderately suited to most recreational uses. The slope and the hazard of erosion are the main management concerns. Some areas are used for overlooks and hiking trails. Freezing and thawing increase the need for trail maintenance.

This soil is not used for crops, pasture and hayland, or building sites. The slope, difficult access across steep terrain, the cold climate, stones, and the hazard of erosion are management concerns.

This soil is moderately suited to access roads. The damage to road surfaces is severe because of the harsh climate. The slope, the instability of the underlying rock, freezing and thawing of the surface layer, and the hazard of erosion are problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Revegetating cuts and fills is a problem because of the slope, slumping, and freezing and thawing in spring and fall. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is very susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on this soil because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

OwE—Oconaluftee channery loam, windswept, 30 to 50 percent slopes. This steep, very deep, and well drained soil is on ridgetops and side slopes in the high mountains. These windswept high mountain areas are subject to a harsh winter climate that includes high winds and extreme cold. This soil occurs only on a few high peaks in the northern part of the county. Individual areas are irregular in shape and range from 5 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Oconaluftee soil are as follows—

Surface layer:
0 to 8 inches—black channery loam
8 to 12 inches—very dark brown channery loam

Subsoil:
12 to 44 inches—dark brown channery loam

Underlying material:
44 to 60 inches—multicolored flaggy fine sandy loam

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer is very high. The climate is severe. Winter is cold, icy, and windy, and the rest of the year is rainy, foggy, and cool. This soil remains frozen for long periods in winter. Seams of rock that have a high content of sulfur may underlie this soil. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of soils that have more than 35 percent rock fragments in the subsoil in drainageways. Also included are small areas of soils intermingled with the Oconaluftee soil that have bedrock within a depth of 60 inches, small rock outcrops, and soils that are similar to Oconaluftee soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Some areas have more surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

This Oconaluftee soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. This soil is not used for commercial timber production because the trees are very stunted, twisted, and sculptured by winter winds and ice. Northern red oak is the most common tree. It is in stands mixed with small amounts of black birch, yellow birch, American beech, and sugar maple.

This soil is poorly suited to most recreational uses because of the slope. Some areas, however, are used for overlooks and hiking trails. Controlling erosion is an additional management concern. Freezing and thawing increase the need for trail maintenance.

This soil is not used for crops, pasture and hayland, or building sites. The slope, difficult access across steep terrain, the cold climate, stones, and the hazard of erosion are management concerns.

This soil is poorly suited to access roads because of the slope. Some areas, however, are used for access roads to fire towers and to fields supporting wildlife habitat. The damage to road surfaces is severe because of the harsh climate. The instability of the underlying rock, freezing and thawing of the surface layer, and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is very susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on this soil because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope, slumping, and freezing and thawing in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

PwD—Plott fine sandy loam, 15 to 30 percent slopes, stony. This moderately steep, very deep, well drained soil is on ridgetops and side slopes of intermediate mountains. This soil is mainly in the eastern part of the county and occurs on north- to east-facing slopes or on south- to west-facing slopes that are shaded by the higher mountains. Individual areas range from 5 to 20 acres in size.

Typically, the sequence, depth, and composition of the layers of this Plott soil are as follows—

Surface layer:
0 to 13 inches—very dark brown fine sandy loam
13 to 16 inches—dark brown fine sandy loam

Subsoil:

16 to 30 inches—brown fine sandy loam
30 to 42 inches—dark yellowish brown cobbly fine sandy loam

Underlying material:

42 to 61 inches—multicolored cobbly sandy loam

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and rapid in areas where the litter has been removed. The content of organic matter in the surface layer is high or very high. The stones cause a problem for tillage. This soil remains frozen for long periods in winter and warms up later in spring than other soils at the same elevation.

Included in this unit in mapping are small areas of Chestnut, Cullasaja, Edneyville, and Tuckasegee soils. Chestnut and Edneyville soils have a surface layer that is thinner or lighter colored, or both, than that of the Plott soil. Chestnut soils are moderately deep to soft weathered bedrock. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Chestnut and Edneyville soils are on south- to west-facing slopes. Cullasaja and Tuckasegee soils are in drainageways. Also included are some small areas of rock outcrops and soils that are similar to the Plott soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Some areas have fewer surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites or recreation.

This Plott soil is moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. This soil is desirable for timber production because it has high productivity and supports valuable species. Common trees include northern red oak, black cherry, black birch, and sugar maple. Yellow-poplar is common at the lower elevations. Yellow birch, American beech, and eastern hemlock are common at the higher elevations. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Restricting the use of heavy equipment to the drier periods helps to prevent soil compaction. When this soil is wet, skid trails and unsurfaced roads are slick.

This soil is poorly suited to building site development because of the slope and the tendency of cutbanks to cave. The stones and the hazard of erosion are additional management concerns. The long, cold winters reduce the desirability of this soil as a site for year-round homes, although some areas are used for second homes. Revegetating disturbed areas is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

This soil is moderately suited to most recreational uses, such as hiking trails. The slope is the main limitation. Controlling erosion is an additional management concern.

This soil is moderately suited to pasture because of the slope. The stones and the hazard of erosion are additional management concerns.

This soil is poorly suited to access roads because of the slope. It is commonly used for this purpose, however, because timber production and building sites are important. The stones and the hazard of erosion are additional management concerns. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 5R.

PwE—Plott fine sandy loam, 30 to 50 percent slopes, stony. This steep, very deep, well drained soil is on ridges and side slopes in the intermediate mountains. This soil is in the eastern part of the county on north- to east-facing slopes or on south- to west-facing slopes that are shaded by the higher mountains.

Individual areas range from 5 to 80 acres in size.

Typically, the sequence, depth, and composition of the layers of this Plott soil are as follows—

Surface layer:
0 to 13 inches—very dark brown fine sandy loam
13 to 16 inches—dark brown fine sandy loam

Subsoil:
16 to 30 inches—brown fine sandy loam
30 to 42 inches—dark yellowish brown cobbly fine sandy loam

Underlying material:
42 to 61 inches—multicolored cobbly sandy loam

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer is high or very high. The stones make tillage a problem unless the larger stones are removed. This soil remains frozen for long periods in winter and warms up later in spring than other soils at the same elevation.

Included in this unit in mapping are small areas of Chestnut, Cullasaja, Edneyville, and Tuckasegee soils. Chestnut and Edneyville soils have a surface layer that is thinner or lighter colored, or both, than that of the Plott soil. Chestnut soils are moderately deep to soft weathered bedrock. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Chestnut and Edneyville soils are on west- to south-facing slopes. Cullasaja and Tuckasegee soils formed in colluvium and are in drainageways. Also included are small intermingled areas of rock outcrops and soils that are similar to the Plott soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Some areas have fewer surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites or recreation.

This Plott soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. This soil, however, is desirable for timber production because it has high productivity and supports valuable species. Common trees include northern red oak, black cherry, black birch, and sugar maple. Yellow-poplar is common at the lower elevations. Yellow birch, American beech, and eastern hemlock are common at the higher elevations. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Restricting the use of heavy equipment to the drier periods helps to prevent soil compaction. When this soil is wet, skid trails and unsurfaced roads are slick.

This soil is poorly suited to building site development because of the slope and the tendency of cutbanks to cave. The stones and the hazard of erosion are additional management concerns. The long, cold winters reduce the desirability of this soil as a site for year-round homes, although some areas are used for second homes. Revegetating disturbed areas is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks. This map unit is in areas of the county where annual rainfall is more than 70 inches. Building sites should be quickly revegetated for erosion control.

This soil is poorly suited to most recreational uses because of the slope. It is occasionally used for hiking trails. Controlling erosion is an additional management concern.

This soil is not used for hay and pasture because of the slope. The stones and the hazard of erosion are additional management concerns.

This soil is poorly suited to access roads because of the slope. The stones and the hazard of erosion are additional management concerns. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 5R.

PwF—Plott fine sandy loam, 50 to 95 percent slopes, stony. This very steep, very deep, well drained soil is on mountainsides of intermediate mountains. This soil is in the eastern part of the county on north- to east-facing slopes or on south- to west-facing slopes that are shaded by the higher mountains. Individual areas range from 10 to 150 acres in size.

Typically, the sequence, depth, and composition of the layers of this Plott soil are as follows—

Surface layer:
0 to 13 inches—very dark brown fine sandy loam
13 to 16 inches—dark brown fine sandy loam

Subsoil:
16 to 30 inches—brown fine sandy loam
30 to 42 inches—dark yellowish brown cobbly fine sandy loam

Underlying material:
42 to 61 inches—multicolored cobbly sandy loam

Permeability is moderately rapid. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer is high or very high. This soil remains frozen for long periods in winter and warms up later in spring than other soils at the same elevation.

Included in this unit in mapping are small areas of Chestnut, Cullasaja, Edneyville, and Tuckasegee soils. Chestnut and Edneyville soils have a surface layer that is thinner or lighter colored, or both, than that of the Plott soil. Chestnut soils are moderately deep to soft weathered bedrock. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Chestnut and Edneyville soils are on south- to west-facing spur ridges. Cullasaja and Tuckasegee soils formed in colluvium and are in drainageways. Also included are small areas of rock outcrops and soils that are similar to the Plott soil. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. Some areas have fewer surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

This Plott soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. This soil, however, is desirable for timber production because it has high productivity and supports valuable species. Common trees include northern red oak, black cherry, black birch, and sugar maple. Yellow-poplar is common at the lower elevations. Yellow birch, American beech, and eastern hemlock are common at the higher elevations. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Hardwoods are commonly selected for commercial timber production. Plant competition is moderate. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Restricting the use of heavy equipment to the drier periods helps to prevent soil compaction. The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Generally, wheeled and tracked equipment is dangerous to operate in this map unit. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

This soil is not used for pasture, building sites, recreation, or crops. The slope is the main limitation. Controlling erosion is an additional problem.

This soil is poorly suited to access roads because of the slope. Because unsurfaced roads are slick when wet, roads require surfacing for year-round use. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is difficult because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 5R.

RhA—Reddies loam, 0 to 3 percent slopes, frequently flooded. This nearly level, moderately well drained soil is moderately deep to sandy material that contains large amounts of gravel and cobbles. This soil is in slightly elevated areas on flood plains along the smaller streams. Individual areas occur as long bands and range from 1 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Reddies soil are as follows—

Surface layer:
0 to 11 inches—very dark brown loam

Subsoil:
11 to 17 inches—yellowish brown loam
17 to 29 inches—yellowish brown gravelly sandy loam

Underlying material:
29 to 60 inches—multicolored very cobbly loamy sand

Permeability is moderately rapid. Surface runoff is slow. Flooding is frequent and occurs for very brief periods. The high water table is at a depth of 2.0 to 3.5 feet. The content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Dellwood, French, Nikwasi, and Tate soils. Dellwood soils are shallow to strata of stones, cobbles, gravel, and sand. French and Tate soils have more clay in the subsoil than the Reddies soil. French soils are somewhat poorly drained. Nikwasi soils are poorly drained or very poorly drained. Tate soils are not subject to flooding. Dellwood soils are in areas scoured by floodwater or where smaller streams cross this unit. French and Nikwasi soils are in depressions. Tate soils are on toe slopes. Also included are soils that are similar to the Reddies soil but have a lighter-colored surface layer or a redder subsoil, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, building sites, or woodland.

This Reddies soil is well suited to pasture and hayland. The flooding, soil compaction, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is moderately suited to cultivated row crops. The flooding is the main limitation. Runoff from the adjacent higher areas and cold air drainage are additional management concerns. Frost can significantly damage sensitive crops because of cold air drainage. This soil is preferred for cultivated row crops because it has good accessibility, is near a source of irrigation water, is nearly level, and has good productivity. Common crops include silage corn, tomatoes, and burley tobacco. Some nutrients are easily leached, and split applications of fertilizer are recommended. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to specialty crops. The flooding is the main limitation. Runoff and sediments from the adjacent higher areas are additional management concerns. This soil is commonly used for landscaping plants. Common, fibrous-rooted landscaping plants are eastern hemlock, Norway spruce, boxwood, white birch, Bradford pear, and maples. The soil also produces seedlings of these plants. Plants and trees can be dug and ball and burlap harvested. Seedlings can be easily pulled without damage to the roots because of the sandy texture of the soil. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around crops.

This map unit is poorly suited to building site development because of the flooding, the wetness, and the tendency of cutbanks to cave.

This soil is well suited to woodland management. Yellow-poplar is the most common tree. It is in stands mixed with black birch, black cherry, eastern hemlock, and American sycamore. This unit includes a few black walnut trees.

This soil is moderately suited to poorly suited to most recreational uses because of the frequent flooding. The soil, however, is used for camping sites and parks with picnic areas because it is nearly level and near streams.

This soil is poorly suited to access roads because of the flooding. Runoff and sediments from the adjacent higher areas are additional management concerns. Building roads in elevated areas helps to minimize flood damage to the road surface. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Roads should be designed so that runoff is diverted. Wet spots need to be drained.

The capability subclass is IIIw. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8A.

RkF—Rock outcrop-Cleveland complex, windswept, 30 to 95 percent slopes. This map unit occurs as areas of Rock outcrop and areas of a steep and very steep, shallow, somewhat excessively drained Cleveland soil. This unit is in the southeastern part of the county on side slopes of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Individual areas range from 20 to 100 acres in size. Typically, this unit is about 45 to 55 percent Rock outcrop and 25 to 35 percent Cleveland soil. The Rock outcrop and the Cleveland soil occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping. Most areas are difficult and dangerous to traverse.

The areas of Rock outcrop consist of exposed bedrock of various dimensions.

Typically, the sequence, depth, and composition of the layers of this Cleveland soil are as follows—

Surface layer:
0 to 8 inches—dark brown gravelly fine sandy loam

Subsoil:
8 to 15 inches—yellowish brown gravelly fine sandy loam

Bedrock:
15 to 19 inches—multicolored, soft weathered gneiss
19 inches—hard unweathered gneiss

Permeability is moderately rapid in the Cleveland soil. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed or bedrock is exposed. The content of organic matter in the surface layer ranges from low to high. Landslides commonly occur during wet periods when the soil material slides off the contact with rock.

Included in this unit in mapping are small areas of Chestnut, Cullasaja, and Plott soils. Chestnut soils are moderately deep to soft weathered bedrock. Cullasaja and Plott soils are very deep and have a dark surface layer that is thicker than that of the Cleveland soil. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Chestnut soils are on south- to west-facing slopes, and Plott soils are on north- to east-facing slopes. Cullasaja soils are in drainageways. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Cleveland soil. These similar soils have a redder subsoil or more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

This map unit is not used for commercial timber production. The main limitation is that trees are very stunted, twisted, and sculptured by the winter winds and ice. The slope, the depth to bedrock, numerous rock outcrops, and a hazard of erosion are additional management concerns. The common trees on south to west aspects include scarlet oak, chestnut oak, eastern white pine, pitch pine, Virginia pine, and hickory. The common trees on north to east aspects include northern red oak, black birch, and eastern hemlock.

This map unit is poorly suited to most recreational uses. It is occasionally used for overlooks. The slope, the depth to bedrock, and the numerous rock outcrops are problems.

This map unit is not used for pasture, building sites, or crops. It is impractical for these uses because of the slope, depth to bedrock, and numerous rock outcrops.

This map unit is not used for access roads. The slope, the depth to bedrock, the numerous rock outcrops, and the hazard of erosion are major management concerns. Roads are nearly always too costly to build and maintain in this unit. Drilling and blasting of hard rock are needed. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping.

The capability subclass is VIIIs in areas of the Rock outcrop and VIIe in areas of the Cleveland soil. Based on chestnut oak as the indicator species, the woodland ordination symbol is 2R in areas of the Cleveland soil. The Rock outcrop was not assigned a woodland ordination symbol.

RnA—Rosman fine sandy loam, 0 to 2 percent slopes, rarely flooded. This nearly level, very deep, moderately well drained and well drained soil is in slightly elevated areas on flood plains. The soil is along the Hiwassee River from Chatuge Dam downstream to the mouth of Tusquitee Creek. Because of the protection of the Tennessee Valley Authority flood-control system, it is rarely flooded. Individual areas occur as long bands and range from 1 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Rosman soil are as follows—

Surface layer:
0 to 11 inches—dark brown fine sandy loam

Subsoil:
11 to 60 inches—dark yellowish brown fine sandy loam

Permeability is moderately rapid. Surface runoff is slow. Flooding is rare and occurs for very brief periods. The high water table is at a depth of 2.5 to 5.0 feet. The content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Arkaqua, Statler, and Toxaway soils. Arkaqua soils are somewhat poorly drained. Statler soils have more clay in the subsoil than the Rosman soil. Toxaway soils are poorly drained or very poorly drained. Arkaqua and Toxaway soils are in depressions, and Statler soils are on small knolls. Also included are soils that are similar to the Rosman soil but have a lighter-colored surface layer or a redder subsoil, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, recreation, building sites, or woodland.

This Rosman soil is well suited to pasture and

hayland. The flooding, soil compaction, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is well suited to cultivated row crops. Droughtiness, runoff from the adjacent higher areas, and cold air drainage are management concerns. Frost can significantly damage sensitive crops because of cold air drainage. This soil is preferred for row crops because it has very good accessibility, is near a source of irrigation water, is nearly level, and has very good productivity if properly fertilized and irrigated. Common crops include silage corn, tomatoes, strawberries, cole crops, and burley tobacco. Some nutrients are easily leached, and split applications of fertilizer are recommended. Plowing patterns should be designed to avoid blocking outlets and forming depressions, which have a wetness problem. Land shaping helps to open outlets and rapidly drain surface water from depressions. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Mulch is used on strawberries to conserve moisture, control weeds, and keep the berries clean. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to specialty crops, such as landscaping plants. Runoff and sediments from the adjacent higher areas are additional management concerns. Common, fibrous-rooted landscaping plants are eastern hemlock, boxwood, dogwood, and white birch. The soil also produces seedlings of these plants. Plants and trees are easily dug and ball and burlap harvested. Seedlings can be pulled without damage to the roots. The water management practices used for row crops are also appropriate for specialty crops.

This soil is poorly suited to building site development because of the flooding, the wetness, and the tendency of cutbanks to cave.

This soil is moderately suited to most recreational uses because of the rare flooding. The soil is used for camping sites and parks with picnic areas because it is nearly level and near streams.

This soil is well suited to woodland management. Yellow-poplar is the most common tree. It is in stands mixed with river birch, black cherry, and American sycamore. This map unit includes a few black walnut trees.

This soil is poorly suited to access roads because of the flooding. Runoff and sediments from the adjacent higher areas are management concerns. Building roads in elevated areas helps to minimize flood damage to the road surface. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Roads should be designed so that runoff from the adjacent higher areas is diverted. Wet spots need to be drained.

The capability subclass is IIw. Based on yellow-poplar as the indicator species, the woodland ordination group is 8A.

RsA—Rosman fine sandy loam, 0 to 2 percent slopes, frequently flooded. This nearly level, very deep, moderately well drained or well drained soil is in slightly elevated areas on flood plains. The soil occurs along major streams, except along the Hiwassee River from Chatuge Dam to the mouth of Tusquitee Creek. Individual areas occur as long bands and range from 1 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Rosman soil are as follows—

Surface layer:

0 to 11 inches—dark brown fine sandy loam

Subsoil:

11 to 60 inches—dark yellowish brown fine sandy loam

Permeability is moderately rapid. Surface runoff is slow. Flooding is frequent and occurs for very brief periods. The high water table is at a depth of 2.5 to 5.0 feet. The content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Arkaqua, Statler, and Toxaway soils. Arkaqua soils are somewhat poorly drained. Statler soils are rarely flooded. Toxaway soils are poorly drained or very poorly drained. Arkaqua and Toxaway soils are in depressions, and Statler soils are on small knolls. Also included are soils that are similar to the Rosman soil but have a lighter-colored surface layer or a redder subsoil, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, recreation, or woodland.

This Rosman soil is well suited to pasture and hayland. The flooding, soil compaction, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is moderately suited to cultivated row crops. The flooding is the main limitation. Droughtiness, runoff from the adjacent higher areas, and cold air drainage are additional management concerns. Frost can significantly damage sensitive crops because of cold air drainage. The soil is preferred for cultivated row crops because it has very good accessibility, is near a source of irrigation water, is nearly level, and has very good productivity if properly fertilized and irrigated. Common crops include silage corn, tomatoes, strawberries, cole crops, and burley tobacco. Some nutrients are easily leached, and split applications of fertilizer are recommended. Plowing patterns should be designed to avoid blocking outlets and forming depressions, which have a wetness problem. Land shaping helps to open outlets and rapidly drain surface water from depressions. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Mulch is used on strawberries to conserve moisture, control weeds, and keep the berries clean. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to specialty crops. The flooding is the main limitation. Runoff and sediments from the adjacent higher areas are additional management concerns. This soil is commonly used for landscaping plants. Common, fibrous-rooted landscaping plants are eastern hemlock, boxwood, dogwood, and white birch. The soil also produces seedlings of these plants. Plants and trees are easily dug and ball and burlap harvested. Seedlings can be pulled without damage to the roots. The water management practices used for cultivated row crops are also appropriate for specialty crops.

This soil is poorly suited to building site development because of the flooding, the wetness, and the tendency of cutbanks to cave.

This soil is moderately suited to poorly suited to most recreational uses because of the frequent flooding. The soil, however, is commonly used for camping sites and parks with picnic areas because it is nearly level and near streams.

This soil is well suited to woodland management. Yellow-poplar is the most common tree. It is in stands mixed with river birch, black cherry, and American sycamore. This map unit includes a few black walnut trees.

This soil is poorly suited to access roads because of the flooding. Runoff and sediments from the adjacent higher areas are management concerns. Building roads in elevated areas helps to minimize flood damage to the road surface. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Roads should be designed so that runoff from the adjacent higher areas is diverted. Wet spots need to be drained.

The capability subclass is IIIw. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8A.

SoD—Soco-Stecoah complex, 15 to 30 percent slopes. This map unit consists of a moderately steep, moderately deep Soco soil and a moderately steep, deep Stecoah soil. These soils are on narrow ridgetops in the intermediate mountains. They are well drained. Individual areas range from 5 to 30 acres in size. Typically, this unit is about 35 to 45 percent Soco soil and 35 to 45 percent Stecoah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Soco soil are as follows—

Surface layer:
0 to 3 inches—dark yellowish brown channery loam

Subsoil:
3 to 23 inches—brownish yellow channery sandy loam

Bedrock:
23 to 35 inches—multicolored, soft weathered metasandstone and phyllite

Typically, the sequence, depth, and composition of the layers of this Stecoah soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 31 inches—yellowish brown loam
31 to 36 inches—light yellowish brown channery loam

Underlying material:
36 to 52 inches—multicolored channery fine sandy loam

Bedrock:
52 to 60 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of

rock that have a high content of sulfur may underlie these soils.

Included in this unit in mapping are small areas of Brasstown, Cheoah, and Junaluska soils. Brasstown and Junaluska soils have more clay in the subsoil than the Soco and Stecoah soils. Cheoah soils have a dark surface layer that is thicker than that of the Soco and Stecoah soils. Brasstown and Junaluska soils are on south- to west-facing slopes. Cheoah soils are in gaps. Also included are soils that are similar to the Soco and Stecoah soils but have more surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Soco and Stecoah soils are moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, shortleaf pine, Virginia pine, and hickory. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

These soils are moderately suited to pasture. The slope and the hazard of erosion are management concerns. In addition, operating farm equipment on these soils is difficult. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the depth to bedrock in the Soco soil and the slope. Controlling erosion is an additional problem. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Soco soil. Areas of the Soco soil may be too shallow to be used for septic tank absorption fields.

These soils are moderately suited to some recreational uses, such as hiking trails. The slope and the hazard of erosion are management concerns. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops. The slope is the main limitation. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11R in areas of the Soco soil and 12R in areas of the Stecoah soil.

SoE—Soco-Stecoah complex, 30 to 50 percent slopes. This map unit consists of a steep, moderately deep Soco soil and a steep, deep Stecoah soil. These soils are well drained. This unit is in the northern part of the county on side slopes and very narrow ridgetops of intermediate mountains. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 40 to 50 percent Soco soil and 30 to 40 percent Stecoah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Soco soil are as follows—

Surface layer:
0 to 3 inches—dark yellowish brown channery loam

Subsoil:
3 to 23 inches—brownish yellow channery sandy loam

Bedrock:
23 to 35 inches—multicolored, soft weathered metasandstone and phyllite

Typically, the sequence, depth, and composition of the layers of this Stecoah soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 31 inches—yellowish brown loam
31 to 36 inches—light yellowish brown channery loam

Underlying material:
36 to 52 inches—multicolored channery fine sandy loam

Bedrock:
52 to 60 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Brasstown, Cheoah, Junaluska, Santeetlah, and Spivey soils. Brasstown and Junaluska soils have more clay in the subsoil than the Soco and Stecoah soils. Cheoah, Santeetlah, and Spivey soils have a dark surface layer that is thicker than that of the Soco and Stecoah soils. Spivey soils have more than 35 percent rock fragments in the subsoil. Brasstown and Junaluska soils are on south- to west-facing slopes, and Cheoah soils are on north- to east-facing slopes. Santeetlah and Spivey soils are in drainageways. Also included are soils that are similar to the Soco and Stecoah soils but have more surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

These Soco and Stecoah soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, shortleaf pine, Virginia pine, and hickory. Northern red oak may be common at the higher elevations. Windblown seeds, such as those of black locust, red maple, shortleaf pine, Virginia pine, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

These soils are poorly suited to pasture because of the slope. The hazard of erosion is an additional management concern. Operating farm equipment on these soils is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Maintaining pasture in good condition helps to control erosion.

These soils are poorly suited to building site development because of the depth to bedrock in the Soco soil and the slope. Controlling erosion is an additional problem. Revegetating disturbed areas is a problem because of the slope and freezing and thawing. Hydroseeding can successfully be used to revegetate steep banks. Excavation for dwellings with basements may be hindered by the depth to bedrock in the Soco soil. Areas of the Soco soil may be too shallow to be used for septic tank absorption fields. Septic tank absorption fields should be dug by hand because of the slope.

These soils are poorly suited to most recreational uses because of the slope. They are used for overlooks and hiking trails. Controlling erosion is an additional problem. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops. The slope is the main limitation. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11R in areas of the Soco soil and 12R in areas of the Stecoah soil.

SoF—Soco-Stecoah complex, 50 to 95 percent slopes. This map unit consists of a very steep, moderately deep Soco soil and a very steep, deep Stecoah soil. These soils are well drained. This unit is in the northern part of the county on side slopes of intermediate mountains. Individual areas range from 10 to 80 acres in size. Typically, this unit is about 45 to 55 percent Soco soil and 25 to 35 percent Stecoah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Soco soil are as follows—

Surface layer:
0 to 3 inches—dark yellowish brown channery loam

Subsoil:
3 to 23 inches—brownish yellow channery sandy loam

Bedrock:
23 to 35 inches—multicolored, soft weathered metasandstone and phyllite

Typically, the sequence, depth, and composition of the layers of this Stecoah soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 31 inches—yellowish brown loam
31 to 36 inches—light yellowish brown channery loam

Underlying material:
36 to 52 inches—multicolored channery fine sandy loam

Bedrock:
52 to 60 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Brasstown, Cheoah, Junaluska, Santeetlah, and Spivey soils. Brasstown and Junaluska soils have more clay in the subsoil than the Soco and Stecoah soils. Cheoah, Santeetlah, and Spivey soils have a dark surface layer that is thicker than that of the Soco and Stecoah soils. Spivey soils have more than 35 percent rock fragments in the subsoil. Brasstown and Junaluska soils are on south- to west-facing slopes, and Cheoah soils are on north- to east-facing slopes. Santeetlah and Spivey soils are in drainageways. Also included are soils that are similar to the Soco and Stecoah soils but have more surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland.

These Soco and Stecoah soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The high cost of access roads also is an additional management concern. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, shortleaf pine, Virginia pine, and hickory. Northern red oak may be common at the higher elevations. Hardwoods are commonly selected for commercial timber production where stands have good sprout potential and hardwood seedlings and where annual rainfall is more than 60 inches. Reforestation of hardwoods occurs dominantly

by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

Eastern white pine is grown in areas where the sprout potential is not good and hardwood seedlings are not available. It also is commonly planted where annual rainfall is less than 60 inches. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling competition from hardwoods may also be needed a few years after planting pine.

The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Generally, wheeled and tracked equipment is dangerous to operate in this map unit. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

These soils are poorly suited to most recreational uses because of the slope. They are used for hiking trails. Controlling erosion is an additional problem. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Roads are difficult and expensive to build and maintain. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Road construction results in large cuts and fills. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on eastern white pine as the indicator species, the woodland ordination symbol is 11R in areas of the Soco soil and 12R in areas of the Stecoah soil.

SpE—Soco-Stecoah complex, windswept, 30 to 50 percent slopes. This map unit consists of a steep, moderately deep Soco soil and a steep, deep Stecoah soil. These soils are well drained. This unit is in the northern part of the county on mountainsides and very narrow ridgetops of intermediate mountains. These windswept mountain areas are exposed to a harsh winter climate that includes high winds and extreme cold. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 40 to 50 percent Soco soil and 30 to 40 percent Stecoah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Soco soil are as follows—

Surface layer:
0 to 3 inches—dark yellowish brown channery loam

Subsoil:
3 to 23 inches—brownish yellow channery sandy loam

Bedrock:
23 to 35 inches—multicolored, soft weathered metasandstone and phyllite

Typically, the sequence, depth, and composition of the layers of this Stecoah soil are as follows—

Surface layer:
0 to 5 inches—dark yellowish brown fine sandy loam

Subsoil:
5 to 31 inches—yellowish brown loam
31 to 36 inches—light yellowish brown channery loam

Underlying material:
36 to 52 inches—multicolored channery fine sandy loam

Bedrock:
52 to 60 inches—multicolored, soft weathered metasandstone and phyllite

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods

when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Brasstown, Cheoah, Junaluska, Santeetlah, and Spivey soils. Brasstown and Junaluska soils have more clay in the subsoil than the Soco and Stecoah soils. Cheoah, Santeetlah, and Spivey soils have a dark surface layer that is thicker than that of the Soco and Stecoah soils. Spivey soils have more than 35 percent rock fragments in the subsoil. Brasstown and Junaluska soils are on south- to west-facing slopes, and Cheoah soils are on north- to east-facing slopes. Santeetlah and Spivey soils are in drainageways. Also included are soils that are similar to the Soco and Stecoah soils but have more surface stones. Contrasting inclusions make up about 20 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

These Soco and Stecoah soils are poorly suited to woodland management because of the slope and are not used for commercial timber production. The main limitation is that trees are very stunted, twisted, and sculptured by the winter winds and ice. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, pitch pine, Virginia pine, hickory, and northern red oak.

These soils are poorly suited to most recreational uses because of the slope. They are used for overlooks and hiking trails. Controlling erosion is an additional problem. Freezing and thawing increase the need for trail maintenance on south to west slopes.

These soils are not used for crops, pasture, or building sites. The slope is the main limitation. Controlling erosion is an additional management concern.

These soils are poorly suited to access roads because of the slope. The instability of the underlying rock and the hazard of erosion are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Ditches are impractical on these soils because cutbanks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is difficult because of the slope and slumping, especially in areas on south to west aspects that freeze and thaw in spring and fall. Hydroseeding can successfully be used to revegetate steep roadbanks. Vegetation is needed to control freezing and thawing of fill. Applications of lime and fertilizer are needed to establish and maintain vegetation on cutbanks.

The capability subclass is VIIe. Based on northern red oak as the indicator species, the woodland ordination symbol is 2R.

SrC—Spivey-Santeetlah complex, 8 to 15 percent slopes, stony. This map unit occurs as strongly sloping, very deep, well drained soils in coves, in drainageways, and on toe slopes in the intermediate mountains in the northern part of the county. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 2 to 30 acres in size. Typically, this unit is about 50 to 60 percent Spivey soil and 20 to 30 percent Santeetlah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Santeetlah soil is between drainageways or along toe slopes and the Spivey soil is along drainageways.

Typically, the sequence, depth, and composition of the layers of this Spivey soil are as follows—

Surface layer:
0 to 10 inches—black flaggy loam
10 to 16 inches—very dark brown flaggy loam

Subsoil:
16 to 21 inches—brown flaggy fine sandy loam
21 to 60 inches—brown flaggy sandy loam

Typically, the sequence, depth, and composition of the layers of this Santeetlah soil are as follows—

Surface layer:
0 to 6 inches—very dark brown loam
6 to 17 inches—dark brown loam

Subsoil:
17 to 39 inches—dark yellowish brown loam

Underlying material:
39 to 49 inches—dark yellowish brown channery loam
49 to 65 inches—mottled dark yellowish brown, dark brown, and yellowish brown very channery loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The

high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high. The stones make tillage difficult in areas of the Spivey soil. The Santeetlah soil is friable and can be tilled throughout a wide range in moisture content.

Included in this unit in mapping are small areas of Dellwood, Nikwasi, and Reddies soils. These soils are subject to flooding. Dellwood and Reddies soils are moderately well drained, and Nikwasi soils are poorly drained or very poorly drained. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Spivey and Santeetlah soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some concave areas the high water table is at a depth of 3 to 6 feet. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture and hayland, specialty crops, cultivated row crops, building sites, or recreation.

These Spivey and Santeetlah soils are well suited to woodland management. The soils are desirable for timber production because they have very high productivity. The slope, a hazard of erosion, and runoff from the adjacent higher areas are management concerns. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, yellow buckeye, eastern hemlock, and Fraser magnolia. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are moderately suited to pasture and hayland. The stones are the main limitation. The slope, the hazard of erosion, runoff from the adjacent higher areas, and streambank damage are additional management concerns. The stones can damage farm equipment used to establish, maintain, and harvest pasture and hayland in areas of the Spivey soil. Large stones should be removed where this map unit is converted to pasture or hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can prevent streambank damage and improve water quality. Maintaining pasture in good condition helps to control erosion.

The Santeetlah soil is moderately suited to specialty crops because of the hazard of erosion, and the Spivey soil is poorly suited because of the stones. The slope and runoff from the adjacent higher areas are additional management concerns. These soils are used for landscaping plants. Common landscaping plants are eastern hemlock, eastern white pine, and Norway spruce. Although Fraser fir is not commonly grown in this map unit, these soils have good potential for its production. Large stones should be removed when areas are converted to cropland. Preparing seedbeds and digging up plants during harvesting are difficult in the Spivey soil because of the many small stones. Plants and trees are easily dug and ball and burlap harvested in areas of the Santeetlah soil. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

The Santeetlah soil is moderately suited to building site development because of the slope, and the Spivey soil is poorly suited because of large stones. Runoff from the adjacent higher areas and the hazard of erosion are additional problems. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

The Santeetlah soil is moderately suited to most recreational uses because of the slope, and the Spivey soil is poorly suited because of small stones. Controlling erosion is an additional management concern. Water sources, such as springs, are common in this map unit.

These soils are not used for cultivated row crops.

The Santeetlah soil is moderately suited to access

roads because of the slope and frost action, and the Spivey soil is poorly suited because of large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is VIIs in areas of the Spivey soil and IVe in areas of the Santeetlah soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8F in areas of the Spivey soil and 8A in areas of the Santeetlah soil.

SrD—Spivey-Santeetlah complex, 15 to 30 percent slopes, stony. This map unit occurs as moderately steep, very deep, well drained soils. This unit is mainly in the northern part of the county and occurs in coves, in drainageways, and on toe slopes of intermediate mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 4 to 30 acres in size. Typically, this unit is about 45 to 55 percent Spivey soil and 25 to 35 percent Santeetlah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Spivey soil is along drainageways and the Santeetlah soil is between drainageways or along toe slopes.

Typically, the sequence, depth, and composition of the layers of this Spivey soil are as follows—

Surface layer:
0 to 10 inches—black flaggy loam
10 to 16 inches—very dark brown flaggy loam

Subsoil:
16 to 21 inches—brown flaggy fine sandy loam
21 to 60 inches—brown flaggy sandy loam

Typically, the sequence, depth, and composition of the layers of this Santeetlah soil are as follows—

Surface layer:
0 to 6 inches—very dark brown loam
6 to 17 inches—dark brown loam

Subsoil:
17 to 39 inches—dark yellowish brown loam

Underlying material:
39 to 49 inches—dark yellowish brown channery loam
49 to 65 inches—mottled dark yellowish brown, dark brown, and yellowish brown very channery loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is medium or rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high. The stones make tillage difficult in areas of the Spivey soil. The Santeetlah soil is friable and can be tilled throughout a wide range in moisture content.

Included in this unit in mapping are small areas of Cheoah, Stecoah, and Soco soils. Stecoah and Soco soils have a surface layer that is thinner or lighter colored, or both, than that of the Spivey and Santeetlah soils. Soco soils are moderately deep to soft weathered bedrock. Cheoah, Stecoah, and Soco soils are on small knolls. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders (fig. 8) and soils that are similar to the Spivey and Santeetlah soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture, specialty crops, building sites, or recreation.

These Spivey and Santeetlah soils are moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. The stones and runoff from the adjacent higher areas are additional problems. The soils are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, yellow buckeye, eastern hemlock, and Fraser magnolia. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber

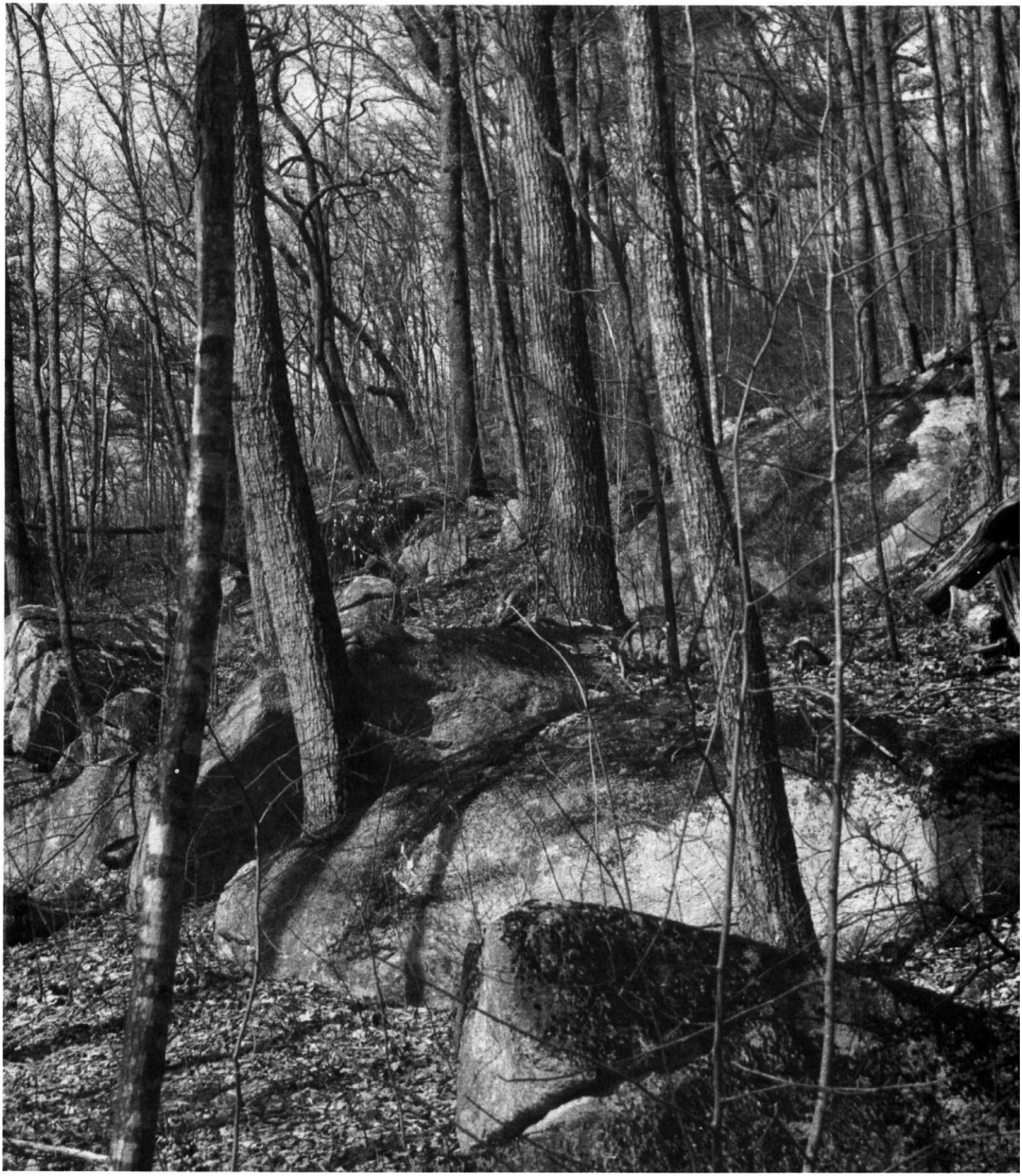


Figure 8.—A small area of rubble land in the Spivey-Santeetlah complex, 15 to 30 percent slopes, stony.

production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are moderately suited to pasture, mainly because of the slope. The stones, the hazard of erosion, runoff from the adjacent higher areas, and streambank damage are additional management concerns. Operating farm equipment on these soils is difficult. The stones can damage farm equipment used to establish and maintain pasture, and large stones should be removed when areas are converted to pasture and hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining pasture in good condition helps to control erosion.

The Santeetlah soil is poorly suited to specialty crops because of the hazard of erosion, and the Spivey soil is poorly suited because of the stones. The slope and runoff from the adjacent higher areas are additional management concerns. These soils are used for landscaping plants. Common landscaping plants are eastern hemlock, eastern white pine, and Norway spruce. Although Fraser fir is not commonly grown in this map unit, these soils have potential for its production. Large stones should be removed when areas are converted to cropland. Preparing seedbeds and digging up plants during harvesting are difficult in the Spivey soil because of the many small stones. Plants and trees are easily dug and ball and burlap harvested in areas of the Santeetlah soil. Operating farm equipment on these soils is difficult. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

The Santeetlah soil is poorly suited to building site development because of the slope, and the Spivey soil is poorly suited because of large stones. Runoff from the adjacent higher areas and the hazard of erosion are additional problems. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

These soils are poorly suited to most recreational uses because of the slope and small stones. The soils are used for camping sites and trailer parks because they are near streams and occur in shaded areas. Controlling erosion is an additional management concern. Water sources, such as springs, are common in this map unit.

These soils are not used for cultivated row crops because of the slope.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating areas of cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIs in areas of the Spivey soil and VIe in areas of the Santeetlah soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

SrE—Spivey-Santeetlah complex, 30 to 50 percent slopes, stony. This map unit occurs as steep, very deep, well drained soils. This unit is in the northwestern

part of the county in coves, in drainageways, and on toe slopes of intermediate mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 5 to 40 acres in size. Typically, this unit is about 50 to 60 percent Spivey soil and 20 to 30 percent Santeetlah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Spivey soil is along drainageways and the Santeetlah soil is between drainageways or along toe slopes.

Typically, the sequence, depth, and composition of the layers of this Spivey soil are as follows—

Surface layer:
0 to 10 inches—black flaggy loam
10 to 16 inches—very dark brown flaggy loam

Subsoil:
16 to 21 inches—brown flaggy fine sandy loam
21 to 60 inches—brown flaggy sandy loam

Typically, the sequence, depth, and composition of the layers of this Santeetlah soil are as follows—

Surface layer:
0 to 6 inches—very dark brown loam
6 to 17 inches—dark brown loam

Subsoil:
17 to 39 inches—dark yellowish brown loam

Underlying material:
39 to 49 inches—dark yellowish brown channery loam
49 to 65 inches—mottled dark yellowish brown, dark brown, and yellowish brown very channery loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is medium or rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high. The stones make tillage difficult in areas of the Spivey soil. The Santeetlah soil is friable and can be tilled throughout a wide range in moisture content.

Included in this unit in mapping are small areas of Cheoah, Stecoah, and Soco soils. Stecoah and Soco soils have a surface layer that is thinner or lighter colored than that of the Spivey and Santeetlah soils. Soco soils are moderately deep to soft weathered bedrock. Cheoah, Stecoah, and Soco soils are on small knolls. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Spivey and Santeetlah soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Almost all of this map unit is used as woodland.

These Spivey and Santeetlah soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The stones and runoff from the adjacent higher areas are additional problems. The soils, however, are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, yellow buckeye, eastern hemlock, and Fraser magnolia at the lower elevations. Black cherry, black birch, northern red oak, sugar maple, and American basswood are more numerous in stands at the higher elevations. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Care is needed during all forestry operations to prevent soil compaction. The use of the wheeled and tracked equipment is difficult because of the slope. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are poorly suited to most recreational uses because of the slope and small stones. They are used for hiking trails.

These soils are not used for pasture, crops, or building sites because of the slope.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Seeding and

maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils.

The capability subclass is VIIs in areas of the Spivey soil and VIIe in areas of the Santeetlah soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

SrF—Spivey-Santeetlah complex, 50 to 95 percent slopes, stony. This map unit occurs as very steep, very deep, well drained soils. These soils occur commonly at the headwaters of streams in the intermediate mountains and in a few areas downstream from waterfalls. Areas are long and narrow and parallel to the drainageways. Stones and boulders are scattered over the surface. Individual areas range from 5 to 30 acres in size. Typically, this unit is about 65 to 70 percent Spivey soil and 10 to 15 percent Santeetlah soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Spivey soil is along drainageways and the Santeetlah soil is in the higher landscape positions.

Typically, the sequence, depth, and composition of the layers of this Spivey soil are as follows—

Surface layer:
0 to 10 inches—black flaggy loam
10 to 16 inches—very dark brown flaggy loam

Subsoil:
16 to 21 inches—brown flaggy fine sandy loam
21 to 60 inches—brown flaggy sandy loam

Typically, the sequence, depth, and composition of the layers of this Santeetlah soil are as follows—

Surface layer:
0 to 6 inches—very dark brown loam
6 to 17 inches—dark brown loam

Subsoil:
17 to 39 inches—dark yellowish brown loam

Underlying material:
39 to 49 inches—dark yellowish brown channery loam
49 to 65 inches—mottled dark yellowish brown, dark brown, and yellowish brown very channery loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and rapid or very rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high.

Included in this unit in mapping are small areas of Cheoah, Stecoah, and Soco soils. Stecoah and Soco soils have a surface layer that is thinner or lighter colored than that of the Spivey and Santeetlah soils. Soco soils are moderately deep to soft weathered bedrock. Cheoah, Stecoah, and Soco soils are on nose slopes and spur ridges. Also included are small areas of rubble land where more than 75 percent of the surface is covered by stones and boulders and soils that are similar to the Spivey and Santeetlah soils. These similar soils have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Almost all of this map unit is used as woodland.

These Spivey and Santeetlah soils are poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The stones and runoff from the adjacent higher areas are additional problems. The soils are desirable for timber production because they have very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, yellow buckeye, eastern hemlock, and eastern white pine at the lower elevations. Black cherry, black birch, northern red oak, and sugar maple are more numerous in stands at the higher elevations. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity. Unsurfaced roads are slick, soft, and dangerous when wet because of the high content of organic matter in the surface layer.

These soils are poorly suited to hiking trails. However, they are commonly used for this purpose

because this map unit includes scenic views of streams flowing over rock ledges. The slope, stones, and the hazard of erosion are management concerns.

These soils are not used for pasture, building sites, or crops. The slope is the main limitation. Stones, the hazard of erosion, and runoff are additional management concerns.

These soils are poorly suited to access roads because of the slope and large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Roads are difficult and expensive to build and maintain. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Road failures are common. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Ditches are impractical on these soils because banks are subject to slumping. Outsloped roads are a better way to remove water. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils.

The capability subclass is VIIs in areas of the Spivey soil and VIIe in areas of the Santeetlah soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R in areas of both soils.

SvB—Statler loam, 1 to 5 percent slopes, rarely flooded. This nearly level and gently sloping, very deep, well drained soil is on low stream terraces. Individual areas occur as long bands that parallel the soils of flood plains. They range from 1 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Statler soil are as follows—

Surface layer:

0 to 10 inches—dark brown loam

Subsoil:

10 to 21 inches—dark yellowish brown clay loam
21 to 49 inches—brownish yellow loam
49 to 60 inches—light yellowish brown fine sandy loam

Permeability is moderate. Surface runoff is medium. Flooding is rare and occurs for very brief periods. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is moderate or high.

Included in this unit in mapping are small areas of Dillard, Hemphill, and Rosman soils. Dillard soils are moderately well drained, and Hemphill soils are very poorly drained. Rosman soils have less clay in the subsoil than the Statler soil. Dillard and Hemphill soils are in depressions, and Rosman soils are along the main stream channels. Also included are areas of somewhat poorly drained soils and soils that are similar to the Statler soil but have a gravelly surface layer or a high water table at a depth of 3 to 6 feet. Contrasting inclusions make up about 15 percent of this map unit.

Most of this map unit is used for cultivated row crops. Some areas are used for specialty crops, pasture and hayland, building sites, recreation, or woodland.

This Statler soil is well suited to cultivated row crops. The soil is desirable for this use because it has good yields, is rarely flooded, and can be planted early. The flooding, runoff from the adjacent higher areas, a hazard of erosion, and cold air drainage are management concerns. Common crops include silage corn, tomatoes, strawberries, cole crops, and burley tobacco. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Irrigation is needed for high-value crops during dry periods. Mulch is used on strawberries to conserve moisture, control weeds, and keep the berries clean. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to specialty crops, such as landscaping plants. The flooding, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, dogwood, boxwood, white birch, Bradford pear, and maples. Although Fraser fir is not commonly grown in this map unit, some areas may have potential for its production. Plants and trees are easily dug and ball and burlap harvested. The water management practices used for cultivated row crops are also appropriate for specialty crops.

This soil is well suited to pasture and hayland. The flooding, soil compaction, and streambank damage are management concerns. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet causes soil

compaction and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to building site development because of the flooding. Runoff and sediments from adjacent land are management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted.

This soil is well suited to woodland management. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, white oak, and black locust. This map unit includes a few black walnut trees.

This soil is moderately suited to most recreational uses. The flooding is the main limitation. The soil has potential as sites for camping areas and parks with picnic areas.

This soil is moderately suited to access roads, mainly because of the flooding. Runoff is an additional management concern. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff from the adjacent higher areas is diverted. Roadbeds should be elevated. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8A.

SxD—Sylco-Cataska complex, 15 to 30 percent slopes. This map unit consists of a moderately steep, moderately deep Sylco soil and a moderately steep, shallow Cataska soil. These soils are on very narrow ridgetops in the intermediate mountains, mainly in the Fires Creek Watershed. The Sylco soil is well drained, and the Cataska soil is excessively drained. Individual areas range from 5 to 20 acres in size. Typically, this unit is about 30 to 40 percent Sylco soil and 30 to 40 percent Cataska soil. The two soils occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Sylco soil are as follows—

Surface layer:
0 to 3 inches—dark brown channery loam
3 to 6 inches—dark yellowish brown channery loam

Subsoil:
6 to 18 inches—strong brown very channery loam
18 to 29 inches—strong brown very channery loam

Bedrock:
29 to 36 inches—fractured, soft weathered slate
36 inches—hard unweathered slate

Typically, the sequence, depth, and composition of the layers of this Cataska soil are as follows—

Surface layer:
0 to 5 inches—dark brown channery loam

Subsoil:
5 to 14 inches—dark yellowish brown very channery loam

Bedrock:
14 to 21 inches—multicolored, soft weathered slate
21 inches—hard unweathered slate

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high in the Sylco soil and from low to moderate in the Cataska soil. Seams of rock that have a high content of sulfur may underlie these soils.

Included in this unit in mapping are small areas of Junaluska, Soco, and Tsali soils. These soils have less than 35 percent rock fragments in the subsoil. Junaluska soils have more clay in the subsoil than the Sylco and Cataska soils. Junaluska and Tsali soils are on south- and west-facing nose slopes. Also included are small areas of rock outcrops. Contrasting inclusions make up about 30 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

These Sylco and Cataska soils are poorly suited to woodland management because of the stones. The equipment limitation is a severe management problem. Droughtiness and the shallowness to bedrock are also problems. Productivity is low. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, pitch pine, shortleaf pine, Virginia pine, and hickory.

These soils have the potential to produce hardwoods and pine. Pine is almost always selected for production instead of hardwoods because it offers higher profits and easier management. Shortleaf pine is preferred for planting to eastern white pine on the hotter, drier sites. The natural seeding of pine occurs in areas of seed trees. Planted, genetically improved trees produce a better stand. In areas of cutover hardwoods, site preparation for the establishment of pine, such as

prescribed burning and applications of herbicide, helps to minimize plant competition. Proper site preparation can increase the seedling survival rate. Prescribed burning helps to reduce the amount of debris and lower planting costs. Controlling competition from hardwoods may also be needed a few years after planting pine. Hardwoods are commonly selected for commercial timber production in areas where annual rainfall is more than 70 inches or where wildlife management is the primary land use. Hardwoods grow very slowly. The natural reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

These soils are poorly suited to most recreational uses because of the slope. They are used for hiking trails. Controlling erosion is an additional management concern.

These soils are not used for crops, pasture, or building sites. The slope, the droughtiness, the shallowness to bedrock, and the hazard of erosion are management concerns.

These soils are poorly suited to access roads because of the slope. The shallowness to hard bedrock and the instability of the underlying rock are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Access roads are difficult and expensive to build and maintain. Drilling and blasting of hard rock are commonly needed. The underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Ditches are impractical on these soils because banks are subject to slumping. Outsloped roads are a better way to remove water. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating the disturbed areas is a problem because of the slope and slumping. Areas on south and west aspects that freeze and thaw in spring and fall are especially difficult to revegetate. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe in areas of the Sylco soil and VIIs in areas of the Cataska soil. Based on shortleaf pine as the indicator species, the woodland ordination symbol is 5X in areas of the Sylco soil. Based on chestnut oak as the indicator species, the woodland ordination symbol is 2R in areas of the Cataska soil.

SxE—Sylco-Cataska complex, 30 to 50 percent slopes. This map unit consists of a steep, moderately deep Sylco soil and a steep, shallow Cataska soil. These soils are on mountainsides and very narrow ridgetops, mainly in the Fires Creek Watershed. The Sylco soil is well drained, and the Cataska soil is excessively drained. Individual areas range from 5 to 60 acres in size. Typically, this unit is about 30 to 40 percent Sylco soil and 30 to 40 percent Cataska soil. Sylco and Cataska soils occur as areas so intricately mixed and so small in size that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Sylco soil are as follows—

Surface layer:
0 to 3 inches—dark brown channery loam
3 to 6 inches—dark yellowish brown channery loam

Subsoil:
6 to 18 inches—strong brown very channery loam
18 to 29 inches—strong brown very channery loam

Bedrock:
29 to 36 inches—fractured, soft weathered slate
36 inches—hard unweathered slate

Typically, the sequence, depth, and composition of the layers of this Cataska soil are as follows—

Surface layer:
0 to 5 inches—dark brown channery loam

Subsoil:
5 to 14 inches—dark yellowish brown very channery loam

Bedrock:
14 to 21 inches—multicolored, soft weathered slate
21 inches—hard unweathered slate

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high in the Sylco soil and from low to moderate in the Cataska soil. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Junaluska, Soco, Spivey, and Tsali soils. Junaluska, Soco, and Tsali soils have less than 35 percent rock fragments in the subsoil. Junaluska soils have more clay in the subsoil than the Sylco and Cataska soils. Spivey soils have a dark surface layer that is thicker than that of the Sylco and Cataska soils. Junaluska and

Tsali soils are on south- and west-facing slopes, and Spivey soils are in drainageways. Also included are small areas of rock outcrops. Contrasting inclusions make up about 30 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

These Sylco and Cataska soils are poorly suited to woodland management because of the slope. A hazard of erosion is a moderate management problem, and the equipment limitation is a severe management problem. Droughtiness and the depth to bedrock are additional problems. Productivity is low. Common trees include scarlet oak, chestnut oak, black oak, white oak, eastern white pine, shortleaf pine, Virginia pine, and hickory.

These soils have the potential to produce hardwoods and pines. Pine is almost always selected for production instead of hardwoods because it offers higher profits and easier management. Shortleaf pine is preferred for planting to eastern white pine on the hotter, drier sites. The natural seeding of pine occurs in areas of seed trees. Planted, genetically improved trees produce a better stand. In areas of cutover hardwoods, site preparation for the establishment of pine, such as prescribed burning and applications of herbicide, helps to minimize plant competition. Proper site preparation can increase the seedling survival rate. Prescribed burning helps to reduce the amount of debris and lower planting costs. Controlling competition from hardwoods may also be needed a few years after planting pine. Hardwoods are commonly selected for commercial timber production in areas where the annual rainfall is more than 70 inches or where wildlife management is the primary land use. Hardwoods grow very slowly. The natural reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

These soils are poorly suited to most recreational uses because of the slope. They are used for hiking trails. Controlling erosion is an additional management concern.

These soils are not used for crops, pasture, or building sites. The slope, the droughtiness, the depth to bedrock, and the hazard of erosion are management concerns.

These soils are poorly suited to access roads because of the slope. The shallowness to hard bedrock and the instability of the underlying rock are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Access roads are difficult and expensive to build and maintain. Drilling and blasting of hard rock are commonly needed. The underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Ditches are impractical on these soils because banks are subject to slumping. Outsloped roads are a more effective way to manage water. Road construction results in cuts and fills. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating the disturbed areas is a problem because of the slope and slumping. Areas on south and west aspects that freeze and thaw in spring and fall are especially difficult to revegetate. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe in areas of the Sylco soil and VIIs in areas of the Cataska soil. Based on shortleaf pine as the indicator species, the woodland ordination symbol is 5R in areas of the Sylco soil. Based on chestnut oak as the indicator species, the woodland ordination symbol is 2R in areas of the Cataska soil.

SxF—Sylco-Cataska complex, 50 to 95 percent slopes. This map unit consists of a very steep, moderately deep Sylco soil and a very steep, shallow Cataska soil. The Sylco soil is well drained, and the Cataska soil is excessively drained. This unit is in the western part of the county on the sides of intermediate mountains. Individual areas range from 10 to 80 acres in size. Typically, this unit is about 35 to 45 percent Sylco soil and 25 to 35 percent Cataska soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping.

Typically, the sequence, depth, and composition of the layers of this Sylco soil are as follows—

Surface layer:
0 to 3 inches—dark brown channery loam
3 to 6 inches—dark yellowish brown channery loam

Subsoil:
6 to 18 inches—strong brown very channery loam
18 to 29 inches—strong brown very channery loam

Bedrock:
29 to 36 inches—fractured, soft weathered slate
36 inches—hard unweathered slate

Typically, the sequence, depth, and composition of the layers of this Cataska soil are as follows—

Surface layer:
0 to 5 inches—dark brown channery loam

Subsoil:

5 to 14 inches—dark yellowish brown very channery loam

Bedrock:

14 to 21 inches—multicolored, soft weathered slate
21 inches—hard unweathered slate

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. The content of organic matter in the surface layer ranges from low to high in the Sylco soil and from low to moderate in the Cataska soil. Seams of rock that have a high content of sulfur may underlie these soils. Landslides may occur during wet periods when the soil material slides off the contact with rock or shears along planes of weakness in the rock.

Included in this unit in mapping are small areas of Junaluska, Soco, Spivey, and Tsali soils. Junaluska, Soco, and Tsali soils have less than 35 percent rock fragments in the subsoil. Junaluska soils have more clay in the subsoil than the Sylco and Cataska soils. Spivey soils have a dark surface layer that is thicker than that of the Sylco and Cataska soils. Junaluska and Tsali soils are on south- and west-facing slopes, and Spivey soils are in drainageways. Also included are small areas of rock outcrops. Contrasting inclusions make up about 30 percent of this map unit.

Almost all of this map unit is used as woodland. Some areas are used for recreation.

These Sylco and Cataska soils are poorly suited to woodland management because of the slope. A hazard of erosion is a moderate management problem, and the equipment limitation is a severe management problem. Droughtiness and the depth to bedrock are additional problems. Productivity is low. Common trees include scarlet oak, chestnut oak, black oak, eastern white pine, pitch pine, shortleaf pine, Virginia pine, and hickory.

These soils have the potential to produce hardwoods and pine. Pine is almost always selected for production instead of hardwoods because it offers higher profits and easier management. Shortleaf pine is preferred for planting to eastern white pine on the hotter, drier sites. The natural seeding of pine occurs in areas of seed trees. Planted, genetically improved trees produce a better stand. In areas of cutover hardwoods, site preparation for the establishment of pine, such as prescribed burning and applications of herbicide, helps to minimize plant competition. Proper site preparation can increase the seedling survival rate. Prescribed burning helps to reduce the amount of debris and lower planting costs. Controlling competition from hardwoods may also be needed a few years after planting pine. Hardwoods are commonly selected in areas where annual rainfall is more than 70 inches or where wildlife management is the primary land use. Hardwoods grow very slowly. The natural reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts.

When these soils are wet, unsurfaced roads are highly unstable because of the depth to bedrock and the slope. The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

These soils are poorly suited to most recreational uses because of the slope. They are occasionally used for hiking trails. Controlling erosion is an additional management concern.

These soils are not used for crops, pasture, or building sites. The slope, the droughtiness, the depth to bedrock, and erosion are management concerns.

These soils are poorly suited to access roads because of the slope. The depth to bedrock and the instability of the underlying rock are additional problems. Seams of rock that have a high content of sulfur may be unearthed by road construction. Because these materials are highly acidic, sediments washed into adjacent streams can increase stream acidity and thus harm aquatic life. Special treatments are required. Access roads are difficult and expensive to build and maintain. Drilling and blasting of hard rock are commonly needed. The underlying rock is susceptible to landslides, especially during periods of heavy rainfall and under heavy traffic. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Ditches are impractical on these soils because banks are subject to slumping. Outsloped roads are a more effective way to manage water. Road construction results in large cuts and fills. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating the disturbed areas is a problem because of the slope and slumping. Areas on south and west aspects that freeze and thaw in spring and fall are especially difficult to revegetate. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe in areas of the Sylco soil and VIIs in areas of the Cataska soil. Based on shortleaf pine as the indicator species, the woodland ordination symbol is 5R in areas of the Sylco soil. Based on chestnut oak as the indicator species, the woodland ordination symbol is 2R in areas of the Cataska soil.

TgC—Tate gravelly loam, 8 to 15 percent slopes, stony. This strongly sloping, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains. Stones and boulders are scattered over the surface. This soil is in elevated areas between streams or on toe slopes. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 3 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Tate soil are as follows—

Surface layer:

0 to 11 inches—brown gravelly loam

Subsoil:

11 to 31 inches—reddish yellow gravelly clay loam
31 to 37 inches—reddish yellow gravelly loam
37 to 60 inches—strong brown very cobbly fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and medium in areas where the litter has been removed. Runoff and sediments from the adjacent higher areas concentrate in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate. The stones make tillage impractical in some areas and should be removed.

Included in this unit in mapping are small areas of Cullasaja, Nikwasi, and Reddies soils. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Nikwasi and Reddies soils are subject to flooding. Cullasaja, Nikwasi, and Reddies soils are along streams. Also included are soils that are similar to the Tate soil but have a redder subsoil or a high water table at a depth of 3 to 6 feet. Some areas have recent overwash 3 to 10 inches thick. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as pasture and hayland. Some areas are used for woodland, building sites, specialty crops, recreation, or cultivated row crops.

This Tate soil is well suited to pasture and hayland. The stones, soil compaction, a hazard of erosion, streambank damage, and runoff from the adjacent higher areas are management concerns. Large stones should be removed in areas of farmland or pasture. Seedbed preparation is a problem because of the cobbles and gravel in the soil. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining a dense vegetative cover can help to control erosion.

This soil is well suited to woodland management. The soil is desirable for timber production because it has very high productivity. The slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to building site development, mainly because of the slope. The stones, runoff from the adjacent higher areas, and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is moderately suited to specialty crops. The hazard of erosion is the main concern. The stones, the slope, runoff from the adjacent higher areas, and cold air drainage are additional management concerns. The soil is used for landscaping plants, such as eastern

hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Large stones should be removed when areas are converted to cropland. Preparing plant beds and digging up plants during harvesting are problems because of the many cobbles and gravel in the soil. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

This soil is moderately suited to most recreational uses, mainly because of the slope. The stones and the hazard of erosion are additional management concerns. Water sources, such as springs, are common in this map unit.

This soil is moderately suited to cultivated row crops, mainly because of the hazard of erosion. The stones, the slope, runoff from the adjacent higher areas, and cold air drainage are additional problems. Common crops include tomatoes and burley tobacco. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops, such as tomatoes. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is moderately suited to access roads. The slope, the hazard of erosion, frost action, springs and seeps, and runoff from the adjacent higher areas are management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6A.

TgD—Tate gravelly loam, 15 to 30 percent slopes, stony. This moderately steep, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 4 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Tate soil are as follows—

Surface layer:

0 to 11 inches—brown gravelly loam

Subsoil:

11 to 31 inches—reddish yellow gravelly clay loam
31 to 37 inches—reddish yellow gravelly loam
37 to 60 inches—strong brown very cobbly fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate. The stones make tillage impractical in some areas and should be removed.

Included in this unit in mapping are small areas of Cowee, Cullasaja, and Evard soils. Cowee and Evard soils have a subsoil that is redder than that of the Tate soil. Cowee soils are moderately deep to soft weathered bedrock. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cowee and Evard soils are on small knolls, and Cullasaja soils are along streams. Also included are soils that are similar to the Tate soil but have a redder subsoil or a high water table at a depth of 3 to 6 feet. Some delineations have recent overwash 3 to 10 inches thick. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

This Tate soil is moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. Runoff from the adjacent higher areas is an additional problem. The soil is desirable for timber production because it has very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by

sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to pasture, mainly because of the slope. The stones, soil compaction, the hazard of erosion, streambank damage, and runoff from the adjacent higher areas are additional management concerns. Large stones should be removed in areas of farmland or pasture. Operating farm equipment on this soil is difficult. Preparing seedbeds is a problem because of the cobbles and gravel in the soil. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a problem in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to building site development because of the slope. The stones, runoff from the adjacent higher areas, and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is moderately suited to poorly suited to most recreational uses because of the slope and the hazard of erosion. It is used for camping sites and hiking trails. Water sources, such as springs, are common in this map unit.

This soil is not used for crops because of the slope. The stones, the hazard of erosion, and runoff from the adjacent higher areas are additional management concerns.

This soil is poorly suited to access roads because of the slope. The hazard of erosion, springs and seeps, and runoff from the adjacent higher areas are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6R.

ThB—Tate loam, 2 to 8 percent slopes. This gently sloping, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 1 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Tate soil are as follows—

Surface layer:
- 0 to 4 inches—dark brown loam
- 4 to 9 inches—dark yellowish brown loam

Subsoil:
- 9 to 13 inches—dark yellowish brown loam
- 13 to 22 inches—yellowish brown clay loam
- 22 to 38 inches—strong brown clay loam
- 38 to 54 inches—strong brown gravelly loam

Underlying material:
- 54 to 60 inches—strong brown cobbly fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the

surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Dellwood, Nikwasi, and Reddies soils. These soils are along streams and are subject to flooding. Dellwood soils have more than 35 percent rock fragments in the subsoil. Dellwood and Reddies soils are moderately well drained, and Nikwasi soils are poorly drained or very poorly drained. Also included are soils that are similar to the Tate soil but have a redder subsoil or a high water table at a depth of 3 to 6 feet. Some areas have recent overwash 3 to 10 inches thick. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, specialty crops, building sites, recreation, or woodland.

This Tate soil is well suited to pasture and hayland. Soil compaction, a hazard of erosion, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining a dense vegetative cover can help to control erosion.

This soil is well suited to cultivated row crops. The slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops, such as tomatoes. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to specialty crops, such as landscaping plants. The soil has good yields, is gently sloping, and is desirable for the production of seedlings. The slope, the hazard of erosion, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Plants and trees are easily dug and ball and burlap harvested. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff. Mulch can be used to control erosion in cultivated areas where sod cannot be used.

This soil is well suited to building site development. Runoff from the adjacent higher areas and the hazard of erosion are management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is well suited to most recreational uses, such as camping sites and trailer parks. The slope and the hazard of erosion are management concerns. Water sources, such as springs, are common in this map unit.

This soil is well suited to woodland management. The soil is desirable for timber production because it has very high productivity. The slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, and yellow buckeye. This unit also includes a few black walnut trees. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields.

This soil is well suited to access roads. Runoff from the adjacent higher areas and the hazard of erosion are management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Roads should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6A.

ThC—Tate loam, 8 to 15 percent slopes. This strongly sloping, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 2 to 40 acres in size.

Typically, the sequence, depth, and composition of the layers of this Tate soil are as follows—

Surface layer:
0 to 4 inches—dark brown loam
4 to 9 inches—dark yellowish brown loam

Subsoil:
9 to 13 inches—dark yellowish brown loam
13 to 22 inches—yellowish brown clay loam
22 to 38 inches—strong brown clay loam
38 to 54 inches—strong brown gravelly loam

Underlying material:
54 to 60 inches—strong brown cobbly fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Dellwood, Nikwasi, and Reddies soils. These soils are along streams and are subject to flooding. Dellwood soils have more than 35 percent rock fragments in the subsoil. Dellwood and Reddies soils are moderately well drained, and Nikwasi soils are poorly drained or very poorly drained. Also included are soils that are similar to the Tate soil but have a redder subsoil, a high water table at a depth of 3 to 6 feet, or recent overwash 3 to 10 inches thick. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, woodland, building sites, recreation, or specialty crops.

This Tate soil is well suited to pasture and hayland. Soil compaction, a hazard of erosion, and streambank damage are management concerns. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a management concern during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining a dense vegetative cover can help to control erosion.

This soil is moderately suited to cultivated row crops. The hazard of erosion, the slope, runoff from the adjacent higher areas, and cold air drainage are management concerns. Common crops include silage corn, tomatoes, and burley tobacco. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops, such as tomatoes. Irrigation is needed for high-value crops during dry periods and to provide frost protection. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is well suited to woodland management. The soil is desirable for timber production because it has very high productivity. The slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to building site development, mainly because of the slope. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is moderately suited to specialty crops, mainly because of the hazard of erosion. The slope, runoff from the adjacent higher areas, and cold air drainage are additional management concerns. The soil

is commonly used for landscaping plants. Common landscaping plants are eastern hemlock, eastern white pine, Norway spruce, boxwood, dogwood, white birch, and maples. Plants and trees are easily dug and ball and burlap harvested in areas of this soil. Areas on toe slopes have better air drainage and are better suited to frost-sensitive crops. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff. Mulch can be used to control erosion in cultivated areas where sod cannot be used.

This soil is moderately suited to most recreational uses because of the slope. Controlling erosion is an additional management concern. Water sources, such as springs, are common in this map unit.

This soil is moderately suited to access roads. Management concerns include the slope, frost action, the hazard of erosion, springs and seeps, and runoff from the adjacent higher areas. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IVe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6A.

ThD—Tate loam, 15 to 30 percent slopes. This moderately steep, very deep, well drained soil is in coves, in drainageways, and on toe slopes of low mountains. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 4 to 30 acres in size.

Typically, the sequence, depth, and composition of the layers of this Tate soil are as follows—

Surface layer:
0 to 4 inches—dark brown loam
4 to 9 inches—dark yellowish brown loam

Subsoil:
9 to 13 inches—dark yellowish brown loam
13 to 22 inches—yellowish brown clay loam
22 to 38 inches—strong brown clay loam
38 to 54 inches—strong brown gravelly loam

Underlying material:
54 to 60 inches—strong brown cobbly fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and rapid in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer ranges from low to moderate.

Included in this unit in mapping are small areas of Cowee and Evard soils. These soils are on small knolls. They have a subsoil that is redder than that of the Tate soil. Cowee soils are moderately deep to soft weathered bedrock. Also included are soils that are similar to the Tate soil but have a redder subsoil, a high water table within a depth of 3 to 6 feet, or recent overwash 3 to 10 inches thick. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture, building sites, or recreation.

This Tate soil is moderately suited to woodland management. The slope, a hazard of erosion, and the equipment limitation are moderate management problems. Runoff from the adjacent higher areas is an additional problem. The soil is desirable for timber production because it has very high productivity. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American beech, black birch, northern red oak, sugar maple, and yellow buckeye. Windblown seeds, such as those of yellow-poplar, black locust, red maple, eastern hemlock, and eastern white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

Eastern white pine can be successfully established in cleared areas. Planted, genetically improved trees produce a better stand than naturally seeded eastern white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to

prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the content of clay.

This soil is moderately suited to pasture, mainly because of the slope. Soil compaction, the hazard of erosion, streambank damage, and runoff from the adjacent higher areas are additional management concerns. Operating farm equipment on this soil is difficult. Grazing when the soil is wet causes soil compaction and reduces the infiltration rate. Controlling erosion is a problem in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks.

This soil is poorly suited to building site development because of the slope. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that the rate of runoff is reduced and runoff is safely controlled. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

This soil is moderately suited to poorly suited to most recreational uses because of the slope and the hazard of erosion. It is used for camping sites and hiking trails. Water sources, such as springs, are common in this map unit.

This soil is not used for crops because of the slope. The hazard of erosion and runoff from the adjacent higher areas are additional management concerns.

This soil is poorly suited to access roads because of the slope. The hazard of erosion, springs and seeps, and runoff from the adjacent higher areas are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of this soil using short sections of road perpendicular to streams. Springs and seeps can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 6R.

ToA—Toxaway loam, 0 to 2 percent slopes, frequently flooded. This nearly level, very deep, poorly drained or very poorly drained soil is in depressions on flood plains along the larger streams. Individual areas occur as long bands and range from 3 to 25 acres in size.

Typically, the sequence, depth, and composition of the layers of this Toxaway soil are as follows—

Surface layer:

0 to 26 inches—very dark brown loam

Underlying material:

26 to 38 inches—dark grayish brown clay loam that has yellowish brown mottles

38 to 50 inches—very dark grayish brown clay loam

50 to 60 inches—dark grayish brown sandy loam

Permeability is moderate. Surface runoff is very slow or ponded. Flooding is frequent and occurs for very brief periods. The high water table is within a depth of 1 foot. The content of organic matter in the surface layer ranges from moderate to very high. The surface layer is friable. Tillage is impractical when the soil is wet. Tile drainage is necessary.

Included in this unit in mapping are small areas of Arkaqua, Dillard, Rosman, and Nikwasi soils. Arkaqua soils are somewhat poorly drained. Dillard soils are moderately well drained and are rarely flooded. Rosman soils are well drained or moderately well drained. Nikwasi soils are moderately deep to strata of stones, cobbles, gravel, and sand. Arkaqua and Rosman soils are along stream channels. Dillard soils are on small knolls. Nikwasi soils are in areas scoured by floodwater or where smaller streams cross this unit. Also included are soils that are similar to the Toxaway soil but have a thinner, dark surface layer or are only occasionally flooded. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as pasture and hayland. Some areas are used for cultivated row crops, woodland, or recreation.

This Toxaway soil is well suited to pasture and hayland in drained areas (fig. 9). Wetness, ponding, soil compaction, runoff from the adjacent higher areas, flooding, and streambank damage are management concerns. Tile drainage is difficult and expensive to install because of the tight soil material, lack of grade

Figure 9.—Fescue hay on Toxaway loam, 0 to 2 percent slopes, frequently flooded, is in the foreground. Silage corn on Arkaqua loam, 0 to 2 percent slopes, frequently flooded, is in the background.

needed for tile drainage, and poor outlets. Land shaping helps to open outlets and rapidly drain surface water from depressions. Grazing when the soil is wet causes soil compaction, increases ponding, and reduces the infiltration rate. Developing livestock watering facilities and limiting stream crossings by fencing can prevent streambank damage and improve water quality.

This soil is moderately suited to cultivated row crops in drained areas. Ponding, flooding, wetness, and runoff from the adjacent higher areas are management concerns. Corn grown for grain or silage is the most common crop. Plowing patterns should be designed to avoid blocking outlets and forming depressions. Grassed field borders and grassed waterways can safely divert runoff from the higher areas around row crops. The water management practices used for pasture are also appropriate for cropland. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

This soil is poorly suited to woodland management because of the wetness and flooding. The equipment limitation is a severe management problem. Alders and red maple are the dominant trees in areas reverting to woodland. On wooded sites, yellow-poplar is the most common tree. It is in stands mixed with river birch and American sycamore.

This soil is poorly suited to most recreational uses because of the wetness and flooding. Some places, however, are drained and used for camping sites and parks with picnic areas, ball fields, and tennis courts. The soil is desirable for these uses because it is nearly level and near streams.

This soil is not generally used as building sites. The flooding, the wetness, and the ponding are the main limitations. Some areas, however, have been filled and converted to commercial building sites.

This soil is poorly suited to access roads because of the wetness, flooding, and low strength. Areas of this soil should be crossed using short sections of road perpendicular to streams. Runoff from the adjacent higher areas and the ponding are additional management concerns. Building roads in elevated areas helps to provide a suitable roadbed and to minimize flood damage to the road surface. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Roads should be designed so that runoff is diverted. The number of culverts needed per mile of road is higher on this soil than on upland soils.

The capability subclass is IIIw in drained areas and Vw in undrained areas. Based on eastern white pine as the indicator species, the woodland ordination symbol is 7W.

TrE—Trimont gravelly loam, 30 to 50 percent slopes, stony. This steep, very deep, well drained soil is on north- to northeast-facing slopes of low mountains in the eastern part of the county. Stones and boulders are scattered over the surface. Individual areas range from 5 to 50 acres in size.

Typically, the sequence, depth, and composition of the layers of this Trimont soil are as follows—

Surface layer:

0 to 9 inches—dark brown gravelly loam

Subsoil:

9 to 23 inches—reddish brown sandy clay loam
23 to 34 inches—yellowish red sandy clay loam
34 to 45 inches—yellowish red fine sandy loam

Underlying material:

45 to 60 inches—multicolored fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer is moderate or high. This soil remains frozen for long periods in winter and warms up later in spring than other soils at the same elevation.

Included in this unit in mapping are small areas of Cowee, Cullasaja, Evard, and Tuckasegee soils. Cowee and Evard soils have a surface layer that is thinner or lighter colored, or both, than that of the Trimont soil. Cowee soils are moderately deep to soft weathered bedrock. Cullasaja and Tuckasegee soils formed in colluvium. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cowee and Evard soils are on south- to west-facing slopes, and Cullasaja and Tuckasegee soils are in drainageways. Small areas of rock outcrops and seeps are near the ridges. Also included are soils that are similar to the Trimont soil but have a dark surface layer that is more than 10 inches thick or have fewer surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites, pasture, or specialty crops.

This Trimont soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The soil, however, is desirable for timber production because it has high productivity and supports valuable species. Yellow-poplar is the most common tree, but black cherry, American beech, black birch, white oak, and northern red oak make up a large percentage of many stands. Scarlet oak, white oak, black oak, and hickory are common in severely high-graded areas. Windblown seeds, such as those of yellow-poplar, black locust, red maple, and eastern hemlock, reforest former fields. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, white oak, and northern red oak is favored.

Care is needed during all forestry operations to prevent soil compaction. The use of the wheeled and tracked equipment is difficult because of the slope. The use of heavy equipment should be restricted to the drier periods. When this soil is wet, skid trails and unsurfaced roads are highly erodible and very slick because of the high organic matter in the surface layer and the content of clay.

This soil is poorly suited to building site development because of the slope. Controlling erosion is a management concern. Access is often a problem in winter. Revegetating disturbed areas is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks. Septic tank absorption fields should be dug by hand because of the slope.

This soil is poorly suited to pasture because of the slope. The hazard of erosion and large stones are additional management concerns. Operating farm equipment on this soil is dangerous. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Control of weeds and applications of fertilizer and lime are usually done by hand. Cool-season grasses, such as tall fescue and orchardgrass, can maintain growth into the summer and provide late-season pasture. Maintaining pasture in good condition helps to control erosion.

This soil is not used for crops. The slope is the main limitation. Controlling erosion is also a management concern.

This soil is poorly suited to access roads because of the slope. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R.

TrF—Trimont gravelly loam, 50 to 95 percent slopes, stony. This very steep, very deep, well drained soil is on north- to northeast-facing slopes of low mountains in the eastern part of the county. Stones and boulders are scattered over the surface. Individual areas range from 10 to 80 acres in size.

Typically, the sequence, depth, and composition of the layers of this Trimont soil are as follows—

Surface layer:
0 to 9 inches—dark brown gravelly loam

Subsoil:
9 to 23 inches—reddish brown sandy clay loam
23 to 34 inches—yellowish red sandy clay loam
34 to 45 inches—yellowish red fine sandy loam

Underlying material:
45 to 60 inches—multicolored fine sandy loam

Permeability is moderate. Surface runoff is slow in areas where forest litter has not been disturbed and is very rapid in areas where the litter has been removed. The content of organic matter in the surface layer is moderate or high. This soil remains frozen for long periods in winter and warms up later in spring than other soils at the same elevation.

Included in this unit in mapping are small areas of Cowee, Cullasaja, Evard, and Tuckasegee soils. Cowee and Evard soils have a surface layer that is thinner or lighter colored, or both, than that of the Trimont soil. Cowee soils are moderately deep to soft weathered bedrock. Cullasaja and Tuckasegee soils formed in colluvium. Cullasaja soils have more than 35 percent rock fragments in the subsoil. Cowee and Evard soils are on south- to west-facing slopes, and Cullasaja and Tuckasegee soils are in drainageways. Small areas of rock outcrops and seeps are near the ridges. Also included are soils that are similar to the Trimont soil but have a dark surface layer that is more than 10 inches thick or have more surface stones, or both. Contrasting inclusions make up about 20 percent of this map unit.

Most of this map unit is used as woodland. Some areas are used for building sites.

This Trimont soil is poorly suited to woodland management because of the slope. A hazard of erosion and the equipment limitation are severe management problems. The soil, however, is desirable for timber production because it has high productivity and supports valuable species. Yellow-poplar is the most common tree. Black cherry, American beech, black birch, white oak, and northern red oak also make up a large part of many stands. Scarlet oak, black oak, and hickory are common in severely high-graded areas. Hardwoods are commonly selected for commercial timber production. Reforestation of hardwoods occurs dominantly by sprouts. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, white oak, and northern red oak is favored.

Unsurfaced roads are slick and dangerous when wet because of the high content of organic matter and the content of clay. The slope restricts the kinds of equipment that can be used in woodland management and harvesting. Wheeled and tracked equipment is dangerous to operate because of the slope. Cable yarding is safer, disturbs the soil less, and helps to maintain productivity.

This soil is poorly suited to building site development because of the slope. The hazard of erosion and cold

winters are additional management concerns. Access is often a problem in winter. Revegetating disturbed areas is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep banks. Septic tank absorption fields should be dug by hand because of the slope.

This soil is not used for pasture or crops. The slope is the main limitation. Erosion control and cold winters are additional management concerns.

This soil is poorly suited to access roads because of the slope. Roads are difficult and expensive to build and maintain. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Selecting sites on natural soil for roadbeds, if possible, helps to reduce the hazard of slumping. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality. Revegetating large cuts and fills is a problem because of the slope. Hydroseeding can successfully be used to revegetate steep roadbanks.

The capability subclass is VIIe. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8R.

TsC—Tuckasegee-Cullasaja complex, 8 to 15 percent slopes, stony. This map unit occurs as strongly sloping, very deep, well drained soils in coves, in drainageways, and on toe slopes in the intermediate mountains. Stones and boulders are scattered over the surface. Areas in coves are bowl-shaped on the lower part of the landscape and finger into the drainageways, and areas on toe slopes are long and narrow. Individual areas range from 4 to 30 acres in size. Typically, this unit is about 45 to 55 percent Tuckasegee soil and 25 to 35 percent Cullasaja soil. The two soils occur as areas so small in size and so intricately mixed that it is not practical to separate them in mapping. Generally, the Tuckasegee soil is between drainageways or along toe slopes and the Cullasaja soil is along drainageways.

Typically, the sequence, depth, and composition of the layers of this Tuckasegee soil are as follows—

Surface layer:

0 to 7 inches—very dark brown loam
7 to 12 inches—dark brown loam

Subsoil:

12 to 30 inches—dark yellowish brown loam
30 to 47 inches—yellowish brown loam
47 to 62 inches—yellowish brown cobbly fine sandy loam

Typically, the sequence, depth, and composition of the layers of this Cullasaja soil are as follows—

Surface layer:

0 to 12 inches—very dark brown cobbly fine sandy loam
12 to 17 inches—dark brown cobbly loam

Subsoil:

17 to 23 inches—dark yellowish brown cobbly fine sandy loam
23 to 60 inches—dark yellowish brown cobbly sandy loam

Permeability is moderately rapid in these soils. Surface runoff is slow in areas where forest litter has not been disturbed and medium in areas where the litter has been removed. Runoff from the adjacent higher areas is concentrated in the concave areas. The high water table is below a depth of 6 feet. The content of organic matter in the surface layer is high or very high. The stones make tillage difficult in areas of the Cullasaja soil. The Tuckasegee soil is friable and can be tilled throughout a wide range in moisture content.

Included in this unit in mapping are small areas of Dellwood soils. These soils are subject to flooding and are moderately well drained. Also included are soils that are similar to the Tuckasegee and Cullasaja soils but have a dark surface layer that is less than 10 inches thick or more than 20 inches thick. In some areas the high water table is at a depth of 3 to 6 feet. Springs and seeps are common in this map unit. Contrasting inclusions make up about 20 percent of this unit.

Most of this map unit is used as woodland. Some areas are used for pasture and hayland, cultivated row crops, building sites, recreation, or specialty crops.

These Tuckasegee and Cullasaja soils are well suited to woodland management. The soils are desirable for timber production because they have very high productivity. The slope, a hazard of erosion, and runoff from the adjacent higher areas are management concerns. This map unit is commonly used for timber production. Yellow-poplar is the most common tree. It is in stands mixed with black cherry, American basswood, American beech, black birch, northern red oak, sugar maple, yellow buckeye, eastern hemlock, and eastern white pine. Windblown seeds, such as those of yellow-poplar, black locust, sugar maple, eastern hemlock, and white pine, reforest former fields. Hardwoods are commonly selected for commercial timber production, except where cleared areas are being converted to woodland. Reforestation of hardwoods occurs dominantly by sprouts in cutover stands. Cutting all of the trees and large shrubs increases the amount and quality of sprouts. When stands are thinned, the regeneration of black cherry, northern red oak, and sugar maple is favored.

In cleared areas, white pine can be successfully

established. Planted, genetically improved trees produce a better stand than naturally seeded white pine. Prescribed burning and applications of herbicide are needed to increase seedling survival rates, control plant competition, reduce the amount of debris, and lower planting costs. Controlling plant competition also is needed a few years after planting.

Care is needed during all forestry operations to prevent soil compaction. The use of heavy equipment should be restricted to the drier periods. When these soils are wet, skid trails and unsurfaced roads are highly erodible and very slick.

These soils are moderately suited to pasture and hayland, mainly because of the stones. The slope, the hazard of erosion, runoff from the adjacent higher areas, and streambank damage are additional management concerns. The stones can damage farm equipment used to establish, maintain, and harvest pasture and hayland in areas of the Cullasaja soil. Large stones should be removed where areas are converted to pasture and hayland. Controlling erosion is a problem during the establishment of plants and in sparsely vegetated or overgrazed areas. Developing livestock watering facilities and limiting stream crossings by fencing can improve water quality and protect streambanks. Maintaining pasture in good condition helps to control erosion.

The Tuckasegee soil is moderately suited to cultivated row crops because of the slope, and the Cullasaja soil is poorly suited because of the stones. Runoff from the adjacent higher areas and the hazard of erosion are additional management concerns. Silage corn is the most common crop. Large stones should be removed when areas are converted to cultivated cropland. Conservation practices, such as contour farming and diversions, can control erosion and water. Grassed field borders and grassed waterways can safely divert runoff around row crops. Drainage is needed in areas around springs and seeps. The amount of soil-applied herbicides needed for effective weed control may be greater than normal because of the content of organic matter in the surface layer. Vegetative filter strips improve water quality and provide wildlife habitat.

The Tuckasegee soil is moderately suited to building site development because of the slope, and the Cullasaja soil is poorly suited because of large stones and the tendency of cutbanks to cave. Runoff from the adjacent higher areas and the hazard of erosion are additional problems. A water table may occur at a depth of 6 to 10 feet. Excavation for dwellings with basements can be hindered by underground water, and a drainage system may be needed. Building sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. Areas of seeps, springs, and runoff should not be selected as sites for septic tank absorption fields.

These soils are moderately suited to most recreational uses, such as camping sites and trailer parks. The slope and small stones are the main management concerns. This map unit is preferred by campers because it is near streams and generally has shaded areas. The slope and the hazard of erosion are management concerns. Water sources, such as springs, are common in this map unit.

The Tuckasegee soil is moderately suited to specialty crops, such as landscaping plants, and the Cullasaja soil is poorly suited. The stones, the slope, the hazard of erosion, and runoff from the adjacent higher areas are management concerns. Common landscaping plants are eastern hemlock, eastern white pine, and Norway spruce. Although Fraser fir is not commonly grown in this map unit, these soils have good potential for its production. Large stones should be removed when areas are converted to cropland. Preparing seedbeds and digging up plants during harvesting are difficult in the Cullasaja soil because of the many small stones. Plants and trees are easily dug and ball and burlap harvested in areas of the Tuckasegee soil. Establishing and maintaining sod in areas not needed for crops help to control erosion and runoff.

The Tuckasegee soil is moderately suited to access roads because of the slope and frost action, and the Cullasaja soil is poorly suited because of large stones. Runoff from the adjacent higher areas, springs and seeps, and the hazard of erosion are additional management concerns. Because unsurfaced roads are soft and slick when wet, roads require surfacing for year-round use. Gravel continuously sinks into the soil material. Frequent smoothing of the road surface is necessary because ruts form easily. Water-related problems can be minimized by crossing areas of these soils using short sections of road perpendicular to streams. Springs, seeps, and large stones can be avoided by building roads in the higher adjacent areas. Road sites should be designed so that runoff from the adjacent higher areas is diverted. Water from seeps and springs should be intercepted and diverted. The number of culverts needed per mile of road is higher on these soils than on upland soils. Seeding and maintaining a good vegetative cover on all banks help to minimize sediments and improve water quality.

The capability subclass is IIIe in areas of the Tuckasegee soil and VIIs in areas of the Cullasaja soil. Based on yellow-poplar as the indicator species, the woodland ordination symbol is 8A in areas of both soils.

Ud—Udorthents, loamy. This map unit consists of areas that have been mined, graded, or filled, including borrow areas, landfills, mines, major highways, commercial sites, and golf courses.

Borrow areas are excavated areas where the soil material is removed for use as fill on construction sites. The cuts are 4 to more than 20 feet deep. The base slope in these cuts is level to steep. Most cuts have two or more nearly vertical side slopes. The exposed surface layer consists mainly of dense weathered rock. These areas commonly range from 3 to 10 acres in size. They commonly include small, intermittently ponded areas, loose fill material, and exposed bedrock.

Some of the borrow areas are temporarily seeded and vegetated. Other areas naturally seed to wild grasses, weeds, and trees. Borrow areas have poor physical properties, which adversely affect plant growth. The available water capacity, soil fertility, and the content of organic matter in the surface layer are low. The rooting depth commonly is shallow. Seeded areas have potential for wildlife habitat. Neglected areas erode quickly and are a significant source of sediments in streams.

Landfills are areas where the natural soil has been altered by operations for waste disposal. These excavated areas consist of graded trenches that are backfilled with alternating layers of solid refuse and soil material. The final surface is covered with about 2 feet of soil material. After the final cover is added, the surface ranges from nearly level to steep. Maintaining a vegetative cover generally is difficult and expensive in areas of landfills. In addition, the potential production of methane gas by decomposing wastes severely limits the use of these areas after landfilling operations are completed.

Mines are areas that are actively being mined or have been recently mined. Crushed stone for roadbeds or other construction purposes is mined from gneiss, metasandstone, and quartzite. Because the characteristics of the soil material within these areas are so variable, onsite examination of individual areas is needed to make interpretations.

Major highways include areas where a large amount soil material has been removed during the construction of roads. Many of the cuts are 10 to 40 feet or more deep. Drilling and blasting hard rock have resulted in the exposure of nearly vertical rock faces in some areas. The fills are 10 to 30 feet or more deep. These areas are seeded and vegetated. The slope varies from gently sloping to nearly vertical on rock faces. These areas occur as long delineations that parallel U.S. Highway 64. Individual areas are commonly 400 to 1,000 feet wide and range from 10 to more than 500 acres in size.

Commercial sites are excavated, leveled areas along major highways. Many of the cuts are 10 to 40 feet or more deep. The fills are commonly 10 feet or more deep. These areas are seeded and vegetated. The base slope is nearly level, but small areas of nearly vertical cuts also occur. The areas of commercial sites are mostly along U.S. Highway 64 and North Carolina Highway 69 near the town of Hayesville. They commonly range from 3 to 20 acres in size.

Golf courses are excavated areas that have had major cutting, filling, and leveling. Cuts and fills that are 10 feet or more deep are common. The areas are seeded and vegetated after construction. The slope varies from gently sloping to moderately steep, but small areas of nearly vertical cuts may also occur. The areas of golf courses commonly range from 10 to 50 acres or more in size.

The capability subclass is VIIe. A woodland ordination symbol has not been assigned to this map unit.

Prime Farmland

In this section, prime farmland is defined. The soils in Clay County that are considered prime farmland are listed in table 5.

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. The moisture supply must be adequate, and the growing season must be sufficiently long. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources. Farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They are used for food or fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial and commercial sites, institutions, public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils usually receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not frequently flooded during the growing season. The slope ranges mainly from 0 to 8 percent.

The map units considered prime farmland in Clay County are listed in table 5. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

Some soils that have a high water table or are flooded during the growing season qualify as prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. If applicable, the need for these measures is indicated in parentheses after the map unit name in table 5. Onsite evaluation is necessary to determine whether or not limitations have been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. It can also help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help to prevent construction failures caused by unfavorable soil properties.

Generally, the soils in Clay County that are well suited to crops, except for those that flood or have a high content of clay in the subsoil, also are well suited to urban uses. The data concerning specific soils in the county can be used in planning future land use patterns. The potential for farming should be considered relative to any soil limitation and the potential for nonfarm development.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern that is in harmony with nature.

Contractors can use this survey to locate sources of sand, gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

William Yarborough, fertility specialist, Soil Testing Service, North Carolina Department of Agriculture; Steve West, County Extension Director, Haywood County, North Carolina; and Bobby G. Brock, agronomist, and Richard Greene, district conservationist, Natural Resources Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils are identified; the system of land capability classification used by the Natural Resources Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units" and in the tables. Specific information can be obtained from the local office of the Natural Resources Conservation Service or the North Carolina Cooperative Extension Service.

Federal and State regulations require that any area designated as wetlands cannot be altered without prior approval. Contact the local office of the Natural Resources Conservation Service for identification of hydric soils and potential wetlands.

Cropland Management

Cropland management includes water management, soil tilth, erosion control, chemical weed control, soil fertility, and site selection and field layout. Most of the cultivated land in Clay County is on flood plains, stream terraces, and low rolling hills. A small acreage is in the coves of low and intermediate mountains. Farmers should profitably manage cropland while conserving soil and water. Crops grown in Clay County can be divided into two groups: conventional crops and ornamental and horticultural crops. The most common conventional crops are silage corn, tobacco, and tomatoes (fig. 10). These crops are grown mainly on flood plains, stream

Figure 10.—Tomatoes and burley tobacco on Reddies loam, 0 to 3 percent slopes, frequently flooded.

terraces, and low rolling hills. Ornamental crops in the county include Norway spruce, eastern white pine, eastern hemlock, Bradford pear, boxwood, dogwood, white birch, a variety of maples, and other native trees, shrubs, and herbaceous plants used in landscaping. Also grown are hybrid trees, shrubs, and flowers. All of these species require intensive management and high maintenance. White pine and Norway spruce are important for the production of Christmas trees. Nurseries that produce landscaping plants are becoming more common on small acreages in coves and on the flood plains of low and intermediate mountains (fig. 11).

Water management. The soils on the flood plains have flood frequencies that vary from year to year. Dellwood, Nikwasi, French, and Reddies soils are more prone to flash floods than Rosman, Arkaqua, and Toxaway soils. Rosman, Arkaqua, and Toxaway soils are on streams that have deeper, more defined channels. The rarely flooded Hemphill and Dillard soils are on stream terraces that are slightly higher than the adjacent flood plains, but flooding is still possible. The loss of crops because of flooding is always a risk during the growing season on the soils of the flood plains. Flood protection is provided for some of these soils in areas on the river flood plain, extending from the dam

at Chatuge Lake downstream to the mouth of Tusquitee Creek.

Arkaqua, French, Nikwasi, and Toxaway soils are on flood plains, have a seasonal high water table, and require artificial drainage for crop production. Dillard, Lonon, Santeetlah, Tate, and Tuckasegee soils include a few wet areas resulting from seeps and springs. Subsurface tile drainage is used to drain these soils.

Managing surface water upslope from fields is important for cropland. Hemphill soils are poorly drained and clayey and do not respond well to subsurface drainage systems, such as tile drainage systems. Surface drainage is needed to produce crops on these soils. Most of the cropland soils are adjacent to higher, steeper areas of upland soils. Water runoff from the upland areas causes a hazard of erosion for the cropland soils and can bury crops in sediments. The movement of overland flow originating in the uplands

Figure 11.—Landscaping plants on French fine sandy loam, 0 to 3 percent slopes, frequently flooded.

should be controlled in cultivated fields. Stripcropping, diversions, and grassed waterways help to control surface water. Maintaining filter strips in areas below cropped fields minimizes environmental damage caused by runoff, sediments, pesticides, and loss of fertile soil. Onsite investigations are essential to determine the proper management method for each field.

Soil tilth. Soils that have good tilth can be easily tilled during seedbed preparation and can provide desirable plant rooting. Soil properties associated with good tilth are loamy textures and granular structure. Good tilth can be destroyed by cultivation or animal traffic during wet periods.

Surface crusting results when clay settles and dries on the soil surface after the surface is ponded. Tillage patterns should be designed so that outlets for surface water are not blocked. New outlets should be provided as needed to drain surface water from ponded soils. Maintaining a dense stand of grass or organic residue on the surface protects the soil from the direct impact of raindrops, which can also cause crusting.

Most of the soils in Clay County that have slopes of less than 4 percent have good tilth unless they have been ponded or had traffic when wet. A surface layer that has a high content of clay, especially in eroded areas, generally has poor tilth. These areas are susceptible to rapid runoff.

Practices that adversely affect soil tilth are continuous cropping systems that do not include erosion control or the return of crop residue to the soil and the use of heavy farm equipment, which causes surface compaction, especially during wet periods. Good tilth can be maintained by planting cover crops, which provide a vegetative cover during winter, or by using conservation tillage practices that leave organic mulch on the surface.

Erosion control. Cropland soils that have slopes greater than 4 percent are the most susceptible to erosion. Erosion is costly for several reasons. Topsoil, water, pesticides, fertilizers, lime, and organic matter are lost if erosion is not controlled. These losses result in reduced productivity and the pollution of streams, lakes, and reservoirs by sediments, agricultural chemicals, and nutrients. Trout streams are especially sensitive to damage caused by sediments.

Conservation tillage is the most effective method of erosion control currently used in Clay County. Conservation tillage provides a year-round surface cover of live vegetation or stubble. A surface cover of stubble or organic residue also reduces evaporation during the seedling stage of the growing season.

Stripcropping can effectively control erosion and conserve water. The grass strips reduce the length of slope in cultivated areas and thus help to slow runoff. Diversions and grassed waterways work well in combination with stripcropping. These methods are practical in most of the cropped areas in the county that have a hazard of erosion, and they can be adapted to a wide range of slope patterns.

Chemical weed control. The use of herbicides for weed control is a common practice on the cropland in Clay County. It decreases the need for tillage and is an integral part of modern farming. Selected soil properties, such as organic matter content and texture of the surface layer, affect herbicide effectiveness and the required rate of soil-applied herbicide. Estimates of both of these properties were determined for the soils in this survey area. Table 15 shows a general range of organic matter content in the surface layer of the soils. The texture of the surface layer is shown in the USDA texture column in table 14.

In some areas the organic matter content projected for the different soils may be outside the range shown in the table. The content can be higher in soils that have received high amounts of animal or manmade waste. Soils that have recently been brought into cultivation may have a higher content of organic matter in the surface layer than similar soils that have been cultivated for a long time. Conservation tillage can increase the content of organic matter in the surface layer. A lower content of organic matter is common where the surface layer has been partly or completely removed by erosion, land smoothing, or other activities. Current soil tests should be used for specific organic matter determinations. Herbicide labels show specific application rates based on the organic matter content and texture of the surface layer.

Soil fertility. The soils in Clay County generally are low in natural fertility. They are naturally acid. Additions of lime and fertilizer are needed for the production of most kinds of crops.

Most of the ornamentals grown in Clay County are nutrient specific. No general recommendations can be made. Soil tests and leaf analysis should be done regularly and their results followed carefully.

Lime and fertilizer should be applied to orchards to maintain the sod and to produce desired apple yields. Recommendations based on soil tests and leaf analysis should be used to develop a fertilizer program.

The local office of the Natural Resources Conservation Service or the Cooperative Extension Service should be contacted when planning ornamental crop production. Information on site selection, soils, fertility, and field layout is available.

Liming requirements are a major concern on cropland. The acidity level in the soil affects the

availability of many nutrients to plants and the activity of beneficial bacteria. Lime also neutralizes exchangeable aluminum and thus counteracts the adverse effects that high levels of aluminum have on many crops. Liming adds calcium (from calcitic lime) or calcium and magnesium (from dolomitic lime) to the soil.

A soil test is a guide to what amount and kind of lime should be used. The desired pH levels may differ, depending on the soil properties and the crop to be grown.

Nitrogen fertilizer is required for most crops. It generally is not required, however, for clover, in some rotations of soybeans, or for alfalfa that is established. A reliable soil test is not available for predicting nitrogen requirements. Appropriate rates of nitrogen application are described in the section "Yields per Acre."

Soil tests can indicate the need for phosphorus and potassium fertilizer. They are needed because phosphorus and potassium tend to build up in the soil. Fields of burley tobacco commonly have received applications of fertilizer for a long time and commonly have high levels of phosphorus and potassium (fig. 12).

Site selection and field layout. Site selection and field layout are extremely important to many ornamental and horticultural crops. For example, soils that have a content of clay less than 15 percent in the surface layer are not favorable for ornamentals that are ball and burlap harvested because these soils ball poorly. Soils that are wet, in natural drainageways, or have a content of clay greater than 30 percent in the surface layer should also not be used for ornamentals. These soils hold excess moisture around roots, which results in poor growth and encourages phytophthora root disease. Soils that have slopes greater than 30 percent should not be used as orchard or nursery sites because the slope is a hazard for mowing, spraying, and harvesting equipment. Steep and very steep slopes increase labor costs and the amount of time needed for harvesting and detrimentally affect plant shape. Sites for ornamentals should be selected in areas having an adequate supply of clear water that can be used for spraying or irrigation. Disturbing as little of the planting area as possible helps to prevent excessive erosion. Areas between plants and areas between rows should remain in permanent sod.

The layout of an orchard should include safe outlets for water flowing into the orchard from higher areas and for water flowing out of the orchard. Field borders and diversions that conduct water into grassed waterways can dispose of flowing water without causing erosion. Perennial vegetation should be established between rows of trees and on all roads and erosion-control structures. Rows of trees should be planted on the contour as nearly parallel to each other as possible. This arrangement helps to control erosion and allows easy access.

Access roads are very important for orchards. These roads should be graded to allow water to safely flow off them. They should be located carefully and planted with perennial vegetation as soon as possible after construction. Short or dead-end roads, which make access with equipment difficult, and roads with sharp turns or with grades greater than 10 percent should not be constructed. Wet areas or natural drainageways should not be used as sites because they hinder the use of equipment. Water bars and culverts should be installed where needed.

Site selection should be considered carefully when planning an orchard. A sloping topography allows good air drainage. Good air drainage helps to prevent damage caused by frosts and freezes during bloom and bud stages. Sites that are gullied, have many ravines, or have abrupt changes in slope should not be selected. Orchards should be established near an adequate supply of water, which can be used for spraying or irrigation. Apple trees grow best on very deep, drained soils that have a loamy subsoil. Very deep, well drained, clayey soils, however, also are commonly used for orchards in Clay County. Braddock, Evard, Edneyville, and Hayesville soils are suited to apple orchards. Trees planted in soils that are wet, affected by seeps, or in natural drainageways produce low yields and are more susceptible to disease. Spivey, Cullasaja, Tate, and Lonon soils are in these undesirable areas and should not be used for orchards.

White pine and Norway spruce are adapted to the drier, warmer sites and can tolerate clayey soil textures. Soils need a minimum of 15 percent clay in the surface layer if these ornamentals are to be satisfactorily ball and burlap harvested. Evard, Cowee, Hayesville, Brasstown, Junaluska, Braddock, Lonon, and Tate soils are suited to these species.

A small acreage in Clay County is used for the production of native ornamentals, such as mountain laurel, rhododendron, eastern hemlock, and Carolina hemlock, hybrid ornamentals, and other woody ornamentals. These plants grow on well drained, loamy soils. Also, these soils should have a content of clay in the surface layer between 15 and 30 percent, which allows ball and burlap harvesting. The plants need to be protected from winter winds, especially at high elevations. Tate, Statler, Tuckasegee, and Lonon soils are well suited to native ornamentals.

Although Fraser fir is not commonly grown in Clay County, this tree has potential in the production of Christmas trees. Fraser fir is best adapted to cool sites at elevations above 3,500 feet but is commercially grown at elevations as low as 2,000 feet in other

Figure 12.—Burley tobacco and Irish potatoes on Lonon loam, 2 to 8 percent slopes. This field has a long history of fertilizer applications, and the soil may have high levels of phosphorus and potassium.

counties of North Carolina. It is best suited to well drained, loamy soils in areas where annual rainfall is greater than 55 inches. Most of the gently sloping to strongly sloping, very deep, well drained soils of the intermediate mountains are well suited to Fraser fir. At the lower elevations, sites for Fraser fir should be on soils that have a moderate content of organic matter and are on cool aspects. Possible sites are on Rosman, Santeetlah, Statler, and Tuckasegee soils. Sites that are below an elevation of 2,500 feet, are on south- or

west-facing slopes, or are on soils having a subsoil that contains more than 35 percent clay are marginally productive.

Christmas trees should be planted in a grid pattern, usually in spaces 5 feet by 5 feet, that allows the easy access of mowing and spraying equipment. Soils that have less than 10 percent clay in the upper 12 inches are best suited to line-out beds of conifers. Soils that have more than 10 percent clay hold seedling roots too tightly, and thus roots are torn and broken during harvesting. This root damage reduces the vigor of seedlings transplanted in the field.

Access roads should be carefully planned and constructed. They should not be constructed in natural drainageways, in wet areas, or where the roadbed grade would be more than 10 percent. They should be surfaced or seeded with perennial vegetation as soon as possible after construction. Lime and fertilizer should be incorporated during construction and applied regularly to maintain the sod. Cut and fill slopes should be stabilized with vegetation as soon as possible.

Pasture Management

Pastures in Clay County have a wide variety of management concerns. Some pastures include a wide range of soil types, many of which exist side by side in individual fields. In many areas wet soils on flood plains, such as Toxaway and Nikwasi soils, join steeper, drier soils, such as Braddock, Evard, Fannin, and Hayesville soils, in the same pasture. Seeps and springs occur on side slopes, on toe slopes, and in coves. Because of these conditions, drought and drowning can be hazards in the same pasture. Pastures in areas of the eroded Braddock and Hayesville soils are more droughty and are subject to compaction. Pastures on south- and west-facing slopes can be damaged by frost heave. These conditions increase the difficulty of establishing, maintaining, and managing pasture. During the establishment of new seedings, mulch can protect the bare soil from erosion and reduce evaporation.

The best soils for pasture and hay are nearly level to strongly sloping, well drained or moderately well drained soils on flood plains, on stream terraces, in coves, and in drainageways. They include Rosman, Reddies, Statler, Dillard, Lonon, Tate, and Tuckasegee soils. Because these soils also are the most productive cropland soils, however, pasture and hay is often grown on eroded and moderately steep soils on side slopes and ridges. Somewhat poorly drained to very poorly drained soils on flood plains and terraces also are commonly used for pasture and hay.

Fertility. Pastures in Clay County have the potential for increased yields. Erosion control, improved plant varieties, applications of fertilizer and lime according to soil test recommendations, and rotational grazing using cross fences help to increase yields.

Generally, a complete fertilizer is required at the beginning of a fertility program. Nitrogen is normally the element most needed. Because there is no soil test for nitrogen, nitrogen is usually applied according to the needs of the pasture plants. Soil tests are needed to determine the proper amounts of phosphorus and potassium to be applied. After a pasture is established, the quality of yield can be greatly improved by further applications of nitrogen.

Chemical fertilizers are the most popular and convenient source of nutrients, but Clay County has dairy operations, which generate manure that can supplement a pasture fertilization program.

Properly timing applications of fertilizer is very important in maximizing pasture yields. Generally, cool-season plants should be fertilized before their periods of maximum growth. If fertilizer application is not properly timed, the number of grazing days on a pasture will be below potential.

Plant species. Livestock producers in Clay County should use pasture species that can grow under a wide range of soil conditions and can also produce yields of high quality and quantity.

Fescue is the most widely suited pasture species in Clay County. Because it can be established and produce very well on soils that have a high water table or clayey textures and in eroded areas, fescue is a very important part of the county's livestock industry. It also is an excellent companion crop to legumes, such as ladino clover and red clover, in pasture mixtures. In Clay County, a legume should be seeded with fescue to increase the palatability and nutritive value of the forage and to reduce the need for nitrogen fertilizers.

Kentucky bluegrass is a pasture species preferred by horses and sheep. Pastures of bluegrass can be improved by applications of high-analysis phosphate fertilizers, which promote the growth of native white clover and increase the quality of forage.

Orchardgrass, another important species, can grow anywhere that fescue thrives, except in wet areas, such as areas of Hemphill, Nikwasi, and Toxaway soils. It has requirements similar to those of fescue but is more susceptible to overgrazing and weed competition. Rotational grazing is important in increasing the lifespan of this species.

In the past, alfalfa was grown extensively in Clay County. Because of a high population of alfalfa weevil, however, this forage plant was phased out of production. Today, because of new resistant varieties and improved pesticides, alfalfa production is increasing. Alfalfa grows best on well drained, loamy or

clayey soils that have been limed according to the recommendations of soil tests. Junaluska, Brasstown, Hayesville, Braddock, Lonon, Statler, Tate, and Evard soils are examples. Alfalfa grows poorly on wet soils, such as Nikwasi, Hemphill, and Toxaway soils.

Including annual summer grasses, such as sudangrass, switchgrass, and sorghum, in a forage program helps to provide silage and hay. Cattle producers can use these grasses as forage in summer, when cool-season grasses are dormant.

Winter cover crops, such as winter wheat or rye, can be used for limited grazing in winter and thus supplement the baled hay fed to livestock.

Livestock producers in Clay County can provide pasture and hay year-round by using cool-season grasses, alfalfa, and clovers for permanent pastures and using annual summer grasses and winter cover crops for temporary forage during summer and winter, respectively.

Erosion control. Pastures in areas where slope is greater than 30 percent generally are too steep for farm equipment. Fertilizer and lime must be applied by hand, or access roads must be built for farm equipment. Applications of fertilizer and lime by hand are usually uneven and result in poor stands of pasture that can support only a few cattle. Where the vegetative cover is poor, erosion, the growth of unwanted weeds, and the encroachment of shrubs and trees at field borders are concerns. Where the construction of access roads is not economically feasible and where lime and fertilizer cannot be regularly applied by hand, maintaining pastures is difficult.

Erosion is a problem in establishing and maintaining pastures on slopes greater than 4 percent. Planting on the proper dates helps to ensure a good stand in a timely manner. Warm-season species, such as sudangrass, should be planted in spring when frost is no longer a danger.

Plowing is not recommended for establishing or maintaining forage. After rainfall, plowed soil can develop a crust, which results in a high rate of seedling mortality. Bare soil is susceptible to severe erosion. Minimizing tillage, applying herbicides, and planting in existing sod or stubble are recommended. The texture of the surface layer and the content of organic matter should always be considered in determining applications of herbicides.

Large amounts of erosion and downstream sedimentation occur along watercourses because of livestock traffic. To help control the erosion, livestock should be fenced away from streams and watering systems that use springs and wells should be installed.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

A high level of management includes maintaining proper soil reaction and fertility levels as indicated by standard soil tests. The application rate of nitrogen for corn on soils that have a yield potential of 125 to 150 bushels per acre should be 140 to 160 pounds per acre. If the yield potential for corn is 100 bushels per acre or less, a rate of 100 to 120 pounds of nitrogen per acre should be used. The application of nitrogen in excess of that required for potential yields generally is not recommended. The excess nitrogen fertilizer that is not utilized by a crop is an unnecessary expense and causes a hazard of water pollution. If corn is grown after the harvest of soybeans, nitrogen rates can be reduced by about 20 to 30 pounds per acre.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is properly conducted.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or

of the North Carolina Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for use as cropland *(10)*. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability classification system, soils are generally grouped at three levels—capability class, subclass, and unit. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class I because the soils of this class have few limitations. The soils in class V are subject to little or no erosion, but they have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation. Class V contains only the subclasses indicated by *w, s,* or *c.*

The capability classification of each map unit component is given in the section "Detailed Soil Map Units" and in table 6.

Woodland Management and Productivity

Albert Coffey, forester, Natural Resources Conservation Service, and Sara A. Browning, soil scientist, U.S. Forest Service, helped prepare this section.

Forests are one of the most important resources of Clay County. They provide wood products, scenic beauty, wildlife habitat, and opportunities for outdoor recreation. Timber production, outdoor recreation, development of sites for second homes, and wildlife habitat often are competing forest uses. The result is that forest managers are faced with the challenge of producing greater yields from smaller areas of forest land. Many of the woodland management techniques now being applied throughout the forest industry resemble those long practiced in agriculture. The techniques include establishing, weeding, and thinning desirable young stands; propagating more productive species and genetic varieties; complete fiber utilization and shortening periods between rotations; controlling insects, diseases, and forest weeds; and increasing growth through fertilization. In addition to these practices, cattle grazing should be restricted from areas managed for timber. Although timber crops require decades to grow, the goal of intensive woodland management is similar to the goal of intensive agriculture—to produce the greatest yield of the most valuable crop in the shortest time possible.

Commercial forests cover much of the land area of Clay County. Commercial forest land is land that is producing or is capable of producing crops of industrial wood and that has not been withdrawn from timber production. Evaluations of timber sites are based on volume per acre, species, and quality. Yellow-poplar produces the highest volume per acre in the county. It grows fast, is adapted to many of the soils, and is easy

Figure 13.—Clearcut harvesting on Cheoah channery loam, 50 to 95 percent slopes. The U.S. Forest Service is managing this site for the production of quality northern red oak and black cherry.

to establish and manage. Quality northern red oak, black cherry, white oak, and sugar maple are the desired products in the marketplace. These species bring the highest value per unit of timber and are in short supply. They grow slower, are very site specific, and are more difficult to establish and manage than yellow-poplar. Low-quality timber and forest products of any species are heavily marked down in price. Comparing the total volume of wood produced from different stands of timber is not the best way to determine the comparative value of forest sites. Species and quality are as important as volume in the marketplace. The difference in value between high-quality and low-quality forest products cannot be overlooked.

Much of the forest land in Clay County has been high-graded. Stands in these areas have few valuable trees remaining for the high-quality markets. Converting these sites to the production of high-value timber species often requires clearcutting (fig. 13). Clearcutting is the fastest way to produce quality timber on these sites. It is necessary in producing stands of northern

red oak and black cherry. Many landowners, however, do not clearcut but manage existing stands because clearcut areas cannot be harvested for a long time.

Forest Types

For management purposes, timber sites are generally grouped by forest type. The forest types in Clay County are yellow-poplar, oak-hickory, northern red oak, yellow pine, and eastern white pine *(8)*. The characteristics of a given site are commonly, but not always, indicated by the forest type on that site. The present forest type is often the result of past management. Some sites may be well suited to more than one forest type. Management decisions for these areas can be based on the goals of the landowner.

Yellow-poplar. This forest type commonly occurs in coves and drainageways. It produces the highest volume of wood per acre of all the forest types. Yellow-poplar is the most common species. This forest type also includes varying amounts of northern red oak, white oak, black cherry, black birch, eastern hemlock, black locust, American basswood, sugar maple, and yellow buckeye. At elevations above 4,000 feet, yellow-poplar is less dominant and northern red oak, black cherry, black birch, yellow birch, hemlock, American beech, and sugar maple are more common. Northern red oak, white oak, black cherry, and sugar maple are more valuable than yellow-poplar and are favored in timber management practices. The soils commonly associated with this forest type include Lonon, Tate, Tuckasegee, Cullasaja, Spivey, and Santeetlah soils.

Oak-hickory. This forest type occurs on south- to west-facing aspects on side slopes and ridges at elevations as high as 4,800 feet. According to acreage, it is the most extensive forest type in the county. It produces the lowest volume of wood per acre in the county. It also has been the most affected by past high-grading. Sites of this forest type are typically hotter and drier than those of the northern red oak forest type. This forest type, however, can, under proper management, produce high-quality timber. The dominant species generally are black oak, chestnut oak, scarlet oak, and hickories. Various other species, including white oak, red maple, pitch pine, and eastern white pine, are also associated with this type. The soils commonly associated with this forest type include Chestnut, Cowee, Edneyville, Evard, Fannin, Brasstown, Junaluska, Hayesville, Soco, and Stecoah soils.

Northern red oak. This forest type occurs on cool aspects on uplands at elevations between 3,000 and 5,500 feet. At elevations below 4,000 feet, it occurs mainly on north- to east-facing side slopes. At elevations above 4,500 feet, it occurs on various aspects on ridges and side slopes. Northern red oak is the most common species. Yellow-poplar, black cherry, American beech, sweet birch, yellow birch, and sugar maple also make up a large part of many stands. Various other species that require cool temperatures, such as yellow buckeye and eastern hemlock, are also common in some stands. This forest type has a large percentage of valuable species, and it commonly has the most valuable stands of timber. The soils commonly associated with this type include Plott, Trimont, and Cheoah soils. At elevations above 4,800 feet, this type is in areas of Burton, Craggey, and Oconaluftee soils. At elevations above 4,800 feet, the soils are not used for commercial timber because frequent ice storms and high winds retard tree growth and cause poor tree shape.

Yellow pine. This forest type occurs on cleared land that was reseeded or planted to pines. It commonly occurs on ridges and side slopes of low rolling hills. Shortleaf pine and Virginia pine are the dominant species. The acreage of this forest type in the county is small. Dry sites of various hardwoods, such as scarlet oak, chestnut oak, blackgum, and sourwood, are also associated with this forest type. The soils commonly associated with this type include Hayesville, Evard, Cowee, Brasstown, and Junaluska soils.

Eastern white pine. This forest type does not occur naturally. Stands of eastern white pine have been planted. This type commonly occurs on ridges and side slopes that previously supported oak-hickory. Areas were converted because eastern white pine produces a greater volume and requires shorter rotations than oak-hickory. Generally, sites of yellow-poplar cannot be easily converted to eastern white pine because of plant competition problems.

One of the first steps in planning intensive woodland management is to determine the potential productivity of the soil for several alternative tree species. The most productive and valued trees are then selected for each soil type. Site and yield information enables a forest manager to estimate future wood supplies. These estimates are the basis of realistic decisions concerning future expenses and profits associated with intensive woodland management, land acquisition, or industrial investments.

The potential productivity of woodland depends on physiography, soil properties, climate, and the effects of past management. Specific soil properties and site characteristics, including soil depth, texture, structure, and depth to the water table, affect forest productivity primarily by influencing available water capacity, aeration, and root development. The net effects of the interaction of these soil properties and site characteristics determine the potential site productivity.

Other site factors are also important. The gradient and length of slopes affect water movement and availability. In mountainous areas, elevation and aspect affect the amount of sunlight a site receives and the rate of evaporation. Sites on south-facing slopes, except where they are shaded by higher mountains, are warmer and drier than those on north-facing slopes. The best sites are generally on north- and east-facing slopes in the lower areas, in sheltered coves, and in gently sloping concave areas. The amount of rainfall and length of growing season influence site productivity.

In the higher mountains, some areas of woodland are exposed to high winds and severe winter temperatures and ice, which can twist, stunt, and break trees. These areas are unable to support commercial forests even though they have soils capable of producing trees. They occur in map units indicated by a windswept phase.

This soil survey can be used by woodland managers planning ways to increase the productivity of forest land. Some soils respond better to applications of fertilizer than others, and some are more susceptible to landslides and erosion after roads are built and timber is harvested. Some soils require special reforestation efforts. In the section "Detailed Soil Map Units," the description of each map unit in the survey area suitable for timber includes information about productivity, limitations in harvesting timber, and management concerns in producing timber. Table 7 summarizes this forestry information and rates the soils for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of the major soil limitations to be considered in forest management.

Table 7 lists the *ordination symbol* for each soil. The first part of the ordination symbol, a number, indicates the potential productivity of a soil for the indicator species in cubic meters per hectare per year. The larger the number, the greater the potential productivity. Potential productivity is based on the site index and the point where mean annual increment is the greatest.

The second part of the ordination symbol, a letter, indicates the major kind of soil limitation affecting use and management. The letter *R* indicates a soil that has a significant limitation because of the slope. The letter *X* indicates that a soil has restrictions because of stones or rocks on the surface. The letter *W* indicates a soil in which excessive water, either seasonal or year-round, causes a significant limitation. The letter *T* indicates a soil that has, within the root zone, excessive alkalinity or acidity, sodium salts, or other toxic substances that limit the development of desirable trees. The letter *D* indicates a soil that has a limitation because of a restricted rooting depth, such as a shallow soil that is underlain by hard bedrock, a hardpan, or other layers that restrict roots. The letter *C* indicates a soil that has a limitation because of the kind or amount of clay in the upper part of the profile. The letter *S* indicates a dry, sandy soil. The letter *F* indicates a soil that has a large amount of coarse fragments. The letter *A* indicates a soil having no significant limitations that affect forest use and management. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

Ratings of the *erosion hazard* indicate the probability that damage may occur if site preparation or harvesting activities expose the soil. The risk is *slight* if no particular preventive measures are needed under ordinary conditions; *moderate* if erosion-control measures are needed for particular silvicultural activities; and *severe* if special precautions are needed to control erosion for most silvicultural activities. Ratings of moderate or severe indicate the need for construction of higher standard roads, additional maintenance of roads, additional care in planning harvesting and reforestation activities, or the use of special equipment.

Ratings of *equipment limitation* indicate limits on the use of forest management equipment, year-round or seasonal, because of such soil characteristics as slope, wetness, stoniness, and susceptibility of the surface layer to compaction. As slope gradient and length increase, the use of wheeled equipment becomes more difficult. On the steeper slopes, tracked equipment is needed. On the steepest slopes, even tracked equipment cannot be operated and more sophisticated systems are needed. The rating is *slight* if equipment use is restricted by wetness for less than 2 months and if special equipment is not needed. The rating is *moderate* if slopes are so steep that wheeled equipment cannot be operated safely across the slope, if wetness restricts equipment use from 2 to 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. The rating is *severe* if slopes are so steep that tracked equipment cannot be operated safely across the slope, if wetness restricts equipment use for more than 6 months per year, if stoniness restricts the use of ground-based equipment, or if special equipment is needed to prevent or minimize compaction. Ratings of moderate or severe indicate a need to choose the best suited equipment and to carefully plan the timing of harvesting and other management activities.

Ratings of *windthrow hazard* indicate the likelihood that trees will be uprooted by the wind. A restricted rooting depth is the main reason for windthrow. The rooting depth can be restricted by a high water table, a fragipan, or bedrock or by a combination of such factors as soil wetness, texture, structure, and depth. The risk is *slight* if strong winds break trees but do not uproot

them; *moderate* if strong winds blow a few trees over and break many trees; and *severe* if moderate or strong winds commonly blow trees over. Ratings of moderate or severe indicate that care is needed in thinning or that the stand should not be thinned at all. Special equipment may be needed to prevent damage to shallow root systems in partial cutting operations. A plan for the periodic removal of windthrown trees and the maintenance of a road and trail system may be needed.

Ratings of *plant competition* indicate the likelihood of the growth or invasion of undesirable plants. Plant competition is more severe on the more productive soils, on poorly drained soils, and on soils having a restricted root zone that holds moisture. The risk is *slight* if competition from undesirable plants hinders adequate natural or artificial reforestation but does not necessitate intensive site preparation and maintenance. The risk is *moderate* if competition from undesirable plants hinders natural or artificial reforestation to the extent that intensive site preparation and maintenance are needed. The risk is *severe* if competition from undesirable plants prevents adequate natural or artificial reforestation unless the site is intensively prepared and maintained. A moderate or severe rating indicates the need for site preparation to ensure the development of an adequately stocked stand. Managers should plan site preparation measures to ensure timely reforestation.

The *potential productivity* of *common trees* on a soil is expressed as a *site index* and a *volume* number. The predominant common trees are listed in table 7. Additional species that commonly occur on the soils may be listed in the detailed soil map unit descriptions. The first tree listed for each soil is the indicator species for that soil. An indicator species is a tree that is common in the area and that is generally the most productive on a given soil.

For soils that are commonly used for timber production, the yield is predicted in cubic feet per acre per year. It is predicted at the point where mean annual increment culminates. The estimates of the productivity of the soils in this survey are based mainly on eastern white pine, yellow-poplar, shortleaf pine, and upland oaks, including northern red oak, chestnut oak, and scarlet oak *(3, 5, 6, 7)*.

The *site index* is determined by taking height measurements and determining the age of selected trees within stands of a given species. This index is the average height, in feet, that the trees attain in a specified number of years (50 years in this survey). This index applies to fully stocked, even-aged, unmanaged stands. Productivity of a site can be improved through management practices, such as bedding, ditching, managing water, applying fertilizer, and planting genetically improved species.

The *volume* is the yield likely to be produced by the most important trees, expressed in cubic feet per acre per year.

Trees to plant are those that are used for reforestation or, under suitable conditions, natural regeneration. They are suited to the soils and can produce a commercial wood crop. The desired product, topographic position (such as a low, wet area), and personal preference are three factors among many that can influence the choice of trees for use in reforestation.

Recreation

A variety of recreational activities is available in Clay County. Chatuge Lake offers a wide range of water-related recreational opportunities. The large acreage of woodland in the county provides good hunting opportunities. Visitors to the county can also enjoy golfing, fishing, hiking, boating, camping, and sightseeing.

In table 8, the soils of the survey area are rated according to the limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table

11 and interpretations for dwellings without basements and for local roads and streets in table 10.

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

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

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock should be considered.

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

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

John P. Edwards, biologist, Natural Resources Conservation Service, and Jeffrey Brooks, wildlife biologist, North Carolina Wildlife Resources Commission, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

Small game and nongame species inhabit areas throughout Clay County. Some of the small game species and important furbearers are gray squirrel, raccoon, rabbit, fox, grouse, dove, and bobcat. Waterfowl populations are low. A few Canada geese stop at Chatuge Lake during their migration. A small population of wood duck inhabits areas along the Hiwassee River and some farm ponds. The county also has a wide assortment of nongame species, including hawks, many species of songbirds, and a variety of small mammals and reptiles.

The Nantahala National Forest supports most of the populations of big game, namely deer, turkey, and black bear.

Wildlife requires food, water, and cover. The variety and abundance of wildlife that inhabit an area depend largely on the variety and abundance of these basic elements. Some wildlife species require greater amounts of food, water, and cover than others and therefore require a much larger area of living space. For example, black bear requires much more living space than deer and gray squirrel. The available amount of food, water, and desirable cover is dependent upon many factors, including soil. If possible, wildlife generally roam throughout the county and inhabit areas of the most productive soils, that is, the soils that produce the best type of food and that have a dependable water supply and desirable cover.

Some of the most productive soils on private land in Clay County are in areas along the Hiwassee River and smaller streams and in coves. This land is used for farming and for residential, industrial, and recreational uses. These activities generally preclude the use of the land by many wildlife species. Consequently, wildlife, especially big game, must inhabit areas of less desirable soils, which support less desirable habitat. Therefore, the soils rated in table 9 as good for wildlife habitat do not necessarily support a wildlife population in Clay County. Rosman, Tate, Braddock, Evard, and Hayesville soils are rated good as potential habitat for woodland wildlife but are intensively used for farming and housing. These uses force out woodland wildlife. Edneyville, Chestnut, and Plott soils are rated good as potential habitat for woodland wildlife and are mostly wooded, even on privately owned land. Cattle, however, have access to these woods. The competition from grazing cattle in these areas forces big game species onto Federal lands or into areas of less desirable soils.

Small game species and numerous nongame species thrive in transition zones that are maintained in early stages of succession. Examples of transition zones are fence lines, field borders, edges of woodlots, roadsides,

ditches, and the right-of-way of power lines. Transition zones can be managed with minimal expenditures of time and money. Because the county has numerous woodlots and small farms, thousands of miles of transition zones are available for wildlife management. Wildlife management can include controlled burning, wildlife plantings, disking, mowing, and leaving unharvested crops along field edges. If proper habitat is maintained, populations of wildlife species thrive.

Some opportunities exist for managing acreages of private woodland as habitat for woodland wildlife. Wildlife management plans usually begin with timber management. Table 7 can be used to determine the best way to manage woodland. Harvesting timber and reforestation can be integral parts of a wildlife management plan.

Small, irregularly shaped clearcuts (less than 20 to 25 acres in size) in large even-aged stands of timber can benefit many species of woodland wildlife, such as deer and grouse. In cutting timber or firewood, some snags or older trees should be left to provide cavity nests for such species as woodpeckers and to provide denning sites for raccoons and squirrels.

Unusually large trees, uncommon tree species, and some mast-bearing trees and shrubs should be left when thinning forests. Seeding road cuts and access roads with clover, sericea lespedeza, and orchardgrass provides food for wildlife and helps to control erosion. Planting cover strips of evergreens at strategic locations in a woodlot provides protection to game species from predators. A variety of habitat for a variety of wildlife is important in wildlife management. Maintaining well dispersed timber stands of different ages and maintaining a variety of tree species in each stand benefit wildlife.

A knowledge of the habits, habitat requirements, and preferred foods of different wildlife species is useful in managing wildlife. The following paragraphs discuss the important game species and furbearers in Clay County.

Black bear. Populations of black bear require large acreages of mature forest (5,000 acres or more in size). In Clay County, most of this land is available in the Nantahala National Forest. The black bear, however, also roams throughout tracts of private land in the county.

The black bear is omnivorous and feeds on acorns, beechnuts, cherries, apples, grapes, blackberries, blueberries, greenbrier, various grasses and clovers, blackgum, hawthorns, small mammals, insects, carrion, and garbage. It also feeds on some farm crops, such as corn, and occasionally disturbs beehives. The preferred denning sites of black bear are old, large, hollow, standing trees, especially chestnut oak. Areas of Edneyville, Chestnut, Evard, Cowee, Stecoah, and Soco soils offer preferred denning sites.

The loss of habitat or living space in the mountains to housing and recreational developments is the greatest threat to populations of black bear. The black bear's living space cannot be replaced. The loss of this habitat can cause a permanent decline in the number of black bear.

White-tailed deer. Populations of white-tailed deer require areas that are 300 to 500 acres in size and that provide proper amounts of food, water, and cover. In spring and summer, deer feed on green, succulent leaves and stems of both woody and herbaceous plants. In fall, acorns, honeysuckle, grapes, apples, and leaves of woody species are important foods. In winter, acorns, honeysuckle, rhododendron, and grasses are important foods. Deer prefer the acorns of white oak, which grows on warm, dry soils, such as Edneyville, Chestnut, Evard, Cowee, Stecoah, Soco, Junaluska, and Brasstown soils. In Clay County, however, northern red oak produces mast more consistently than white oak and therefore is more important to deer for food. Northern red oak grows best on cool, moist soils, such as Plott, Tuckasegee, Trimont, Cheoah, and Cullasaja soils. Agricultural crops can be important food sources for deer if the crops are available within the deer's range. Deer browse areas of crops and pasture on private land in most of the agricultural communities in the county.

The population of deer on private land in Clay County can be potentially increased. Landowners of small acreages (20 to 50 acres in size) can help to increase the deer population by providing the necessary food and cover.

Wild turkey. Populations of wild turkey require a variety of habitat that generally ranges over large acreages (5,000 acres in size). Wild turkey feeds on green, herbaceous leaves and forbs, berries and other fruits, insects, and acorns and dogwood berries when in season. In spring, turkey poults benefit from grassy open areas where they can have a diet high in insects, which promotes quick growth. Mature hardwood stands, such as oak-hickory stands, that include an open understory are an important part of the wild turkey's winter range. These hardwood stands occur mostly on warm, dry mountainsides, on such soils as Edneyville, Chestnut, Evard, Cowee, Stecoah, Soco, Trimont, Brasstown, and Junaluska soils.

Raccoon. Raccoon is a nocturnal and omnivorous mammal. Its diet includes fleshy fruits, acorns, corn, persimmon, blackgum, invertebrates, small mammals, snakes, lizards, salamanders, bird eggs, young birds, carrion, and garbage. When harvesting timber and

firewood on large and small woodlots, leaving den trees and some mast-bearing trees and shrubs helps to improve the habitat of raccoon. It is important to protect areas of streams from damage caused by cattle or clearing operations because the raccoon's food and traffic ways are located near waterways.

Mink. Mink is a predator that feeds mainly on animals associated with areas of water. It lives mainly in coves, on stream terraces, and on flood plains. Its diet includes fish, frogs, crayfish, mice, songbirds, snakes, lizards, salamanders, rabbits, squirrel, and muskrat.

Muskrat. Muskrat generally is a vegetarian that eats roots, stems, bark, fruit, and leaves of various plants. It prefers grasses, clover, and corn. Occasionally, its diet includes fish, freshwater mussels, insects, crayfish, and snails.

Squirrels. Both the gray squirrel and the red squirrel, frequently called mountain boomer, inhabit Clay County. Generally, the gray squirrel inhabits areas below an elevation of about 4,500 feet where mast and den trees are available. These areas include all of the soils in the county classified in the mesic temperature regime (See table 17). The gray squirrel prefers hardwood mast to pine mast if both are plentiful. The red squirrel lives wherever mast and den trees are available but prefers areas above an elevation of about 4,500 feet. Generally, these areas include all of the soils in the county classified in the frigid temperature regime. The choice foods of squirrels are acorns, beechnuts, blackgum, black cherry, corn, dogwood berries, hickory nut, mulberries, pine mast, chestnut, hazelnut, walnut, butternut, chinquapin, poplar flowers, and wild grapes.

Rabbit and quail. These two wildlife species are generally considered farm game species. Many farms lack the cover necessary to support good populations of quail and rabbit. Modern farming technology has eliminated field edges and odd corners, and fence rows no longer support briars or brush. Changes in the kinds of crops that are grown have also affected populations of these animals. The dominant use of fescue as a pasture and hayland crop instead of other grass-clover mixtures has adversely affected the amount of food available to rabbits and quail on farmland. On farmland, important cover components for these animals include patches of blackberry, greenbrier, and honeysuckle, fallow fields, and evergreen plantations. The favorite foods of rabbit include clover, lespedeza, and twigs and bark of several woody species. The favorite foods of quail include seeds of a variety of lespedeza, blackberries, dogwood berries, cowpeas, millet, buckwheat, waste grain, clover, alfalfa, and a variety of insects. Riparian areas between fields and streams can be managed to provide excellent cover for rabbit and quail and to minimize the sedimentation of streams.

Fox. Both the gray fox and the red fox inhabit Clay County. Generally, the gray fox inhabits woodland and the red fox inhabits farmland. The foxes eat mice, rats, rabbits, songbirds, and a variety of cold-blooded vertebrates. They also eat grapes, corn, acorns, apples, pokeberries, and persimmons. Generally, practices that improve the habitat of small game species also benefit the habitat of foxes. Foxes can benefit farmers because a main component of their diet is mice and other rodents.

Grouse. Ruffed grouse is commonly seen in a variety of habitats in Clay County. It commonly eats corns, beechnuts, wild grapes, blackberries, tender leaves, strawberries, serviceberries, dogwood berries, buds of beech, maple, and apple, and rose hips. The grouse requires some amount of evergreen cover, such as small patches of pine in warm, dry areas or thickets of rhododendron and laurel in cool, moist areas. In forested tracts, irregularly shaped clearcuts that are 1 to 5 acres in size provide areas where grouse can feed on a variety of insects, buds, grasses, forbs, and fruits. These cleared areas can provide a variety of foods to grouse for several years after the initial cutting operations.

Bobcat. Bobcat hunts mostly at night. It feeds on rabbits, mice, snakes, squirrels, woodchucks, and birds. Woodland cover is an important part of the bobcat's habitat. The bobcat prefers very thick cover in which it can hide during the day.

Woodchuck. The woodchuck, or groundhog, has a large population in Clay County and is popularly hunted. It lives in a variety of habitats, including pastures, fallow fields, grassy roadsides, croplands, and woodlands. The woodchuck prefers areas that provide its favorite foods, including grasses, clovers, and a variety of annual plants. The woodchuck also feeds on apples, garden crops, and acorns. In Clay County, the feeding activities of woodchucks annually cause problems for garden crops.

Populations of woodchuck are important for other wildlife. Abandoned woodchuck dens can be used as homes for rabbits, foxes, raccoons, chipmunks, and snakes. The woodchuck also is an important part of the diet of foxes, bobcats, and various birds of prey.

Game fish. Clay County offers opportunities for both lake fishing and stream fishing. Largemouth bass and bream are the common fish in Chatuge Lake. Because of the high elevations and woodland cover, cool water flows in many of the streams throughout the county. Consequently, brown trout, rainbow trout, and brook trout are the most abundant game fish in many watercourses in the county. Brook trout is the only trout species native to the mountain waters.

Trout habitat is affected by land and water uses.

Erosion control and publicly supported pollution control are important for maintaining the productivity of existing trout waters and for cleaning potential trout waters. Protecting streams and waterways from siltation and various kinds of pollution helps to preserve trout fishery and can possibly increase the recreational fishery resource in Clay County.

Clay County has several trout ponds. Soils associated with trout farms are soils in coves, such as Tate, Spivey, Tuckasegee, and Lonon soils, that have seeps, springs, and perennial branches for water supply. These soils have good filters and thus yield clean water. Other areas, such as areas of Dellwood soils, that are on sandy flood plains along fast-moving, cool streams high in oxygen content are also associated with trout production.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. The ratings in table 9 are intended to be used as a guide and are not site specific. Onsite investigation is needed for individual management plans.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

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

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, and pokeberry.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwoods and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, yellow-poplar, black cherry, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are autumn-olive and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are cattail, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain

and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, meadowlark, field sparrow, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, white-tailed deer, and black bear.

Habitat for wetland wildlife consists of open, swampy, shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Engineering

Howard C. Tew, engineer, Natural Resources Conservation Service, helped prepare this section.

The soils in Clay County are on a variety of slopes, ranging from nearly level to very steep. They are on a variety of landscapes, ranging from flood plains at elevations as low as 1,900 feet to rugged mountains at elevations higher than 5,000 feet. They are used for a wide variety of engineering purposes. Some areas of the soils can be easily developed using conventional engineering designs. Other areas require considerable specialized engineering designs and construction techniques to overcome certain soil limitations. The limitations must be considered when planning any engineering activity in order to prevent construction problems. Tables 10 through 16 can be used by planners to evaluate the limitations of the soils at potential construction sites.

To effectively evaluate the soils for potential engineering or construction purposes, the factors that limit the use of the soils need to be considered. In Clay County, several soil characteristics can cause engineering problems. Many of the characteristics are inherent to mountainous terrain and climate. Some of the most important are landscape position, slope, erodibility, instability (such as poor bearing strength and poor shear strength), stoniness, depth to bedrock, action of freezing and thawing, and shrink-swell potential.

Landscape position. Before initiating any engineering project, the compatability of the intended use and the characteristics of the landscape position should be considered. For example, site characteristics can differ depending on whether the site is on a ridge, on a side slope, in a cove, or on a flood plain. They can also differ depending on whether or not water runs off or onto the site, on whether or not the site is on a flood plain, on the frequency of flooding, or on whether or not the site has a high water table within a depth of 6 feet.

Slope. Many of the soils in Clay County are on slopes that range from 15 to 95 percent. The steeper the slope the greater the limitation. In the steeper areas, access roads require deeper cuts and longer fill slopes, buildings may require stronger foundations, and septic tank absorption fields require special design.

In watersheds that have large areas of very steep soils, the possibility of flash floods is increased because storm water is rapidly drained and fills stream channels. Designs for water-control and impoundment structures must meet exacting standards to overcome the high rates of runoff in areas of these watersheds.

Erodibility. Slope is the main factor contributing to the erosion of many soils on mountains. Surface cover is removed during construction, and the soil is exposed to erosion. Unless runoff is prevented from accumulating and flowing uncontrolled across construction sites, erosion will be severe. Excavations in most of the soils on mountains result in severe erosion and damage caused by offsite sediments unless erosion-control measures have been used. Cuts and fills for construction are common in steep or very steep areas. Fill slopes may contain material consisting dominantly of saprolite and rock fragments. Because the saprolite can be very infertile and very strongly acid or extremely acid, establishing vegetation in areas of fill slopes to prevent excessive erosion can be difficult.

Instability. To support loads, soil material used in fills and undisturbed soils need to have a certain bearing strength. Undisturbed soils also need a certain degree of shear strength to support their own weight. Additional loading puts a greater stress on the soil. If a loading stress exceeds the bearing or shear strength, the soil may move unpredictably. Loading stresses exceed the bearing or shear strength of unstable soils much more quickly than that of stable soils. The stability of soil material is affected by lateral support, occurrence of natural lubricants, and slope.

Undisturbed soils have lateral, or side to side, support. Excavating these soils removes the lateral support holding the soil material in place. Eventually, the soil material upslope may move downslope and cause damage to roads and structures.

Soils, like mechanical mechanisms, move more freely when lubricated. The soil is lubricated where it has a high content of mica or organic matter. Mica appears as a shiny sparkle in soil material that is exposed to bright light, and it feels slick and greasy. The soil can also be lubricated by water. When the soil becomes saturated with water, it tends to move away from the loading forces applied to it. Whether lubricated by natural particle characteristics or by water, soils that move

provide very little shear strength. Micaceous soils or soils subject to seeps and springs provide poor sites for construction because of the hazard of slippage or landslides. Fannin soils, which occur on side slopes of low rolling hills, have a high content of mica. Planning detailed engineering tests and designs prior to building on fill slopes is often required to prevent damage from settling and slope-related failures. As the slope increases, keeping the soil material in place becomes more difficult.

Landscapes in the western part of Clay County are less stable than those in the eastern and central parts. They are underlain by metasedimentary bedrock. Soils associated with metasedimentary bedrock are Cataska, Cheoah, Junaluska, Brasstown, Stecoah, Soco, Sylco, and Tsali soils. The underlying bedrock occurs as plates. The plates provide very little shear strength and tend to slide across one another when subjected to loading forces.

Excavations in areas of the less stable rock formations have the same problems related to lateral support, occurrence of lubricants, and slope as those for soil material. Because of the platy nature of the rocks, the risk of support failure is greater where the plates are oriented in the same direction as the slope and lesser where the slope is not parallel to the platy rock.

Soils on flood plains of the Hiwassee River, such as Rosman soils, are dominantly composed of fine sands or silts, have little natural plasticity, and can become unstable when saturated with water. The soil material, unless bound together by an adhesive of clay, flows in a thick slurry if subjected to excessive loading when wet. Excavating areas of these soils is difficult and can be dangerous because side walls tend to cave in and slough when lateral support is removed. Extensively shoring the walls is needed to prevent caving. The soil instability may also be caused by the shrinking and swelling of the subsoil as the soil water content fluctuates. Soil movement is a hazard for foundations and buried pipes. Special planning and properly designing footings, foundations, and underground utilities are required prior to construction.

Stoniness. Most of the soils on mountains contain rock fragments, ranging from gravel to large boulders in varying amounts. Some soils in coves, such as Cullasaja and Spivey soils, are stony throughout (fig. 14). Other soils in coves, such as Tuckasegee and Santeetlah soils, have stones only in part of the profile. Some soils on flood plains, such as Dellwood, French, Reddies, and Nikwasi soils, contain or are underlain by smooth, water-rounded rocks that range from fine gravel to large cobbles. Other soils on flood plains, such as Rosman soils, do not have stones within a depth of 40 inches or more. In some soils on mountains, such as Stecoah and Edneyville soils, the content of rock fragments ranges from to low to 35 percent, by volume. In other soils on mountains, such as Cataska soils, it is more than 35 percent. In some places, it can vary greatly throughout the soil profile.

Fill material is needed during construction and development to provide firm foundations and impervious layers. An excess amount of rock fragments in fill material hinders compaction; and an unacceptable settlement, resulting in damage to structures, is likely to occur. Compaction of rocky soils cannot produce the homogeneous density required for the construction of earth dams and other water-retention structures. Shallow excavations and fine grading may be difficult in soils that have an excess amount of rock fragments. In some soils, such as Cataska, Cleveland, and Craggey soils, deeper excavations may require blasting. The removal of rock from stony soils is expensive and time consuming.

When soils are analyzed for engineering purposes, special emphasis should be placed on stone content. The Unified and AASHTO Soil Classification Systems only evaluate that fraction of the soil smaller than 3 inches in diameter. For example, according to the Unified Soil Classification System, a soil may be designated as SC (sand that has clayey fines) and thus indicated as an ideal soil for fill material that will respond acceptably to compaction. This soil, however, may be excessively stony and contain scattered large boulders and thus be unsuitable for use as fill. See table 14 and the pedon descriptions given in the section "Classification of the Soils" for information on rock fragments for specific soils. In the descriptions, soils that contain stones or rock fragments have defined percentages of gravel, stones, cobbles, channers, or flagstones or are described as skeletal. Onsite investigation may be necessary to determine actual conditions.

Bedrock. Most of the soils in Clay County are very deep or deep. Some soils, however, have hard bedrock at a depth of 10 to 40 inches. They include Burton, Cleveland, Cataska, Craggey, and Sylco soils. Hard bedrock is designated as an R horizon in the pedon descriptions. Some soils have weathered bedrock at a depth of 10 to 40 inches. They include Chestnut, Soco, Cowee, Junaluska, and Tsali soils. Weathered bedrock can be excavated with difficulty with machinery, and hard bedrock requires blasting. The surfaces of these restrictive features are undulating, and onsite investigations are needed prior to construction to determine topography. Material excavated from layers

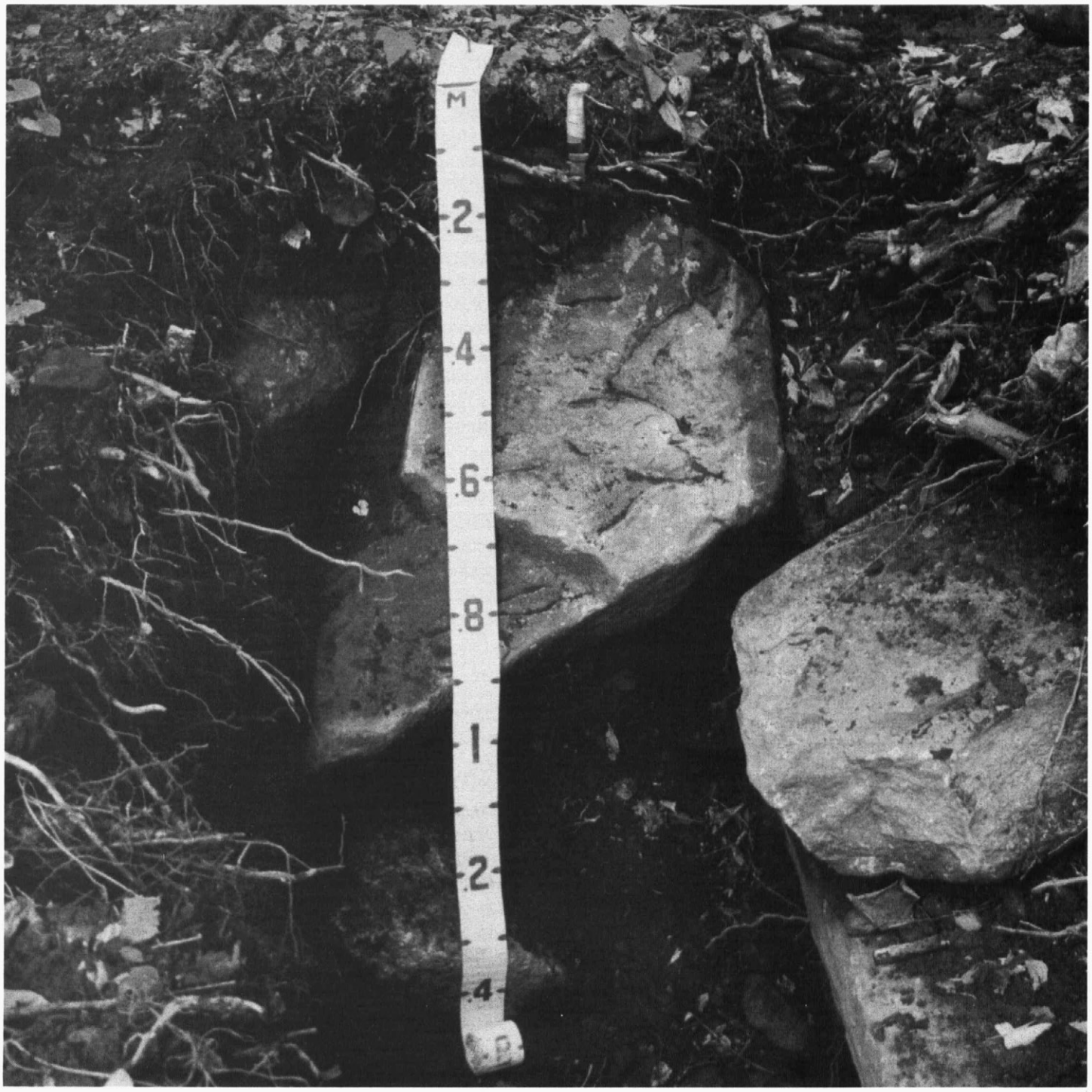


Figure 14.—Soil profile of the Spivey series in an area of Spivey-Santeetlah complex, 15 to 30 percent slopes, stony. Spivey soils have large stones and boulders, which limit use and management.

of weathered bedrock is dry, brittle, and hard to pack. These layers are designated as Cr horizons in the soil pedon descriptions.

Freezing and thawing. In Clay County, soils on south-facing slopes are continually subject to freezing and thawing from November through March. Repeated

winter cycles of freezing and thawing cause heaving and sloughing of surface soil. Soils that have a moderate or high content of clay are affected the most. Frost action loosens the surface of the soil and thus can heave it above its normal position. Subsequent thawing can result in a near liquid state in the subsoil. Soils in this condition are subject to erosion and have little load-supporting strength. In areas of these soils, unprotected slopes are subject to extreme erosion and access roads become impassable.

Sometimes a thaw does not affect all of the frozen soil. The result is an unfrozen, heaved layer of soil material over frozen soil material. Soils in this condition are subject to severe erosion when water moves laterally across the frozen soil surface.

Frost heaving in areas of susceptible soils exerts considerable force on footings and foundations. Potential frost damage should be considered in the design of structures. Frozen soil resists compaction and should not be used in fill material if compacted densities are important. Depth of frost penetration varies throughout the county according to elevation. On north-facing slopes, frost penetrates to greater depths. The depth of frost penetration can be as much as 36 inches in some years at elevations above 5,000 feet.

Shrink-swell potential. The clay part of a soil shrinks and swells. Braddock and Hemphill soils are subject to shrinking and swelling. If the soil has a low content of clay, visual classification may be sufficient to determine a low shrink-swell potential. If the soil exhibits any shrink-swell characteristics, however, mechanical analysis and tests on Atterberg limits are needed. Soils that have 25 percent or more material with particles finer than 0.002 millimeter in the fraction passing a No. 10 sieve are considered clay and can have limitations caused by shrinkage. Tables 10 and 15 identify soils subject to shrinking and swelling.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution (texture), liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, the shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

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

Building Site Development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial

buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock or a very firm dense layer, stone content, soil texture, and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. Depth to a high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. The depth to bedrock, depth to a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), the shrink-swell potential, frost-action potential, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, depth to a high water table, depth to bedrock, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established. Soil tests are essential to determine the need for liming and fertilizer. Help in making soil tests or in deciding what soil additive, if any, to use can be obtained from the office of the Clay County Soil and Water Conservation District or the local office of the North Carolina Cooperative Extension Service.

Sanitary Facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and that good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, depth to a high water table, depth to

bedrock, and flooding affect absorption of the effluent. Large stones and bedrock interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand, gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water. The animal waste lagoons commonly used in farming operations are not considered in the ratings. They are generally deeper than the lagoons referred to in the table and rely on anaerobic bacteria to decompose waste materials.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, depth to a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope or bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, depth to a water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material may be obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing when the surface is bare of vegetation.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface

layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and the shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* have more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. These soils have layers of suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale, siltstone, and weathered granite saprolite, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are naturally fertile or respond well to fertilizer and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and releases a variety of plant nutrients as it decomposes.

Water Management

Table 13 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to

Figure 15.—A subsurface drainage system may be needed to improve the productivity of some soils on flood plains in Clay County. It can also improve the performance of the soils for such uses as golf fairways. Arkaqua loam, 0 to 2 percent slopes, frequently flooded, is in the foreground; Toxaway loam, 0 to 2 percent slopes, frequently flooded, is in the background, behind the tractor.

overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives the restrictive features that affect each soil for drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low

seepage potential in the upper 60 inches. The seepage potential is determined by the permeability in the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area. Ponds that are less than about 2 acres in size are not shown on the soil maps because of the scale of mapping.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, mica, or salts or sodium. The depth to a high water table affects the amount of usable material. It also affects trafficability.

Soils that have a high content of mica, such as Fannin soils, are poorly suited to use in the construction of embankments. The problems resulting from the high content of mica include difficulty in compaction, poor trafficability, susceptibility to erosion, and low shear strength. Also, piping commonly is a problem if the soil material is used to impound water.

Drainage is the removal of excess surface and subsurface water from the soil (fig. 15). How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement, permeability, depth to a high water table or depth of standing water if the soil is subject to ponding, slope, susceptibility to flooding, subsidence of organic layers, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Federal and State regulations require that any area designated as wetlands cannot be altered without prior approval. Contact the local office of the Natural Resources Conservation Service for identification of hydric soils and potential wetlands.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the availability of suitable irrigation water, the depth of the root zone, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to help control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. Maintenance of terraces and diversions is adversely affected by a restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.