SOIL SURVEY OF

Catawba County, North Carolina

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

Major fieldwork for this soil survey was done in the period 1963–1968. Soil names and descriptions were approved in 1969. Unless otherwise indicated, statements in the publication refer to conditions in the county at the time the survey was in progress. This survey was made cooperatively by the Soil Conservation Service and the North Carolina Agricultural Experiment Station. It is part of the technical assistance furnished to the Catawba Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

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

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

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

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

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

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

Cover: **Typical landscape in the Pacolet-Cecil association. Pacolet soils are in the drainageways, and Cecil soils are on the ridgetops.**

Contents

Issued October 1975

SOIL SURVEY OF CATAWBA COUNTY, NORTH CAROLINA

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SOIL SURVEYED BY ROBERT M. BROWN, JULIAN H. McINTYRE, RONALD B. STEPHENS, AND EDWARD O. BREWER
SOIL CONSERVATION SERVICE [1]

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

CATAWBA COUNTY is on the upper Piedmont Plateau in the west-central part of North Carolina (fig. 1). Newton, the county seat, is about 180 miles west of Raleigh, the State capital, and 55 miles northwest of Charlotte, the largest city in North Carolina. Hickory, the largest city in the county, is about 10 miles northwest of Newton.

The 1970 census showed a population of 90,873 for the county, 38,943 of which is urban. The total land area is 394 square miles. The average elevation is 1,165 feet above sea level. Baker Mountain, the highest elevation, is 1,812 feet above sea level. It is in the western part. The lowest elevation is approximately 760 feet above sea level, where the Catawba River leaves the county. The soils are nearly level to steep. The landscape is one of fairly broad ridges and short, steep slopes.

Catawba County is industrially oriented, but farm crops are of major importance. Farms number about 1,012. The average size is approximately 97 acres. About 98 percent are owner operated; many farmers also work in industry. Corn, small grain, and soybeans are the leading cash crops. Poultry, cattle, and hogs contribute considerably to the farm income.

According to the 1969 Census of Agriculture, 51,032 acres was cropland, including idle cropland; 16,151 acres was pasture; and 28,626 acres woodland.

The soils of Catawba County are dominantly acid and strongly leached and for the most part have low base saturation. Most of the soils are low in natural fertility and organic-matter content; exceptions are Wilkes and Enon soils, which have more than 35 percent base saturation and are medium in natural fertility. For optimum yields, most soils in the county require fertilizer and lime.

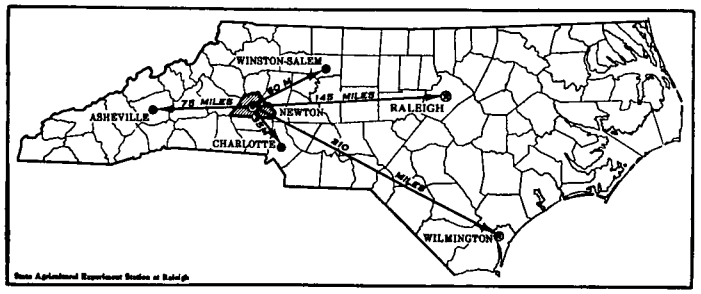

Figure 1.—Location of Catawba County in North Carolina.

How This Survey Was Made

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

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

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Cecil and Appling, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Cecil sandy loam, 2 to 6 percent slopes, eroded, is one of several phases within the Cecil series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries

[1] CHARLES S. WILSON and EARL S. WARRICK contributed substantially to this survey.

of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

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

Some mapping units are made up of soils of different series, or of different phases within one series. Only one such kind of mapping unit is shown on the soil map of Catawba County: a soil complex.

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

In most areas surveyed there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Gullied land is a land type in this county.

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

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

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

General Soil Map

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

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

The six soil associations in Catawba County are described on the following pages.

The terms for texture used in the title for several of the associations apply to the texture of the surface layer. For example, in the title of association 5, the words, "mainly gravelly soils," refer to the texture of the surface layer.

1. *Cecil association*

Gently sloping to moderately steep soils that have a subsoil that is dominantly red, firm clay, on broad ridgetops and short side slopes

This association occurs as large areas on broad ridges and fairly short side slopes. It makes up 25 percent of the county. It is about 75 percent Cecil soils and 25 percent soils of minor extent.

Cecil soils are well drained. The surface layer is sandy loam or clay loam. The subsoil is mainly red, firm clay.

Less extensive in this association are the Pacolet, Hiwassee, Madison, and Appling soils on uplands and the Congaree, Wehadkee, and Chewacla soils on flood plains.

Most of this association is cultivated and pastured. The rest is chiefly wooded or under urban development. The major farm enterprises are growing corn, small grain, and soybeans and raising cattle. The Cecil soil is fairly well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

2. *Hiwassee-Cecil association*

Gently sloping to moderately steep soils that have a subsoil that is dominantly dark-red or red, firm clay; on fairly broad ridgetops and short side slopes

This association occupies irregularly shaped bands on fairly broad ridges and short side slopes. It makes up about 23 percent of the county. It is about 30 percent Hiwassee soils, 30 percent Cecil soils, and 40 percent soils of minor extent.

Hiwassee soils are well drained. The surface layer is loam or clay loam. The subsoil is dark-red to red, firm clay or friable clay loam.

Cecil soils are well drained. The surface layer is sandy loam or clay loam. The subsoil is red, firm clay.

Less extensive in this association are the Pacolet, Madison, Enon, and Wilkes soils on uplands and the Congaree, Chewacla, and Wehadkee soils on flood plains.

Most of this association is cultivated or pastured. The rest is chiefly forested. Growing corn and small grain and raising cattle are the chief farm enterprises. The Hiwassee and Cecil soils are fairly well suited to well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

3. *Hiwassee association*

Gently sloping to moderately steep soils that have a subsoil that is dominantly dark-red, firm clay; on smooth, broad ridgetops and short side slopes

This association is in long, wide belts on smooth, broad ridges and short side slopes. It makes up about 19 percent of the county. It is about 70 percent Hiwassee soils and 30 percent soils of minor extent.

Hiwassee soils are well drained. The surface layer is loam or clay loam. The subsoil is dark-red or red, firm clay or friable clay loam.

Less extensive in this association are the Cecil, Madison, Pacolet, Enon, Wilkes, and Appling soils on uplands and the Congaree, Chewacla, and Wehadkee soils on flood plains.

Most of this association is pastured or cultivated. The rest is chiefly forested or under urban development. The Hiwassee soil is well suited to fairly well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

4. *Pacolet-Cecil association*

Gently sloping to steep, mainly gravelly soils that have a subsoil that is dominantly red, friable clay loam or firm clay; on long, narrow, winding ridgetops and long side slopes

This association occurs as large areas on fairly narrow ridges and long, sharply breaking side slopes. It makes up about 13 percent of the county. It is about 45 percent Pacolet soils, 35 percent Cecil soils, and 20 percent soils of minor extent.

Pacolet soils are well drained. The surface layer is gravelly sandy loam, gravelly fine sandy loam, or sandy loam. The subsoil is red to yellowish-red, friable clay, sandy clay loam, or firm clay.

Cecil soils are well drained. The surface layer is sandy loam and clay loam. The subsoil is red, firm clay.

Less extensive in this association are the Madison, Hiwassee, Appling, Enon, and Wilkes soils on uplands and the Congaree, Chewacla, Wehadkee, and Altavista soils on flood plains and terraces.

Most of this association is forested. The rest is chiefly pastured, cultivated, or under urban development. The Pacolet and Cecil soils are well suited to fairly well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

5. *Madison-Cecil association*

Gently sloping to moderately steep, mainly gravelly soils that have a subsoil that is dominantly red, friable clay or firm clay; on fairly narrow ridgetops and long side slopes

This association occurs as fairly long, wide bands on ridges and side slopes. It makes up about 12 percent of the county. It is about 40 percent Madison soils, 30 percent Cecil soils, and 30 percent soils of minor extent.

Madison soils are well drained. The surface layer is gravelly sandy loam. The subsoil is red to yellowish-red, firm clay, friable clay loam, or sandy clay loam that contains varying amounts of fine mica.

Cecil soils are well drained. The surface layer is sandy loam and clay loam. The subsoil is mainly red, firm clay.

Less extensive in this association are the Pacolet, Hiwassee, Appling, and Worsham soils on uplands and the Chewacla, Congaree, and Wehadkee soils on flood plains.

About half of this association is forested. The rest is pastured or cultivated. Pasture grasses, corn, and small grain are the chief crops. The Madison and Cecil soils are well suited to fairly well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

6. *Cecil-Appling association*

Gently sloping to moderately steep soils that have a subsoil that is dominantly red or strong-brown and brown, firm clay; on broad ridgetops and short side slopes

This association is on broad ridges and fairly short side slopes. It makes up about 8 percent of the county. It is about 50 percent Cecil soils, 30 percent Appling soils, and 20 percent soils of minor extent.

Cecil soils are well drained. The surface layer is sandy loam or clay loam. The subsoil is red, firm clay.

Appling soils are well drained. The surface layer is sandy loam. The subsoil is strong-brown to yellowish-red, firm clay or friable clay loam.

Less extensive in this association are the Pacolet, Hiwassee, and Madison soils on uplands and the Congaree, Chewacla, and Wehadkee soils on flood plains.

Most of this association is cultivated or pastured. The rest is chiefly forested. The major farm enterprises are growing corn, soybeans, and small grain and raising cattle. The Cecil and Appling soils are well suited to fairly well suited to most locally grown crops.

The slope and the clayey subsoil are the chief limiting factors for all farm and nonfarm uses.

Descriptions of the Soils

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

An important part of the description of each soil series is the soil profile, that is, the sequence of layers from the

surface downward to rock or other underlying material. Each series contains two descriptions of this profile. The first is brief and in terms familiar to the layman. The second is much more detailed and is for those who need to make thorough and precise studies of soils. The profile described in the series is representative for mapping units in that series. If the profile of a given mapping unit is different from the one described for the series, these differences are stated in describing the mapping unit, or they are differences that are apparent in the name of the mapping unit.

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

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit and woodland group to which the mapping unit has been assigned. To find the page for the description of each capability unit and woodland group refer to the "Guide to Mapping Units" at the back of this survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*8*).[2]

Altavista Series, Clayey Variant

The Altavista series, clayey variant, consists of moderately well drained, gently sloping soils on low, slightly convex benches or shelves between the steeper uplands and the flood plains. These soils formed in fairly old alluvium.

In a representative profile the surface layer is dark yellowish-brown fine sandy loam 6 inches thick. The subsoil is yellowish-brown, firm clay loam 32 inches thick. Gray mottles are within a depth of 38 inches. The substratum extends to a depth of about 100 inches. It is light brownish-gray clay in the upper part and light brownish-gray gravelly coarse sand in the lower part.

Altavista soils, clayey variant, are flooded infrequently for brief periods. They are low in natural fertility and content of organic matter. Unless limed, they are medium acid. Permeability is moderate, and available water capacity is medium. The root zone is deep. Depth to the seasonal high water table is about 2 feet. The shrink-swell potential is moderate.

Altavista soils are of minor importance for farming. Most of the acreage is pastured or cultivated, and the rest is wooded. Slope and wetness are the main limitations.

Representative profile of Altavista fine sandy loam, clayey variant, in a pasture 2½ miles southeast of Catawba, one-half mile south of County Road 1004, 100 yards north of Balls Creek, and 160 feet east of field road:

Ap—0 to 6 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; many small roots; few fine mica flakes; slightly acid; clear, smooth boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/6) clay loam; weak, medium, subangular blocky structure; friable, slightly sticky, slightly plastic; few small roots; few fine mica flakes; medium acid; gradual, wavy boundary.

B21t—9 to 22 inches, yellowish-brown (10YR 5/6) clay loam; weak, medium, subangular blocky structure; firm, slightly sticky, slightly plastic; thin discontinuous clay films on ped faces; few fine mica flakes; medium acid; gradual, wavy boundary.

[2] Italic numbers in parentheses refer to Literature Cited, p. 46.

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Altavista fine sandy loam, clayey variant	771	0. 3	Hiwassee clay loam, 2 to 6 percent slopes, eroded	1, 697	0. 7
Appling sandy loam, 2 to 6 percent slopes	4, 992	2. 0	Hiwassee clay loam, 6 to 10 percent slopes, eroded	9, 831	3. 9
Appling sandy loam, 6 to 10 percent slopes, eroded	2, 791	1. 1	Leveled clayey land	1, 469	. 6
Appling sandy loam, 10 to 25 percent slopes, eroded	940	. 4	Madison gravelly sandy loam, 2 to 6 percent slopes, eroded	4, 789	1. 9
Buncombe loamy sand	766	. 3	Madison gravelly sandy loam, 6 to 10 percent slopes, eroded	7, 471	3. 0
Cecil sandy loam, 2 to 6 percent slopes, eroded	37, 745	15. 0	Madison gravelly sandy loam, 10 to 25 percent slopes, eroded	10, 137	4. 0
Cecil sandy loam, 6 to 10 percent slopes, eroded	36, 560	14. 5	Pacolet gravelly sandy loam, 25 to 45 percent slopes	4, 902	1. 9
Cecil sandy loam, 10 to 15 percent slopes, eroded	11, 838	4. 7	Pacolet gravelly fine sandy loam, 2 to 6 percent slopes	1, 012	. 4
Cecil clay loam, 2 to 6 percent slopes, eroded	1, 515	. 6	Pacolet gravelly fine sandy loam, 6 to 10 percent slopes	6, 180	2. 5
Cecil clay loam, 6 to 10 percent slopes, eroded	6, 278	2. 5	Pacolet soils, 10 to 25 percent slopes	21, 258	8. 4
Cecil clay loam, 10 to 25 percent slopes, severely eroded	16, 121	6. 4	Wehadkee fine sandy loam	839	. 3
Chewacla loam	11, 170	4. 4	Wilkes loam, 10 to 25 percent slopes	1, 265	. 5
Congaree complex	5, 622	2. 2	Worsham fine sandy loam	937	. 4
Enon fine sandy loam, 2 to 6 percent slopes	318	. 1			
Gullied land	1, 080	. 4	Total	252, 160	100. 0
Hiwassee loam, 2 to 6 percent slopes, eroded	23, 287	9. 2			
Hiwassee loam, 6 to 10 percent slopes, eroded	11, 764	4. 7			
Hiwassee loam, 10 to 15 percent slopes, eroded	3, 607	1. 4			
Hiwassee loam, 15 to 25 percent slopes	3, 208	1. 3			

B22t—22 to 38 inches, yellowish-brown (10YR 5/6) clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure; firm, slightly sticky, slightly plastic; thin patchy clay films on ped faces; few fine mica flakes; medium acid; gradual, wavy boundary.

Cg—38 to 55 inches, light brownish-gray (10YR 6/2) clay; massive; firm, plastic, sticky; few fine mica flakes; medium acid; abrupt, wavy boundary.

IICg—55 to 100 inches, light brownish-gray (10YR 6/2) gravelly coarse sand; loose.

This variant of the Altavista series differs from the typical Altavista soils in having a higher clay content in the B horizon. The solum ranges from 30 to 50 inches in thickness. Depth to bedrock is more than 5 feet. The A horizon ranges from yellowish brown to dark brown in color and from 6 to 10 inches in thickness. The B horizon ranges from 24 to 40 inches in thickness and is yellowish-brown or brownish-yellow, friable to firm clay loam. Gray mottles are within a depth of 38 inches. The B and C horizons in places contain few to common mica flakes. The C horizon ranges from grayish brown or light brownish gray to gray and from clay to gravelly coarse sand.

Altavista fine sandy loam, clayey variant (Af).—This is a moderately well drained soil on benches and shelves between the steeper uplands and the flood plains. It occurs as fairly narrow bands just above flood plains. Slopes are 2 to 6 percent. Areas range from 3 to 15 acres in size.

Included with this soil in mapping are a few areas of similar soils that have slopes of 6 to 10 percent and a few areas of similar soils that are well drained.

This Altavista soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is medium acid throughout unless limed. Infiltration is moderate, and surface runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops and is used mainly for corn. Most of the acreage is pastured or cultivated, and the rest is wooded. Drainage is needed in places, particularly in low spots, for some deep-rooted crops. The hazard of erosion is moderate. Control of runoff and erosion is needed in cultivated areas. Capability unit IIe–2; woodland group 2w8.

Appling Series

The Appling series consists of well-drained, gently sloping to moderately steep soils on uplands. These soils formed in residuum derived from acidic rock, including granite and granite-gneiss.

In a representative profile the surface layer is dark grayish-brown and pale-brown sandy loam 8 inches thick. The subsoil is about 39 inches thick. The upper part is dominantly strong-brown and brown, firm clay mottled with red and yellowish brown. The lower part is mottled yellowish-brown, red, and gray, friable sandy clay loam. The substratum, to a depth of about 90 inches, is reddish-yellow sandy loam mottled with brownish yellow.

Appling soils are low in natural fertility and content of organic matter. Unless limed, they are strongly acid to very strongly acid throughout. Permeability is moderate, and available water capacity is medium. The root zone is deep. Depth to the seasonal high water table is more than 7 feet. The shrink-swell potential is moderate.

Appling soils are important for farming. Most of the acreage is cleared and is either cultivated or pastured. Slope is the main limitation.

Representative profile of Appling sandy loam, 2 to 6 percent slopes, in a wooded area 6 miles east of Newton, about 1½ miles north of Ball's Creek School on County Road 1810, and 100 feet west of road:

O2—2 inches to 0, partially decomposed litter.

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

A2—3 to 8 inches, pale-brown (10YR 6/3) sandy loam; weak, fine and medium, granular structure; very friable; many small and medium roots; few quartz pebbles; very strongly acid; clear, smooth boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4) sandy clay loam; weak, fine, subangular blocky structure; friable; few small roots; few quartz pebbles; very strongly acid; clear, smooth boundary.

B21t—12 to 27 inches, strong-brown (7.5YR 5/6) clay; moderate, medium, subangular blocky structure; firm, sticky, slightly plastic; thin discontinuous clay films on ped faces; few small and medium roots; few fine mica flakes; very strongly acid; gradual, smooth boundary.

B22t—27 to 42 inches, brown (7.5YR 5/4) clay; common, medium, distinct, red (2.5YR 5/6) and yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm, sticky, slightly plastic; thin discontinuous clay films on ped faces; few fine mica flakes; very strongly acid; gradual, smooth boundary.

B3t—42 to 47 inches, mottled yellowish-brown (10YR 5/6), red (2.5YR 5/8), and gray (10YR 5/1) sandy clay loam; weak, medium, subangular blocky structure; friable; thin discontinuous clay films on ped faces; few fine mica flakes; strongly acid; gradual, smooth boundary.

C—47 to 90 inches, reddish-yellow (5YR 6/8) sandy loam; common, medium, distinct, brownish-yellow (10YR 6/6) mottles; massive; friable; few, soft, weathered rock fragments; few fine mica flakes; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock is more than 5 feet. The A1 or Ap horizon ranges from 5 to 12 inches in thickness and is dark grayish brown to yellowish brown. The A2 horizon, if present, is pale brown to yellowish brown. The B horizon ranges from 36 to 48 inches in thickness. The B1 horizon is commonly yellowish-brown sandy clay loam. The B2 horizon is strong-brown, brown, or yellowish-red clay or clay loam. The B3 horizon is commonly mottled yellowish-brown, yellowish-red, red, or gray sandy clay loam. The C horizon is weathered granite or granite-gneiss of sandy loam to clay loam texture and is commonly mottled with shades of red, brown, yellow, and gray.

Appling sandy loam, 2 to 6 percent slopes (AsB).—This soil has the profile described as representative of the series. It is a well-drained soil on fairly smooth broad ridges on uplands. Areas are irregular in shape and 5 to 10 acres in size.

Included with this soil in mapping are areas of a yellower, coarser textured soil; areas of Cecil soils; and a few areas of well-drained to somewhat poorly drained soils along small drainageways and in depressions.

This Appling soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is strongly acid to very strongly acid throughout. Infiltration is moderate, and runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops and to pasture and native trees. It is used chiefly for soybeans, corn, and small grain. Most of the acreage is cultivated or pastured, and the rest is wooded. In areas of cultivated row crops, the hazard of erosion is moderate.

Control of runoff and erosion is needed in cultivated areas. Capability unit IIe–1; woodland group 3o7.

Appling sandy loam, 6 to 10 percent slopes, eroded (AsC2).—This is a well-drained soil on the upper parts of slopes on uplands. It occurs as fairly long areas 4 to 25 acres in size. In many places the present surface layer is a mixture of the original surface layer, subsurface layer, and subsoil material. The surface layer is pale-brown to yellowish-brown sandy loam 5 to 8 inches thick. In some wooded areas it is dark grayish brown. The subsoil is firm clay to friable clay loam 36 to 48 inches thick. It is strong brown to yellowish red and is commonly mottled with red.

Included with this soil in mapping are areas of a yellower, coarser textured soil that typically has a sandy clay loam subsoil; areas of Cecil soils; and a few areas of well-drained to somewhat poorly drained soils along small drainageways and in depressions.

This Appling soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is strongly acid to very strongly acid throughout. Infiltration is moderate, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops and is used chiefly for soybeans, corn, and small grain. Most of the acreage is cultivated or pastured. The hazard of erosion is severe. Control of runoff and erosion is needed in cultivated areas. Capability unit IIIe–1; woodland group 3o7.

Appling sandy loam, 10 to 25 percent slopes, eroded (AsE2).—This is a well-drained soil on lower slopes bordering drainageways. It occurs on uplands as fairly long narrow bands 3 to 20 acres in size. In many places the present surface layer is a mixture of the original surface layer, subsurface layer, and subsoil material. The surface layer is pale-brown to yellowish-brown sandy loam 5 to 8 inches thick. In some wooded areas it is dark grayish brown. The subsoil is strong-brown to yellowish-red, firm clay to friable clay loam 36 to 40 inches thick. In most places it is mottled with red.

Included with this soil in mapping are many areas of similar soils that are only slightly eroded and a few areas of Cecil and Pacolet soils.

This Appling soil is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is strongly acid to very strongly acid throughout. Infiltration is moderately slow, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops and is well suited to pasture and trees. Most of the acreage is wooded, and the rest is cultivated or pastured. Most cultivated areas are on the milder slopes. They are chiefly in small grain and soybeans. Trees and pasture are on the steeper slopes. Control of runoff and erosion is needed in cultivated areas. Capability unit IVe–1; woodland group 3r8.

Buncombe Series

The Buncombe series consists of nearly level, somewhat excessively drained soils on flood plains. These soils formed in recent alluvium.

In a representative profile the surface layer is brown loamy sand about 10 inches thick. The next layers are light-brown loose sand, reddish-yellow loamy fine sand, and brown loose sand. At a depth of about 55 inches is reddish-brown, very friable sandy loam mottled with strong brown and yellowish brown.

Buncombe soils are flooded frequently, but only for brief periods. They are very low in natural fertility and content of organic matter. Unless limed, they are medium acid. Permeability is rapid, and available water capacity is low. The root zone is deep. Depth to the seasonal high water table is about 2½ feet. The shrink-swell potential is low.

Buncombe soils are not important for farming. Most of the acreage is forest. The rest is pastured or cultivated. Flooding and droughtiness are the main limitations.

Representative profile of Buncombe loamy sand in a pasture 1½ miles west of Maiden, one-fourth mile east of County Road 2009, and 50 yards west of Clark Creek:

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

C1—10 to 13 inches, light-brown (7.5YR 6/4) sand; single grain; loose; few small and medium roots; few medium mica flakes; medium acid; abrupt, smooth boundary.

C2—13 to 16 inches, reddish-yellow (7.5YR 6/6) loamy fine sand; single grain; loose; few small and medium roots; few medium mica flakes; medium acid; clear, wavy boundary.

C3—16 to 55 inches, brown (7.5YR 5/4) sand, few grains of reddish yellow and black; single grain; loose; few medium mica flakes; medium acid; gradual, smooth boundary.

C4—55 to 65 inches, reddish-brown (5YR 5/4) sandy loam; few, fine and medium, faint, strong-brown and yellowish-brown mottles; massive; very friable; medium acid.

The A horizon ranges from dark brown or brown to yellowish brown in color and from 10 to 18 inches in thickness. The upper part of the horizon ranges from light brown or brown to reddish yellow in color and from sand to loamy fine sand in texture. The lower part is commonly reddish-brown sandy loam, loam, and loamy sand. The substratum in some places contains layers of rounded gravel and cobblestones. Content of mica flakes ranges from few to common throughout the profile. Depth to bedrock is more than 10 feet.

Buncombe loamy sand (Bn).—This is a somewhat excessively drained soil on flood plains. It occurs as fairly long, narrow strips adjacent to streams and is subject to frequent flooding. Slopes are 0 to 2 percent. Areas range from 3 to about 30 acres in size and are about 325 feet wide.

Included with this soil in mapping are some areas of Congaree soils and a few areas of poorly drained and somewhat poorly drained loamy sands and sands.

This Buncombe soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is medium acid throughout unless limed. Permeability is rapid, and surface runoff is slow. Crops respond fairly well to applications of lime and fertilizer.

Most of the acreage is forest. The rest is pastured or cultivated. Most locally grown crops are fairly well suited. Flooding and droughtiness are severe limitations. Capability unit IIIs–1; woodland group 2s8.

Cecil Series

The Cecil series consists of well-drained, gently sloping to moderately steep soils on uplands. These soils formed in residuum from acidic rock, including granite-gneiss and granite.

In a representative profile the surface layer is dark grayish-brown and brown sandy loam about 7 inches thick. The subsoil is about 43 inches thick. It is dominantly red, firm clay in the upper part and red, friable clay loam mottled with strong brown in the lower part. The substratum, to a depth of about 75 inches, is mottled red, strong-brown, and pale-brown sandy loam.

Cecil soils are low in natural fertility and organic-matter content. Unless limed, they are strongly acid to very strongly acid throughout. Permeability is moderate, and available water capacity is medium. The root zone is deep. Depth to the seasonal high water table is 10 feet or more. The shrink-swell potential is moderate.

Cecil soils are important for farming. Most of the acreage is cultivated or pastured (fig. 2), and the rest is chiefly wooded. Slope is the main limitation.

Representative profile of Cecil sandy loam, 2 to 6 percent slopes, eroded, in a wooded area 5¼ miles southeast of Newton on State Highway 16, 1¼ miles south of Mount Olin Church, 450 yards north of County Road 1877, and 50 feet northeast of private road:

O2—2 inches to 0, partially decomposed forest litter.
A1—0 to 2 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, medium, granular structure; very friable; many small roots; few quartz pebbles; strongly acid; clear, wavy boundary.
A2—2 to 7 inches, brown (7.5YR 5/4) sandy loam; weak, medium, granular structure; very friable; many small and medium roots; few quartz pebbles; strongly acid; clear, smooth boundary.
B1—7 to 10 inches, yellowish-red (5YR 4/8) sandy clay loam; weak, fine, subangular blocky structure; friable; few small and medium roots; strongly acid; clear, smooth boundary.
B21t—10 to 30 inches, red (2.5YR 4/8) clay; moderate, medium, subangular blocky structure; firm, sticky, plastic; few small roots; distinct clay films on ped faces; few fine mica flakes; few fine quartz pebbles; strongly acid; gradual, smooth boundary.
B22t—30 to 40 inches, red (2.5YR 4/8) clay; moderate and weak, medium, subangular blocky structure; firm, sticky, plastic; thin clay films on most ped faces; common fine mica flakes; strongly acid; gradual, smooth boundary.
B3—40 to 50 inches, red (2.5YR 5/8) clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few clay films on vertical faces; common fine mica flakes; strongly acid; gradual, smooth boundary.

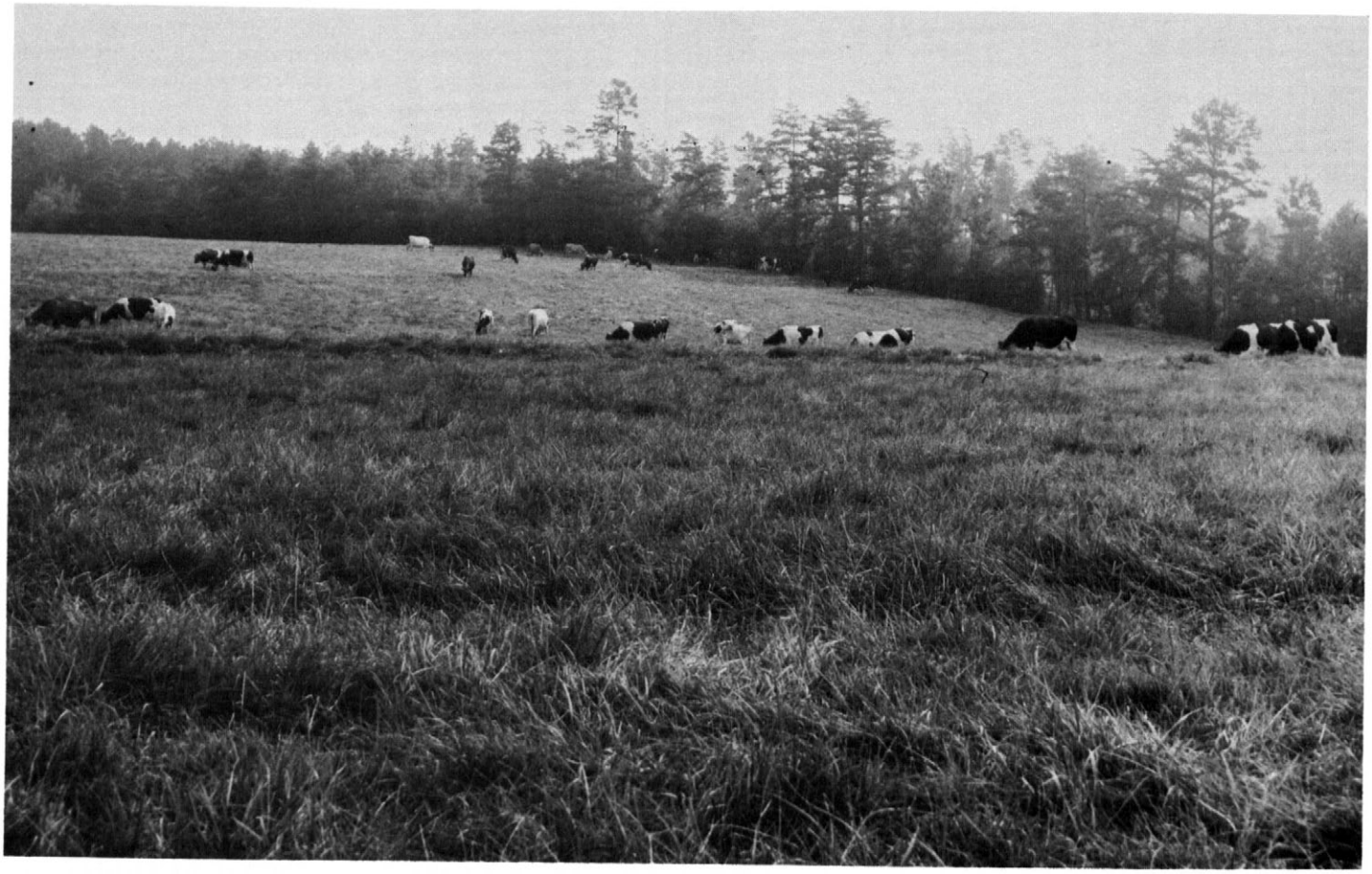

Figure 2.—Fescue pasture on Cecil sandy loam, 2 to 6 percent slopes, eroded.

C—50 to 75 inches, mottled red (2.5YR 5/8), strong-brown (7.5YR 5/8), and pale-brown (10YR 6/3) sandy loam; massive; friable; common fine mica flakes; strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock is more than 5 feet. The A1 or Ap horizon is grayish-brown or dark grayish-brown to reddish-brown sandy loam or clay loam 4 to 10 inches thick. The A2 horizon is brown or yellowish-brown sandy loam, fine sandy loam, or loam. The B horizon ranges from 35 to 50 inches in thickness. The B1 horizon is yellowish-red or red sandy clay loam or clay loam. The B2t horizon is red clay. The B3 horizon is red sandy clay loam or clay loam. The C horizon is mostly mottled red, strong-brown, and pale-brown sandy loam to clay loam material weathered from acidic rock that includes granite and granite-gneiss.

Cecil sandy loam, 2 to 6 percent slopes, eroded (CmB2).—This soil has the profile described as representative of the series. It is a well-drained soil on fairly smooth, broad ridges on uplands. It occurs as fairly long, wide bands 6 to 100 acres in size.

Included with this soil in mapping are areas of similar soils that are only slightly eroded or have a gravelly surface layer, a few areas of Hiwassee and Madison soils, and a few areas of similar soils on stream terraces that contain a small amount of rounded gravel.

Unless limed, this Cecil soil is strongly acid to very strongly acid throughout. It is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. In the more eroded areas, a crust forms after heavy rain and clods form if the surface layer is worked when too wet. Infiltration is moderate, and runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops and is used chiefly for corn, soybeans, and small grain. Most of the acreage is cultivated or pastured. The rest is wooded or is under urban development. The hazard of erosion is moderate in cultivated areas. Control of runoff is needed. Capability unit IIe–1; woodland group 3o7.

Cecil sandy loam, 6 to 10 percent slopes, eroded (CmC2).—This is a well-drained soil on the upper parts of slopes on uplands. It occurs as long, fairly wide bands 6 to 60 acres in size. In many places the present surface layer is a mixture of the original surface layer and material from the upper part of the subsoil. The surface layer is grayish-brown to reddish-brown sandy loam 6 to 10 inches thick. The subsoil is dominantly red, firm clay 35 to 50 inches thick.

Included with this soil in mapping are areas of similar soils that are only slightly eroded or have a gravelly surface layer; a few areas of Pacolet, Madison, and Hiwassee soils; and a few areas of a similar soil, on stream terraces, that contains a small amount of quartz gravel.

Unless limed, this Cecil soil is strongly acid to very strongly acid throughout. It is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. In the more eroded areas, a crust forms after heavy rain and clods form if the surface layer is worked when too wet. Infiltration is moderate, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops and is used chiefly for small grain, soybeans, and corn. It is well suited to pasture, hay, and trees. About half the acreage is cultivated or pastured. The rest is wooded or is under urban development. The hazard of erosion is severe in cultivated areas. Control of runoff and erosion is needed. Capability unit IIIe–1; woodland group 3o7.

Cecil sandy loam, 10 to 15 percent slopes, eroded (CmD2).—This is a well-drained soil on uplands. It occupies lower slopes bordering drainageways and is also above steeper side slopes. It occurs as fairly narrow areas 3 to 30 acres in size. In many places the present surface layer is a mixture of the original surface layer and material from the upper part of the subsoil. The surface layer is grayish-brown to reddish-brown sandy loam 5 to 8 inches thick. The subsoil is dominantly red, firm clay 35 to 45 inches thick.

Included with this soil in mapping are a few areas of similar soils that have a gravelly surface layer and some areas of Pacolet, Madison, and Hiwassee soils.

Unless limed, this Cecil soil is strongly acid to very strongly acid. It is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. In the more eroded areas, a crust forms after heavy rain and clods form if the surface layer is worked when too wet. Crusts and clods affect germination. Hence, stands are poor and uneven and yields are reduced. Crops respond fairly well to applications of lime and fertilizer. Infiltration is moderately slow, and runoff is rapid.

This soil is fairly well suited to most locally grown crops and is used chiefly for small grain and corn. It is well suited to pasture and trees. Most of the acreage is wooded, and the rest is pastured or cultivated. Control of runoff and erosion is needed in cultivated areas. Capability unit IVe–1; woodland group 3o7.

Cecil clay loam, 2 to 6 percent slopes, eroded (CnB2).—This is a well-drained soil on fairly smooth broad ridges on uplands. It occurs as fairly wide, irregularly shaped areas 3 to 50 acres in size. The surface layer is dominantly reddish-brown clay loam 4 to 6 inches thick. It is a mixture of the original surface layer and material from the upper part of the subsoil. The subsoil is dominantly red, firm clay 35 to 45 inches thick.

Included with this soil in mapping are some areas of Hiwassee and Pacolet soils and a few small areas of gravelly and cobbly soils.

Unless limed, this Cecil soil is strongly acid to very strongly acid throughout. It is difficult to keep in good tilth and can be worked within only a very narrow range of moisture content. A crust forms after heavy rain, and clods form if the surface layer is worked when too wet. Crusts and clods affect germination, and stands are poor and uneven. Yields are somewhat lower on this soil than on Cecil sandy loams. Crops respond fairly well to applications of lime and fertilizer. Infiltration is slow, and runoff is rapid.

This soil is fairly well suited to most locally grown crops and is used chiefly for small grain and corn. About half the acreage is cultivated or pastured, and the rest is mostly wooded. Control of runoff and erosion is needed. Capability unit IIIe–2; woodland group 3o7.

Cecil clay loam, 6 to 10 percent slopes, eroded (CnC2).—This is a well-drained soil on the upper parts of slopes on uplands. It occurs as fairly long bands 3 to 50 acres in size. The surface layer is dominantly reddish-

brown clay loam 4 to 6 inches thick and is a mixture of the original surface layer and material from the upper part of the subsoil. The subsoil is dominantly red, firm clay 35 to 40 inches thick.

Included with this soil in mapping are areas of Hiwassee and Pacolet soils.

Unless limed, this Cecil soil is strongly acid to very strongly acid throughout. It is difficult to keep in good tilth and can be worked within only a very narrow range of moisture content. A crust forms after heavy rain, and clods form if the surface layer is worked when too wet. Crusts and clods affect germination, and stands are poor and uneven. Yields are somewhat lower on this soil than on Cecil sandy loams. Crops respond fairly well to applications of lime and fertilizer. Infiltration is slow, and runoff is rapid.

This soil is well suited to pasture and most hay crops and trees and is fairly well suited to most locally grown cultivated crops. Most of the acreage is wooded. The rest is chiefly pastured or cultivated. Control of runoff and erosion is needed in cultivated areas. Capability unit IVe–2; woodland group 3o7.

Cecil clay loam, 10 to 25 percent slopes, severely eroded (CnE3).—This is a well-drained soil on the lower parts of slopes on uplands. It occurs as fairly long, narrow bands bordering drainageways. Areas are 5 to 50 acres in size. The surface layer is mostly reddish-brown clay loam 4 to 6 inches thick and is a mixture of the original surface layer and material from the upper part of the subsoil. The subsoil is dominantly red, firm clay 35 to 40 inches thick. It is commonly cut by many shallow gullies and a few deep gullies.

Included with this soil in mapping are areas of Hiwassee and Pacolet soils.

Unless limed, this Cecil soil is strongly acid to very strongly acid throughout. Crop response is fair to applications of lime and fertilizer. Infiltration is slow, and runoff is very rapid.

This soil is not suited to cultivated crops. It is poorly suited to pasture and is only fairly well suited to trees. Most of the acreage is wooded, and the rest is chiefly pastured. The severe hazard of erosion, the steep slope, and the gullies are the main limitations. Capability unit VIe–2; woodland group 4c2e.

Chewacla Series

The Chewacla series consists of nearly level, somewhat poorly drained soils on flood plains. These soils formed in recent alluvium.

In a representative profile the surface layer is brown loam about 10 inches thick. The subsoil is about 30 inches thick. The upper part is brown, friable loam mottled with light brownish gray. Underlying this is light yellowish-brown, friable loam mottled with light brownish gray. The lower part is light-gray, friable clay loam mottled with yellowish brown. The substratum, to a depth of about 64 inches, is gray clay loam mottled with yellowish brown and olive.

Chewacla soils are flooded very frequently, but for brief periods. Unless limed, they are medium acid to strongly acid throughout. Natural fertility is low, and the content of organic matter is medium. Permeability is moderate, and available water capacity is high. The root zone is moderately deep. Depth to the seasonal high water table is 1 foot. The shrink-swell potential is low.

Chewacla soils are fairly important for farming. They are well suited to corn. Most of the acreage is pastured or cultivated. Flooding and wetness are the main limitations.

Representative profile of Chewacla loam in a pasture 2½ miles southeast of Catawba, 1 mile south of Hudson Chapel Church, and 200 feet south of Ball Creek:

Ap—0 to 10 inches, brown (7.5YR 4/4) loam; few, fine, distinct, pale-brown mottles; weak, medium, granular structure; very friable; many small fibrous roots; few fine mica flakes; medium acid; gradual, wavy boundary.

B21—10 to 14 inches, brown (7.5YR 4/4) loam; few, fine, distinct, light brownish-gray mottles; weak, medium, subangular blocky structure; friable; few small fibrous roots; common fine mica flakes; medium acid; abrupt, smooth boundary.

B22g—14 to 30 inches, light yellowish-brown (10YR 6/4) loam; common, fine and medium, distinct, light brownish-gray (2.5Y 6/2) mottles; weak, medium, subangular blocky structure; friable; few small fibrous roots; common fine mica flakes; medium acid; gradual, wavy boundary.

B23g—30 to 40 inches, light-gray (10YR 7/2) clay loam; common, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine mica flakes; medium acid; gradual, wavy boundary.

C1g—40 to 51 inches, gray (10YR 5/1) clay loam; few to common, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; massive; friable; common fine mica flakes; strongly acid; gradual, wavy boundary.

C2g—51 to 64 inches, gray (N 5/0) clay loam; few, medium, distinct, olive (5Y 4/3) mottles; massive; friable; common fine mica flakes; strongly acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock is more than 4 feet. The A horizon ranges from 8 to 15 inches in thickness and is brown, yellowish-brown, or reddish-brown loam, sandy loam, or silt loam. The B horizon ranges from 28 to 45 inches in thickness and is brown, light yellowish-brown, yellowish-brown, dark-brown, or light-gray loam, silt loam, or clay loam. It is mottled with light brownish gray, brownish gray, gray, grayish brown, yellowish brown, or strong brown. The C horizon is dominantly clay loam and sandy clay loam, but ranges to stratified sand, silt, and clay.

Chewacla loam (Cw).—This is a somewhat poorly drained soil on flood plains. It is very frequently flooded. It is along streams in strips u to 2 miles long, 200 to 600 feet wide, and 2 to 40 acres in size. Slopes are 0 to 2 percent.

Included with this soil in mapping are a few areas of Congaree and Wehadkee soils and a few areas of somewhat poorly drained clayey soils at the heads of draws and in depressions.

This Chewacla soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is medium acid to strongly acid throughout. Infiltration is moderate, and runoff is slow. Crops respond well to applications of lime and fertilizer.

This soil is fairly well suited to a few locally grown crops and is well suited to pasture and water-tolerant trees. Most of the acreage is pastured or cultivated. The rest is chiefly wooded. Wetness, flooding, and a seasonal high water table are severe limitations to cultivated crops and are moderate limitations to trees. In unprotected areas, flooding usually damages crops 1 year out

of 2. Artificial drainage and flood control are needed in cultivated areas. Capability unit IIIw–1; woodland group 1w8.

Congaree Series

The Congaree series consists of nearly level, well-drained soils on flood plains. These soils formed in recent alluvium.

In a representative profile the surface layer is brown loam about 10 inches thick. The underlying material extends to a depth of about 70 inches. It is dark-brown, friable silt loam in the upper part. The middle part is strong-brown and yellowish-brown, friable silty clay loam. The lower part is dark yellowish-brown clay loam mottled with strong brown and grayish brown.

Congaree soils are flooded very frequently, but for brief periods. Unless limed, they are strongly acid to medium acid throughout. Natural fertility is low, and the content of organic matter is medium. Permeability is moderate, and available water capacity is high. The root zone is deep. Depth to the seasonal high water table is more than 3 feet. The shrink-swell potential is low.

Congaree soils are fairly important for farming. Most of the acreage is cultivated or pastured. Flooding is the main limitation.

Representative profile of Congaree loam, in an area of Congaree complex, in a pasture 5¼ miles south of Hickory, 2 miles southwest of Brookford at the north end of County Road 1129, and 200 yards south of Henry Fork River:

Ap—0 to 10 inches, brown (7.5YR 5/4) loam; weak, fine and medium, granular structure; very friable; many small fibrous roots; common fine mica flakes; medium acid; gradual, smooth boundary.

C1—10 to 27 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, granular structure; friable; few small fibrous roots; few fine mica flakes; medium acid; gradual, smooth boundary.

Ab—27 to 31 inches, dark-brown (10YR 3/3) silt loam; weak, fine and medium, granular structure; friable; common fine mica flakes; medium acid; gradual, smooth boundary.

C2—31 to 52 inches, strong-brown (7.5YR 5/6) silty clay loam; massive; friable, slightly sticky, slightly plastic; common fine mica flakes; medium acid; gradual, smooth boundary.

C3—52 to 58 inches, yellowish-brown (10YR 5/4) silty clay loam; massive; friable, slightly sticky, slightly plastic; common fine mica flakes; medium acid; gradual, smooth boundary.

C4—58 to 70 inches dark yellowish-brown (10YR 4/4) clay loam; common, fine, strong-brown and grayish-brown mottles; massive; friable; common fine mica flakes; strongly acid.

Depth to bedrock is more than 10 feet. The A horizon ranges from 8 to 15 inches in thickness and is brown, dark-brown, dark yellowish-brown, or strong-brown loam, silt loam, and fine sandy loam. The C horizon is dark brown, dark yellowish brown, strong brown, and yellowish brown and ranges from fine sandy loam to clay loam or silty clay loam. A buried A horizon is common. The lower part of the C horizon is dominantly sandy clay loam or clay loam but includes sand, loamy sand, and gravelly sand. The content of mica flakes ranges from few to common. In most places bedding planes are evident.

Congaree complex (Cy).—These are intricately mixed, well-drained soils on flood plains. They occur as fairly wide bands adjacent to streams and are subject to very frequent flooding for brief periods. Slopes are 0 to 2 percent. Areas range from 3 to 50 acres in size. In most areas this complex is about 60 percent Congaree soil and about 15 percent a soil that is similar to the Congaree soil, but is less clayey and in some places lacks evidence of bedding planes and has little or no structure.

Included with these soils in mapping are a few areas of Buncombe and Chewacla soils and a few areas on low terraces of more strongly developed, well-drained soils that are subject to less frequent flooding.

These Congaree soils are easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, they are strongly acid to medium acid throughout. Infiltration is moderate, and runoff is slow. Crops respond well to applications of lime and fertilizer.

These soils are well suited to most locally grown crops. Most of the acreage is pastured or cultivated. Crops are only occasionally damaged by flooding. Flood control is needed in cultivated areas. Capability unit IIw–1; woodland group 1o7.

Enon Series

The Enon series consists of well-drained, gently sloping soils on uplands. These soils formed in residuum from mixed acidic and basic rock, including hornblende, gneiss, and diorite.

In a representative profile the surface layer is dark grayish-brown and light olive-brown fine sandy loam about 7 inches thick (fig. 3). The subsoil is about 24 inches thick. It is yellowish-brown, very firm clay in the upper part and light olive-brown, firm clay in the lower part. The substratum, to a depth of about 39 inches, is mottled pale-yellow, yellowish-brown, and dark olive-gray clay loam.

Unless limed, Enon soils are medium acid to slightly acid throughout. Natural fertility is medium, and the content of organic matter is low. Permeability is slow, and available water capacity is medium. The root zone is moderately deep. Depth to the seasonal high water table is more than 10 feet. The shrink-swell potential is high.

Enon soils are of little importance for farming. About half the acreage is pastured or cultivated, and the rest is chiefly wooded. Slope is the main limitation.

Representative profile of Enon fine sandy loam, 2 to 6 percent slopes, in a pasture 9 miles north of Conover, 1 mile east of Lake Hickory Dam, one-half mile south of the Catawba River, and 20 feet west of field road:

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

A2—3 to 7 inches, light olive-brown (2.5Y 5/4) fine sandy loam; weak, fine, granular structure; very friable; few small fibrous roots; medium acid; abrupt, smooth boundary.

B21t—7 to 20 inches, yellowish-brown (10YR 5/6) clay; moderate, medium, angular blocky structure; very firm, sticky, plastic; few small fibrous roots; thin discontinuous clay films on ped faces; slightly acid; clear, wavy boundary.

B22t—20 to 31 inches, light olive-brown (2.5Y 5/4) clay; weak, medium, angular blocky structure; firm, sticky, plastic; few medium fibrous roots; few black highly weathered concretions; patchy clay films on ped faces; slightly acid; gradual, irregular boundary.

C—31 to 39 inches, mottled pale-yellow (2.5Y 8/4), yellowish-brown (10YR 5/8), and dark olive-gray (5Y 3/2) clay loam and weathered soft rock fragments; massive; slightly acid.

The solum ranges from 20 to 40 inches in thickness. Depth to bedrock is more than 4 feet. The A1 or Ap horizon ranges from 5 to 10 inches in thickness and is dark grayish-brown to olive-brown fine sandy loam, loam, or clay loam. The A2 horizon is light olive-brown or yellowish-brown fine sandy loam, loam, or clay loam. The B horizon ranges from 15 to 30 inches in thickness and from yellowish brown to light olive brown in color. Structure is mostly weak to moderate angular blocky. The C horizon is mottled pale-yellow or yellowish-brown to olive-brown or dark olive-gray, weathered soft rock of clay loam to clay texture. Black manganese concretions range from few to many throughout the profile.

Enon fine sandy loam, 2 to 6 percent slopes (EnB).—This is a well-drained soil on fairly short smooth ridges on uplands. Areas range from 3 to 20 acres in size.

Included with this soil in mapping are a few areas of similar soils that have slopes greater than 6 percent and some areas of Wilkes soils.

This Enon soil is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. Unless limed, it is medium acid or slightly acid throughout. Infiltration is moderate to slow, and runoff is medium. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops and is used chiefly for corn and small grain. About half the acreage is pastured or cultivated. The rest is chiefly wooded. The hazard of erosion is moderate in areas used for row crops. Control of runoff and erosion is needed. Capability unit IIe–3; woodland group 4o1.

Figure 3.—Profile of Enon fine sandy loam. The surface layer is fine sandy loam. The subsoil is plastic and clayey.

Gullied Land

Gullied land (Gu) consists of areas that have been severely eroded and deeply dissected by gullies. It occurs as small areas throughout the county, but is mainly in the steeper parts of uplands. In most places gullies have cut into the parent material and are so numerous that only narrow ridges of the original soil remain (fig. 4). On these ridges the surface layer is clay loam.

Gullied land is suitable only for trees and wildlife. Infiltration is slow, and surface runoff is rapid. Capability unit VIIe–2; woodland group unclassified.

Hiwassee Series

The Hiwassee series consists of well-drained, gently sloping to moderately steep soils on uplands. The soils formed in old alluvium or in residuum from mixed acidic and basic rock, including hornblende, gneiss, and schist.

In a representative profile the surface layer is reddish-brown loam about 6 inches thick. The subsoil is about 50 inches thick. It is dark-red, firm clay in the upper part and red, firm and friable clay loam in the lower part. The substratum, to a depth of about 108 inches, is yellowish-red loam.

Unless limed, Hiwassee soils are medium acid throughout. Natural fertility and the organic-matter content are low. Permeability is moderate, and available water capacity is medium. The root zone is deep. Depth to the seasonal high water table is more than 5 feet. The shrink-swell potential is moderate.

Hiwassee soils are important farm soils. Most of the acreage is cultivated or pastured. Slope is the chief limitation.

Representative profile of Hiwassee loam, 2 to 6 percent slopes, eroded, in a cultivated field 3½ miles southwest of Newton, 220 yards west of County Road 2013, and 50 feet east of woods along field boundary:

Ap—0 to 6 inches, reddish-brown (5YR 4/4) loam; weak, fine, granular structure; very friable; many small fibrous roots; medium acid; abrupt, smooth boundary.

B21t—6 to 30 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) dry; moderate, fine and medium, subangular blocky structure; firm, sticky, plastic; few small roots; thin continuous clay films on ped faces; medium acid; clear, smooth boundary.

B22t—30 to 44 inches, red (2.5YR 4/6) clay loam; moderate, medium, subangular blocky structure; firm, sticky, plastic; thin patchy clay films on ped faces; few fine mica flakes; medium acid; gradual, smooth boundary.

B3t—44 to 56 inches, red (2.5YR 4/8) clay loam; weak, medium, subangular blocky structure; friable; discontinuous clay films on ped faces; few, fine, dark-brown, primary mineral streaks; common fine mica flakes; medium acid; gradual, wavy boundary.

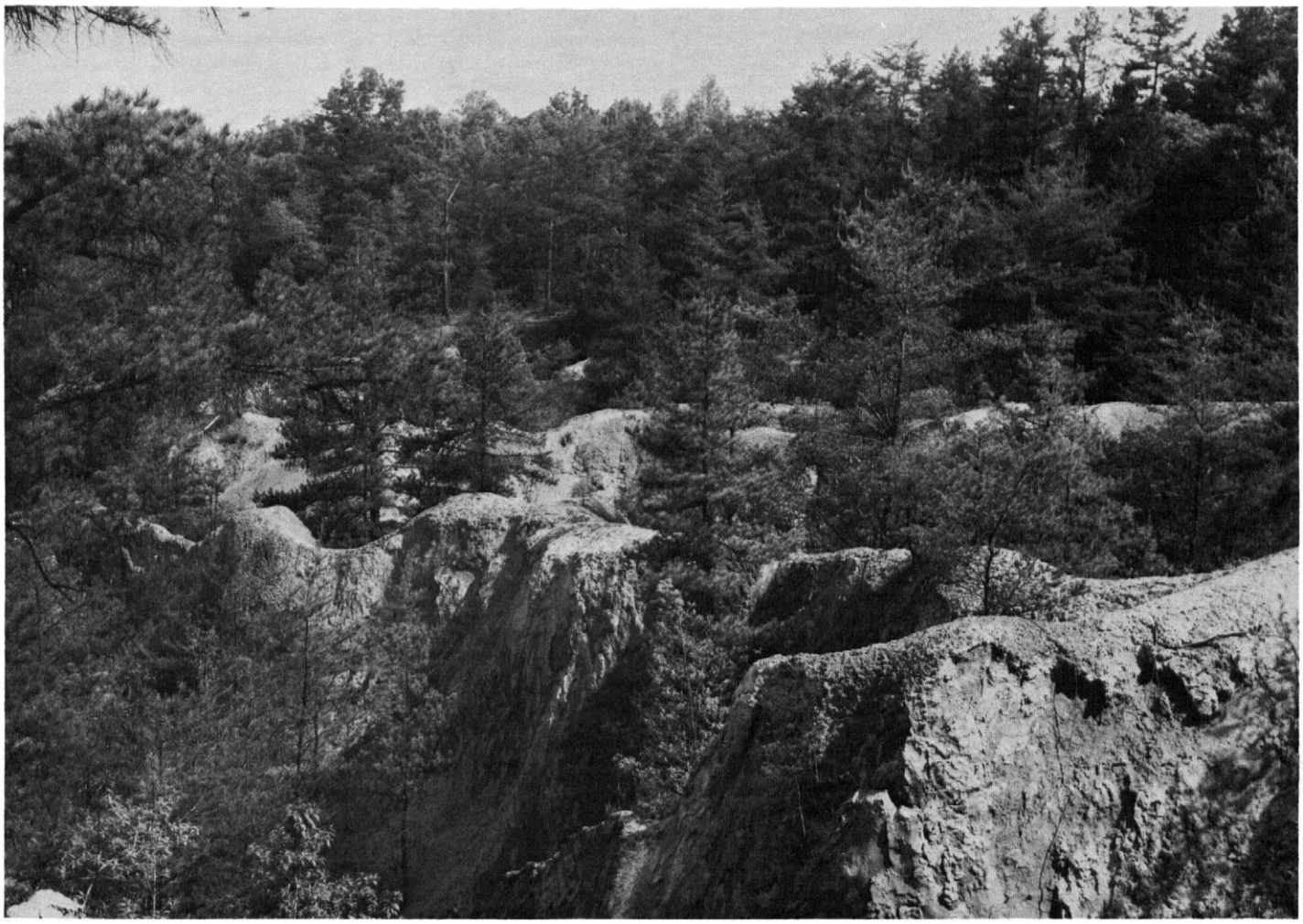

Figure 4.—Gullied land. Gullies have cut through the solum and into the parent material and are so numerous that only remnants of soil profiles remain.

C—56 to 108 inches, yellowish-red (5YR 5/6) loam; massive; friable; many dark-brown and black particles; pockets of soft weathered rock fragments; common fine mica flakes; medium acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock is more than 5 feet. The A horizon ranges from 4 to 12 inches in thickness and is reddish-brown to dark reddish-brown loam or clay loam. The B horizon ranges from 36 to 50 inches in thickness and is dark-red and red, firm clay and friable clay loam. The C horizon ranges from yellowish-red, red, or dark-red loam to clay loam. In places few to common mica flakes occur throughout the profile.

Hiwassee loam, 2 to 6 percent slopes, eroded (HsB2).—This soil has the profile described as representative of the series. It is a well-drained soil on smooth, broad ridges on uplands. It occupies wide belts 5 to 120 acres in size.

Included with this soil in mapping are a few areas of Cecil soils and a few areas in draws and depressions in which there is a soil that has a thick surface layer.

Unless limed, this Hiwassee soil is medium acid throughout. It is fairly easy to keep in good tilth, but can be worked within only a narrow range of moisture content. Crusts form after heavy rain, and clods form if the soil is too wet when worked. Infiltration is moderate, and runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to all locally grown crops and is used chiefly for corn, small grain, and soybeans. It is also well suited to pasture and trees. Most of the acreage is cultivated or pastured, and the rest is chiefly wooded or under urban development. The erosion hazard is moderate in cultivated areas. Control of runoff and erosion is needed. Capability unit IIe–1; woodland group 3o7.

Hiwassee loam, 6 to 10 percent slopes, eroded (HsC2).—This is a well-drained soil on uplands. It occurs as long, wide bands, 5 to 120 acres in size, on the upper parts of slopes. In many places the present surface layer is a mixture of the original surface layer and subsoil material. The surface layer is reddish-brown to dark reddish-brown loam 6 to 12 inches thick. The subsoil is dark-red and red, firm clay and friable clay loam 36 to 50 inches thick.

Included with this soil in mapping are some areas of Cecil soils and a few areas in draws and depressions of a similar soil that has a thick surface layer.

Unless limed, this Hiwassee soil is medium acid throughout. It is fairly easy to keep in good tilth, but can be worked within only a narrow range of moisture content. Crusts form after heavy rain, and clods form if the soil is too wet when worked. Stands of crops in the more eroded areas are uneven, and yields are lower. Crops respond well to applications of lime and fertilizer. Infiltration is moderate, and runoff is rapid.

This soil is well suited to all locally grown crops, pasture grasses, and trees. It is used chiefly for small grain, soybeans, and corn. Most of the acreage is cultivated or pastured, and the rest is wooded or under urban development. The erosion hazard is severe in cultivated areas. Control of runoff and erosion is needed. Capability unit IIIe–2; woodland group 3o7.

Hiwassee loam, 10 to 15 percent slopes, eroded (HsD2).—This is a well-drained soil on lower slopes bordering drainageways and on the lower parts of steeper slopes. It is on uplands. It occurs as short, narrow bands 3 to 30 acres in size. The surface layer is reddish-brown to dark reddish-brown loam 6 to 10 inches thick. The subsoil is dark-red, firm clay and friable clay loam 36 to 45 inches thick.

Included with this soil in mapping are some areas of similar soils that are only slightly eroded and a few areas of Cecil and Madison soils.

Unless limed, this Hiwassee soil is medium acid throughout. It is fairly easy to keep in good tilth, but can be worked within only a narrow range of moisture content. In the more eroded areas, crusts form after heavy rain and clods form if the soil is too wet when worked. In these areas stands of crops are uneven, and yields are somewhat lower. Crops respond fairly well to applications of lime and fertilizer. Infiltration is moderately slow, and runoff is rapid.

This soil is fairly well suited to most locally grown crops. It is well suited to pasture and trees. Most of the acreage is wooded. The rest is chiefly pastured or cultivated. The erosion hazard is very severe in cultivated areas. Control of runoff and erosion is needed. Capability unit IVe–2; woodland group 3o7.

Hiwassee loam, 15 to 25 percent slopes (HsE).—This is a well-drained soil on uplands. It occurs as long, narrow bands, 5 to 50 acres in size, on lower slopes bordering drainageways. The surface layer is reddish-brown to dark reddish-brown loam 7 to 10 inches thick. The subsoil is dark-red and red, firm clay and friable clay loam 36 to 40 inches thick.

Included with this soil in mapping are a few areas of Cecil and Madison soils.

Unless limed, this Hiwassee soil is medium acid throughout. Infiltration is moderately slow, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is well suited to trees and is fairly well suited to pasture. It is not suited to cultivated crops. Most of the acreage is wooded, and the rest is chiefly pastured. Slope is the main limitation. Capability unit VIe–1; woodland group 3r8.

Hiwassee clay loam, 2 to 6 percent slopes, eroded (HwB2).—This is a well-drained soil on smooth, broad ridges on uplands. Areas are irregular in shape and 3 to 40 acres in size. The surface layer is dominantly reddish-brown clay loam 4 to 6 inches thick. The subsoil is dark-red and red, firm clay and friable clay loam 36 to 45 inches thick.

Included with this soil in mapping are a few areas of Cecil and Madison soils and a few small areas in draws and depressions of a similar soil that has a thick loam surface layer.

Unless limed, this Hiwassee soil is medium acid throughout. It is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. Crusts form after heavy rain, and clods form if the soil is too wet when worked. Infiltration is slow, and runoff is medium. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops and is well suited to pasture, hay, and trees. Cultivated areas are used chiefly for small grain, corn, and soybeans. About half of the acreage is pastured or cultivated, and the rest is chiefly wooded or under urban development. The erosion hazard is severe in cultivated areas. Slope and the slow rate of infiltration are the main limitations. Control of runoff and erosion is needed. Capability unit IIIe–2; woodland group 3o7.

Hiwassee clay loam, 6 to 10 percent slopes, eroded (HwC2).—This is a well-drained soil on uplands. It occurs as long, wide bands, 5 to 100 acres in size, on the upper parts of slopes. The surface layer is dominantly reddish-brown clay loam 4 to 6 inches thick. The subsoil is dark-red and red, firm clay and friable clay loam 36 to 40 inches thick.

Included with this soil in mapping are some areas of Cecil and Madison soils.

Unless limed, this Hiwassee soil is medium acid throughout. It is difficult to keep in good tilth and can be worked within only a narrow range of moisture content. Crusts form after heavy rain, and clods form if the soil is too wet when worked. Infiltration is slow, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops. It is well suited to pasture, hay, and trees. Cultivated areas are used chiefly for small grain and corn. Most of the areage is wooded or under urban development. The rest is chiefly pastured or cultivated. In cultivated areas the hazard of erosion is very severe. Slope and the slow rate of infiltration are the main limitations. Control of runoff and erosion is needed. Capability unit IVe–2; woodland group 3o7.

Leveled Clayey Land

Leveled clayey land (Lc) consists of areas on uplands that have been cut or filled and altered to such an extent that the original soils cannot be recognized. In some places the surface layer, the subsoil, and part of the underlying material have been removed. In other places the fill is 6 to 8 feet thick.

Leveled clayey land is used chiefly for parking lots, playgrounds, and industrial sites. Some areas are along railroad tracks and right-of-ways.

The material is so variable that no use or management can be suggested. Onsite examination is needed. Capability unit unclassified; woodland group unclassified.

Madison Series

The Madison series consists of well-drained, gently sloping to moderately steep soils on uplands. These soils formed in residuum from acidic rock, including mica-schist and mica-gneiss.

In a representative profile the surface layer is yellowish-brown gravelly sandy loam about 6 inches thick. The subsoil is about 29 inches thick. It is dominantly red, friable clay in the upper part and yellowish-red friable sandy clay loam in the lower part. The substratum, to a depth of about 66 inches, is yellowish-red sandy loam mottled with red.

Unless limed, Madison soils are strongly acid throughout. Natural fertility and content of organic matter are low. Permeability is moderate, and available water capacity is medium. The root zone is moderately deep. Depth to the seasonal high water table is more than 10 feet. The shrink-swell potential is moderate.

Madison soils are fairly important for farming. About half the acreage is pastured or cultivated, and the rest is chiefly wooded. Slope is the main limitation.

Representative profile of Madison gravelly sandy loam, 2 to 6 percent slopes, eroded, in a wooded area 5¼ miles southeast of Newton on State Highway 16, one-eighth mile south on County Road 1810, 2⅛ miles southeast on County Road 1858, 2 miles west on County Road 1874 and 500 feet north of road:

Ap—0 to 6 inches, yellowish-brown (10YR 5/4) gravelly sandy loam; moderate, medium and coarse, granular structure; very friable; many small and medium roots; few fine mica flakes; common quartz and schist fragments, about 1 inch in size, make up about 20 percent of volume; strongly acid; clear, smooth boundary.

B1—6 to 9 inches, strong-brown (1.5YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; friable; many small and medium roots; common medium mica flakes; quartz and schist fragments make up about 20 percent of volume; strongly acid; clear, wavy boundary.

B2t—9 to 30 inches, red (2.5YR 4/8) clay; moderate, fine, subangular blocky structure; friable, sticky, slightly plastic; few small and medium roots; patchy clay films on ped faces; many fine mica flakes; common quartz and schist fragments; strongly acid; gradual, smooth boundary.

B3—30 to 35 inches, yellowish-red (5YR 5/8) sandy clay loam; weak, fine and medium, subangular blocky structure; friable; many fine mica flakes; many quartz and reddish-brown schist fragments; strongly acid; gradual, smooth boundary.

C—35 to 66 inches, yellowish-red (5YR 5/8) sandy loam; common, medium, distinct, red (2.5YR 5/8) mottles; massive; friable; weathered quartz and mica-schist mixed with sandy loam; strongly acid.

The solum ranges from 24 to 40 inches in thickness. Depth to bedrock is more than 3 feet. The A horizon ranges from 4 to 8 inches in thickness and from yellowish brown to reddish brown in color. The B horizon ranges from 20 to 32 inches in thickness and is red, friable to firm clay, clay loam, or sandy clay loam. The B1 horizon, if present, ranges from strong-brown sandy clay loam to clay loam. The B3 horizon, if present, is dominantly yellowish-red clay loam. Mica flakes range from common to many in the B horizon and give it a slick, greasy feel. The C horizon is dominantly yellowish-red, reddish-yellow, and red, weathered, highly micaceous schist or gneiss that contains pockets and seams of yellowish-red sandy loam.

Madison gravelly sandy loam, 2 to 6 percent slopes, eroded (MgB2).—This soil has the profile described as representative of the series. It is a well-drained soil on fairly narrow ridges on uplands. Areas range from 2 to 20 acres in size. Gravel content ranges from 15 to 30 percent, by volume, throughout the profile.

Included with this soil in mapping are some areas of similar, but nongravelly soils; some of soils that are slightly eroded; and some areas of Pacolet and Cecil soils.

Unless limed, this Madison soil is strongly acid throughout. It is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content. In the more eroded areas, a crust forms after heavy rain and clods form if the surface layer is worked when too wet. Infiltration is moderate, and runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops. It is used chiefly for small grain and soybeans. Most of the acreage is cultivated or pastured, and the rest is chiefly wooded. The hazard of erosion is moderate in cultivated areas. Control of runoff and erosion is needed. Capability unit IIe–1; woodland group 3o7.

Madison gravelly sandy loam, 6 to 10 percent slopes, eroded (MgC2).—This is a well-drained soil on the upper slopes of uplands, in fairly short, narrow bands 3 to 25 acres in size. The surface layer is yellowish-brown to reddish-brown gravelly sandy loam 5 to 8 inches thick. The subsoil is red to yellowish-red, friable to firm clay to clay loam 24 to 30 inches thick. Gravel content ranges from 15 to 30 percent by volume throughout the profile.

Included with this soil in mapping are some areas of similar, but nongravelly soils; and some areas of Pacolet and Cecil soils.

Unless limed, this Madison soil is strongly acid throughout. It is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content. In the more eroded areas, a crust forms after heavy rain, and clods form if the surface layer is worked when wet. Infiltration is moderate, and runoff is rapid. Crops respond well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops. It is used chiefly for small grain and soybeans. About half the acreage is pastured or cultivated, and the rest is chiefly wooded. The hazard of erosion is severe in cultivated areas. Control of erosion and runoff is needed. Capability unit IIIe–1; woodland group 3o7.

Madison gravelly sandy loam, 10 to 25 percent slopes, eroded (MgE2).—This is a well-drained soil on the lower slopes bordering drainageways in the uplands. It occurs as fairly short, narrow bands from 3 to 20 acres in size. The surface layer is yellowish-brown to reddish-brown gravelly sandy loam 4 to 7 inches thick. The subsoil is red to yellowish-red, friable to firm clay to clay loam 24 to 28 inches thick. Gravel content ranges from 15 to 30 percent, by volume.

Included with this soil in mapping are some areas of Pacolet and Cecil soils and a few areas of thinner, more weakly developed soils.

Unless limed, this Madison soil is strongly acid throughout. Infiltration is moderate, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is generally not suited to row crops. It is fairly well suited to all local pasture plants and is well

suited to trees. Most of the acreage is wooded, and a small amount is pastured. Capability unit VIe–1; woodland group 3r8.

Pacolet Series

The Pacolet series consists of well-drained, gently sloping to steep soils on uplands. These soils formed in residuum and acidic rock, including granite-gneiss and granite.

In a representative profile the surface layer is brown gravelly fine sandy loam about 6 inches thick. The subsoil is dominantly red, friable clay loam and sandy clay loam about 29 inches thick. The substratum, to a depth of about 60 inches, is reddish-yellow sandy loam.

Unless limed, Pacolet soils are strongly acid throughout. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. The root zone is moderately deep. Depth to the seasonal high water table is more than 5 feet. The shrink-swell potential is moderate.

Pacolet soils are fairly important for farming. Most of the acreage is wooded. Small acreages are cultivated and pastured. Slope is the main limitation.

Representative profile of Pacolet gravelly fine sandy loam, 6 to 10 percent slopes, in wooded area 9 miles southwest of Hickory, 1.6 miles southwest of Baker Mountain, and 50 feet west of County Road 1121:

A1—0 to 6 inches, brown (7.5YR 5/4) gravelly fine sandy loam; weak, fine, granular structure; very friable; many small roots; about 20 percent, by volume, common fine and medium gravel; strongly acid; clear, smooth boundary.

B1—6 to 8 inches, yellowish-red (5YR 5/8) gravelly sandy clay loam; weak, fine, subangular blocky structure; friable; few small roots; common fine and medium gravel; strongly acid; gradual, smooth boundary.

B2t—8 to 26 inches, red (2.5YR 4/8) clay loam; weak, medium, subangular blocky structure; friable, sticky; few small and medium roots; thin discontinuous clay films on ped faces; few fine pebbles; strongly acid; gradual, smooth boundary.

B3—26 to 35 inches, red (2.5YR 5/8) sandy clay loam; weak, fine, subangular blocky structure; friable, slightly sticky, slightly plastic; some partially weathered rock; few fine mica flakes; strongly acid; gradual, wavy boundary.

C—35 to 60 inches, reddish-yellow (7.5YR 6/8) sandy loam; many, soft, weathered rock fragments; strongly acid.

R—60 inches, semihard, acid crystalline rock.

The solum ranges from 24 to 40 inches in thickness. Depth to bedrock is more than 5 feet. The A horizon is brown to dark grayish-brown gravelly fine sandy loam, gravelly sandy loam, and sandy loam and ranges from 5 to 9 inches in thickness. The B horizon ranges from 19 to 31 inches in thickness. The B1 horizon is red or yellowish-red sandy clay loam, and in some areas it contains gravel. The B2 horizon is red clay loam or clay. The B3 horizon is red sandy clay loam or sandy clay. The C horizon is reddish-yellow to red sandy loam.

Pacolet gravelly sandy loam, 25 to 45 percent slopes (PaF).—This is a well-drained soil on uplands, in long narrow bands bordering drainageways. Areas are 5 to 50 acres in size. The surface layer is brown to dark grayish-brown gravelly sandy loam 5 to 7 inches thick. The subsoil is red or yellowish-red, friable to firm clay loam or clay 20 to 25 inches thick.

Included with this soil in mapping are a few areas of Madison soils, a few areas of shallow soils that have less distinct horizons than this Pacolet soil, and a few areas where rock is at the surface.

Unless limed, this Pacolet soil is strongly acid throughout. Infiltration is moderately slow, and runoff is rapid. Crop response is fair to applications of lime and fertilizer.

This soil is not suited to cultivated crops or hay. It is only fairly well suited to pasture, but is well suited to trees. Most of the acreage is wooded. Slope is the main limitation. Capability unit VIIe–1; woodland group 3r8.

Pacolet gravelly fine sandy loam, 2 to 6 percent slopes (PcB).—This is a well-drained soil on long narrow ridges on uplands. Areas range from 3 to 25 acres in size. The surface layer is brown to dark grayish-brown gravelly fine sandy loam 5 to 9 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam or clay 22 to 30 inches thick.

Included with this soil in mapping are areas of Cecil, Madison, and Hiwassee soils.

This Pacolet soil is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is strongly acid throughout. Infiltration is moderate, and runoff is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to pasture, hay, and all locally grown crops. Part of the acreage is wooded, part is under urban development, and the rest is chiefly pastured or cultivated. The hazard of erosion is moderate in cultivated areas. Control of runoff and erosion is needed. Capability unit IIe–1; woodland group 3o7.

Pacolet gravelly fine sandy loam, 6 to 10 percent slopes (PcC).—This soil has the profile described as representative of the series. It is a well-drained soil in long narrow bands on upper slopes of the uplands. Areas are 4 to 30 acres in size.

Included with this soil in mapping are areas of Cecil and Madison soils.

This Pacolet soil is fairly easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless limed, it is strongly acid throughout. Infiltration is moderate, and runoff is rapid. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to pasture, hay, and most locally grown crops. Most of the acreage is wooded, and the rest is chiefly pastured. The hazard of erosion is severe in cultivated areas. Control of runoff and erosion is needed. Capability unit IIIe–1; woodland group 3o7.

Pacolet soils, 10 to 25 percent slopes (PeE).—These are well-drained soils on uplands. They occupy fairly long, narrow bands along drainageways or between the milder and steeper slopes. Areas are 5 to 50 acres in size. The surface layer is brown to dark grayish-brown gravelly sandy loam or sandy loam 5 to 8 inches thick. The subsoil is red to yellowish-red, friable to firm clay loam or clay 19 to 28 inches thick. Gravel content ranges from 15 to 30 percent.

Included with these soils in mapping are a few areas of Madison and Cecil soils and small areas of well drained to moderately well drained soils in long narrow drainageways. Also included are a few areas where rock is at the surface.

Unless limed, these Pacolet soils are strongly acid throughout. Infiltration is moderately slow, and runoff

is rapid. Crops respond fairly well to applications of lime and fertilizer.

These soils are well suited to trees and fairly well suited to most pasture plants. They generally are not suited to row crops. Most of the acreage is wooded, and the rest is chiefly pastured. Slope and the hazard of erosion are the main limitations. Capability unit VIe–1; woodland group 3r8.

Wehadkee Series

The Wehadkee series consists of nearly level, poorly drained soils on flood plains. These soils formed in loamy alluvial deposits.

In a representative profile the surface layer is grayish-brown fine sandy loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is dark-gray, friable loam mottled with strong brown. The lower part is gray, friable sandy clay loam mottled with strong brown. The substratum, to a depth of about 50 inches, is gray sandy loam mottled with grayish brown and strong brown.

Wehadkee soils are flooded very frequently, but for brief periods. Unless limed, they are medium acid throughout. Natural fertility is low, and the content of organic matter is medium. Permeability is moderate, and available water capacity is high. The root zone is moderately deep. The high water table is seasonally at the surface. The shrink-swell potential is low.

Wehadkee soils are not important for farming. Most of the acreage is in mixed hardwoods and a few pines. A small part is pasture. Wetness and flooding are the main limitations.

Representative profile of Wehadkee fine sandy loam one-half mile south of Witherspoon Crossroads on County Road 1801, three-fourths of a mile east on County Road 1807, and 650 feet north of bridge on Hagan Fork:

Ap—0 to 8 inches, grayish-brown (10YR 5/2) fine sandy loam; weak, medium, granular structure; very friable; few fine mica flakes; medium acid; abrupt, smooth boundary.

B1g—8 to 17 inches, dark-gray (10YR 4/1) loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure; friable; few fine mica flakes; medium acid; clear, smooth boundary.

B2g—17 to 40 inches, gray (10YR 6/1) sandy clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common fine mica flakes; medium acid; clear, smooth boundary.

Cg—40 to 50 inches, gray (10YR 6/1) sandy loam; common, medium, distinct, grayish-brown (10YR 5/2) and strong-brown (7.5YR 5/6) mottles; massive; friable; common fine mica flakes; medium acid.

The solum ranges from 36 to 60 inches in thickness. Depth to bedrock is more than 4 feet. The A horizon ranges from 6 to 12 inches in thickness and from grayish brown to gray in color. The B horizon ranges from 30 to 48 inches in thickness and is light-gray to dark-gray sandy clay loam, loam, or silt loam. It contains few to many grayish-brown, strong-brown, and yellowish-brown mottles. Structure is commonly weak, fine and medium, subangular blocky. The C horizon is sandy loam or stratified sand, silt, clay, and gravel. The content of mica flakes ranges from few to common throughout the profile.

Wehadkee fine sandy loam (Wd).—This is a poorly drained soil on flood plains. It occurs as fairly narrow bands between uplands and streams. Areas range from 3 to 40 acres in size. Slopes are 0 to 2 percent.

Included with this soil in mapping are some areas of Chewacla soils and small areas of more clayey, poorly drained soils in draws and depressions.

This Wehadkee soil is fairly easy to keep in good tilth, but can be worked within only a narrow range of moisture content. Unless limed, it is medium acid throughout. Infiltration is moderate. Runoff is slow and in places is ponded. Crops respond fairly well to applications of lime and fertilizer.

If adequately drained, this soil is well suited to pasture and water-tolerant trees and is fairly well suited to a few locally grown crops. Most of the acreage is wooded. Wetness caused by a seasonal high water table and very frequent flooding is a severe limitation. Artificial drainage and flood control are needed in cultivated areas. Capability unit IVw–1; woodland group 1w9.

Wilkes Series

The Wilkes series consists of strongly sloping to moderately steep, well-drained soils on uplands. These soils formed in residuum derived from mixed acidic and basic rocks.

In a representative profile the surface layer is light olive-brown loam about 5 inches thick. The subsoil is light yellowish-brown clay loam about 10 inches thick. The substratum is mottled pale-yellow and olive-gray sandy loam. Depth to hard rock is about 42 inches.

Wilkes soils are medium in natural fertility and low in content of organic matter. They are medium acid to neutral throughout the profile. Permeability is moderately slow, and available water capacity is medium. The root zone is shallow. A seasonal high water table is at a depth of more than 10 feet. The shrink-swell potential is high.

Wilkes soils are of minor importance for farming. Most of the acreage is wooded. Slope and shallowness are the main limitations.

Representative profile of Wilkes loam, 10 to 25 percent slopes, in a pasture 1¼ miles east from junction of State Highway 16 and County Road 1700, 1 mile west on farm road to old two-story house, and 250 feet northeast from house.

Ap—0 to 5 inches, light olive-brown (2.5YR 5/4) loam; weak, medium, granular structure; friable; many small fibrous roots; few quartz pebbles; few black rock fragments; few fine mica flakes; slightly acid; abrupt, wavy boundary.

B2t—5 to 15 inches, light yellowish-brown (2.5Y 6/4) clay loam; moderate, medium, angular blocky structure; firm, sticky, plastic; thin discontinuous clay films on ped faces; few fine mica flakes; few black rock fragments; many pockets of highly weathered saprolite; neutral; gradual, irregular boundary.

C—15 to 42 inches, mottled pale-yellow (2.5Y 8/4) and olive-gray (5Y 4/2) sandy loam; massive; friable; few fine mica flakes; clayey material intermingled in layer; slightly acid.

R—42 inches, hard rock.

The solum ranges from 12 to 20 inches in thickness. It contains few to many black ferromagnesian rock fragments. Depth to bedrock ranges from 2 to 4 feet or more. The A horizon ranges from 4 to 8 inches in thickness, from light olive brown to dark brown in color, and from loam to sandy loam in texture. The B horizon ranges from 6 to 12 inches in thickness, from light yellowish brown to olive brown in color, and

from clay to sandy clay loam in texture. The C horizon is highly variable in color and is mottled mostly in shades of yellow, brown, black, and gray. It ranges from clay loam to sandy loam.

Wilkes loam, 10 to 25 percent slopes (WkE).—This is a well-drained soil of the uplands. It occurs as irregular areas, 3 to 20 acres in size, bordering drainageways.

Included with this soil in mapping are a few areas of Enon soils, a few areas where slopes are less than 10 percent, and some where slopes are greater than 25 percent.

This Wilkes soil is medium acid to neutral throughout the profile. Crops respond moderately well to applications of lime and fertilizer. Infiltration is moderately slow, and runoff is rapid.

This soil is not suited to crops but is moderately well suited to pasture grasses and trees. Most of the acreage is wooded, and the rest is pastured. Slope and shallowness are the main limitations. Capability unit VIe–1; woodland group 4r2.

Worsham Series

The Worsham series consists of nearly level to gently sloping, poorly drained soils on uplands. These soils are at the heads of drainageways, on foot slopes, and in slight depressions. They formed in material washed from adjacent slopes and in residuum derived from weathered bedrock.

In a representative profile the surface layer is dark-gray fine sandy loam about 9 inches thick. The subsoil contains yellowish-brown mottles and is about 31 inches thick. It is gray, firm sandy clay in the upper part, and gray, friable sandy clay loam in the lower part. The substratum, to a depth of 60 inches, is gray sandy clay mottled with yellowish brown.

Worsham soils are low in natural fertility and medium in content of organic matter. Unless limed, they are strongly acid to very strongly acid throughout. Permeability is moderately slow, and available water capacity is high. The root zone is moderately deep. The high water table is seasonally at the surface. The shrink-swell potential is moderate.

Worsham soils are not important for farming. Most of the acreage is wooded. If cleared, the soils are well suited to pasture and fairly well suited to a few locally grown crops. The seasonal high water table, seepage, and flooding are the main limitations.

Representative profile of Worsham fine sandy loam in a wooded area 6 miles east of Newton, 0.7 mile southeast of Balls Creek School, and 125 yards east of County Road 1815:

A1—0 to 9 inches, dark gray (10YR 4/1) fine sandy loam; weak, fine, granular structure; very friable; many small fibrous roots; strongly acid; clear, smooth boundary.

B2tg—9 to 30 inches, gray (10YR 6/1) sandy clay; few, fine, distinct, yellowish-brown mottles; moderate, medium, subangular blocky structure; firm, sticky, slightly plastic; patchy clay films on ped faces; few fine mica flakes; strongly acid; gradual, smooth boundary.

B3tg—30 to 40 inches, gray (10YR 6/1) sandy clay loam; common, fine and medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; friable; patchy clay films on ped faces; few fine mica flakes; very strongly acid; clear, smooth boundary.

Cg—40 to 60 inches, gray (10YR 6/1) sandy clay; many, fine and medium, distinct, yellowish-brown (10YR 5/4) mottles; massive; firm; few fine mica flakes; very strongly acid.

The solum ranges from 40 to 60 inches in thickness. Depth to bedrock is more than 5 feet. The A horizon ranges from 8 to 12 inches in thickness and is gray to dark grayish-brown fine sandy loam or loam. The B horizon ranges from 28 to 48 inches in thickness and is light-gray to grayish-brown clay loam, sandy clay, sandy clay loam, and clay. There are few to many, yellowish-brown to yellowish-red mottles in the B horizon. The B and C horizons contain few to common mica flakes. The C horizon ranges from sandy clay to sandy loam.

Worsham fine sandy loam (Wo).—This is a poorly drained soil at the heads of drainageways, on foot slopes, and in depressions on uplands. Slopes range from 0 to 6 percent. Areas are irregular in shape and 3 to 20 acres in size.

Included with this soil in mapping are some areas of a somewhat poorly drained soil in draws and depressions and a few areas of somewhat poorly drained and poorly drained soils on flood plains and low terraces that are subject to flooding.

This Worsham soil is wet during much of the year. Infiltration is moderately slow, and surface runoff is slow or ponded. This soil is easy to keep in good tilth. Unless limed, it is strongly acid to very strongly acid throughout. Crops respond fairly well to applications of lime and fertilizer.

If adequately drained, this soil is well suited to pasture and moderately well suited to a few locally grown crops. Most of the acreage is wooded. Wetness is the main limitation for cultivated crops. The water table is seasonally high, and water seeps in from the adjacent uplands. Artificial drainage and diversions are needed in cultivated areas. Capability unit IVw–1; woodland group 2w8.

Use and Management of the Soils

Use and management of the soils of Catawba County for crops and pasture, woodland, wildlife, and engineering are suggested in the pages that follow. For specific suggestions on management of individual soils, consult a representative of the local office of the Soil Conservation Service, the Extension Service, or the Agricultural Experiment Station.

Crops and Pasture [3]

This section explains the capability classification, in which the soils are grouped according to their suitability for most kinds of farming. It defines the capability groups in Catawba County and describes management of the soils by capability units. It also gives estimates of yields of crops under superior management on the arable soils of the county.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations when used for

[3] J. E. POLLOCK, conservation agronomist, and ANTHONY J. ERNSTES, district conservationist, Soil Conservation Service, helped prepare this section.

field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

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

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

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

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

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

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

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

Class V soils are subject to little or no erosion, but have other limitations, impractical to remove, that limit their use largely to pasture or range, woodland, or wildlife. (None in Catawba County)

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None in Catawba County)

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in some parts of the United States but not in Catawba County, shows that the chief limitation is climate that is too cold or too dry.

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

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example IIe–2 or IIw–1. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

In the following pages the capability units in Catawba County are described and suggestions for the use and management of the soils are given. The capability designation for each soil in the county can be found in the Guide to Mapping Units.

CAPABILITY UNIT IIe–1

This unit consists of well-drained, gently sloping soils on uplands. The surface layer is loam, sandy loam, gravelly sandy loam, or gravelly fine sandy loam. The subsoil ranges from friable clay loam or sandy clay loam to firm clay. In places part of the original plow layer has been removed through erosion, and the plow layer is a mixture of the remaining surface layer and the subsoil. In some small areas the subsoil is exposed.

Unless limed, these soils are medium acid to very strongly acid.

The uneroded soils are easy to keep in good tilth and can be worked throughout a wide range of moisture content. In most places the eroded soils are fairly easy to keep in good tilth, but unless they are worked under optimum moisture conditions, crusts and clods form. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crops respond well to applications of fertilizer and lime.

These soils are well suited to most locally grown crops, mainly small grain, corn, and soybeans. Most of the acreage is cultivated or pastured, and the rest is wooded or is under urban development.

The erosion hazard is moderate in cultivated areas. Runoff and the erosion hazard can be reduced if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 25 to 50 percent of the time; and contour tillage, diversions, terraces, and stripcropping are part of management. Natural draws, field borders (fig. 5), and other needed outlets for disposal of surface runoff can be planted to perennial grasses, preferably a sod-forming type.

CAPABILITY UNIT IIe–2

Altavista fine sandy loam, clayey variant, is the only soil in this unit. It is a moderately well drained, gently

Figure 5.—**Field border of fescue on Hiwassee loam, 2 to 6 percent slopes, eroded.**

sloping soil on uplands and flood plains. The surface layer is fine sandy loam. The subsoil is friable to firm clay loam.

This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is medium acid unless limed. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crops respond well to applications of lime and fertilizer.

This soil is well suited to most locally grown crops. Most of the acreage is cultivated or pastured, and the rest is chiefly wooded.

The hazard of erosion is moderate in cultivated areas. Runoff and the erosion hazard can be reduced, soil tilth improved, and crop yields increased if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 25 to 50 percent of the time; and contour tillage along with diversions, terraces, or stripcropping are part of management. Natural draws, field borders, and other needed outlets for disposal of surface runoff can be planted to perennial grasses, preferably a sod-forming type.

CAPABILITY UNIT IIe-3

Enon fine sandy loam, 2 to 6 percent slopes, the only soil in this unit, is a well-drained soil on uplands. The surface layer is fine sandy loam. The subsoil is very firm to firm clay. Part of the original surface layer has been removed through erosion, and in places the plow layer is a mixture of the remaining surface layer and the subsoil.

This soil is difficult to keep in good tilth. It can be worked only within a narrow range of moisture content; otherwise, crusts and clods form. Natural fertility is medium, and content of organic matter is low. Permeability is slow, and available water capacity is medium. The soil is medium acid to slightly acid unless limed. Crops respond fairly well to applications of lime and fertilizer.

This soil is fairly well suited to most locally grown crops. About half the acreage is cultivated or pastured, and the rest is wooded.

Runoff and the hazard of erosion are moderate in cultivated areas. Both can be reduced, soil tilth improved, and crop yields increased if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 30 to 50 percent of the time; and contour tillage along with diversions, terraces, or stripcropping are part of management. Natural draws, field borders, and other needed outlets for disposal of surface runoff can be planted to perennial grasses, preferably a sod-forming type.

CAPABILITY UNIT IIw-1

This unit consists only of Congaree complex, a mapping unit of well-drained, nearly level soils on flood plains.

The surface layer ranges from loam to silt loam and fine sandy loam. The underlying material is friable fine sandy loam, clay loam, or silty clay loam.

These soils are easy to keep in good tilth and can be worked throughout a wide range of moisture content. They are medium acid to strongly acid unless limed. Natural fertility is low, and content of organic matter is medium. Permeability is moderate, and available water capacity is high. Crops respond very well to applications of lime and fertilizer.

These soils are well suited to most locally grown crops. Most of the acreage is cultivated or pastured.

Flooding is the main limitation to intensive use of these soils. Flooding for brief periods occurs two or three times in some years. Crops are occasionally damaged. In some areas drainage is needed in small wet spots. Row crops can be grown each year if all crop residue is returned to the soil. Crop yields, the organic-matter content, and the soil tilth can be maintained at a high level if tillage is kept at a minimum and soil conserving crops, preferably perennial grasses, are included in the cropping system every other year or at least 1 year in 3.

CAPABILITY UNIT IIIe-1

This unit consists of well-drained, sloping soils on uplands. The surface layer is gravelly sandy loam, gravelly fine sandy loam, or sandy loam. The subsoil ranges from friable sandy clay loam or clay loam to firm clay. In places part of the original plow layer has been removed through erosion, and the present plow layer is a mixture of the remaining surface material and material from the subsoil. In some small areas the subsoil is exposed.

Unless limed, these soils are strongly acid to very strongly acid. All but the eroded soils are easy to keep in good tilth and can be worked throughout a wide range of moisture content. Unless the eroded soils are worked under optimum moisture conditions, crusts and clods form. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crops respond well to fairly well to applications of lime and fertilizer.

The eroded soils are fairly well suited to most locally grown crops. The rest are well suited. Small grain (fig. 6), corn, and soybeans are the main crops. About half

Figure 6.—Barley on Cecil sandy loam, 6 to 10 percent slopes, eroded.

the acreage is cultivated or pastured, and the rest is wooded or under urban development.

Runoff and the hazard of erosion are severe in cultivated areas. Both can be reduced if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 50 to 75 percent of the time; and contour tillage along with diversions, terraces, or stripcropping are part of management.

CAPABILITY UNIT IIIe-2

This unit consists of well-drained, gently sloping to sloping soils on uplands. The surface layer is loam or clay loam. The subsoil is firm clay or friable clay loam. In many places part of the original plow layer has been removed through erosion, and the present plow layer is a mixture of the remaining surface material and the subsoil. In the more severely eroded areas, the plow layer is dominantly subsoil material.

Unless limed, these soils are medium acid to very strongly acid. In most areas they are difficult to keep in good tilth and can be worked within only a narrow or very narrow range of moisture content. Unless moisture conditions are optimum, crusts and clods form. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crops respond well to fairly well to applications of lime and fertilizer, depending on the degree of erosion.

The severely eroded soils are fairly well suited to most locally grown crops. The rest are well suited. All are well suited to grasses, legumes, and small grain. About half the acreage is cultivated or pastured, and the rest is wooded or under urban development.

Runoff and the hazard of erosion are severe in cultivated areas. Both can be reduced, soil tilth improved, and organic-matter content and crop yields increased if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 50 to 75 percent of the time; and contour tillage along with diversions, terraces, or stripcropping are part of management. Natural draws, field borders, and other needed outlets for disposal of surface runoff can be planted to perennial grasses, preferably a sod-forming type, such as fescue (fig. 7).

CAPABILITY UNIT IIIw-1

Chewacla loam, the only soil in this unit, is a somewhat poorly drained, nearly level soil on flood plains. The surface layer is loam, and the subsoil is friable loam, silt loam, or clay loam.

Unless limed, this soil is medium acid to strongly acid. It is easy to keep in good tilth and can be worked

Figure 7.—**Natural draw seeded to fescue. The soil is Hiwassee loam, 6 to 10 percent slopes, eroded.**

throughout a wide range of moisture content. Natural fertility is low, and the content of organic matter is medium. Permeability is moderate, and available water capacity is high. Crops respond well to applications of lime and fertilizer.

This soil is fairly well suited to a few locally grown crops that are fairly tolerant of water, for example, corn and fescue. It is well suited to pasture. Most of the acreage is pastured or cultivated, and the rest is wooded.

Wetness and flooding are the main limitations. Wetness is a severe hazard. Some artificial drainage is needed for most crops. The content of organic matter can be maintained and tilth improved if all crop residue is returned to the soil.

CAPABILITY UNIT IIIs–1

Buncombe loamy sand, the only soil in this unit, is a somewhat excessively drained, nearly level soil on flood plains. The surface layer is loamy sand, and the underlying layers are loose sand or loamy fine sand.

This soil is easy to keep in good tilth and can be worked throughout a wide range of moisture content. It is medium acid unless limed. Natural fertility and the content of organic matter are very low. Permeability is rapid, and available water capacity is low. Crops respond fairly well to applications of lime and fertilizer.

Most of the acreage is wooded, and the rest is pastured or cultivated. Flooding and low available water capacity make this soil only fairly well suited to most locally grown crops.

Droughtiness and the very low natural fertility and content of organic matter are the major limitations. Tilth can be maintained, the content of organic matter increased, and crop yields improved if all crop residue is returned to the soil and tillage is kept at a minimum. Organic matter "burns out" of this soil rapidly. Fertilizer, especially nitrogen, should be applied in split applications.

CAPABILITY UNIT IVe–1

This unit consists of well-drained, strongly sloping to moderately steep soils on uplands. The surface layer is sandy loam, and the subsoil is firm clay or friable clay loam. In places, part of the original plow layer has been removed through erosion, and the present plow layer is a mixture of the remaining material and the subsoil. In spots the subsoil is exposed.

Unless limed, these soils are strongly acid to very strongly acid. Some are easy to keep in good tilth and can be worked throughout a wide range of moisture content. Others are difficult to keep in good tilth and can be worked within only a narrow range of moisture content. Unless moisture conditions are optimum, crusts and clods form. Natural fertility and the organic-matter content are low. Permeability is moderate, and available water capacity is medium. Crops respond fairly well to applications of lime and fertilizer.

These soils are fairly well suited to moderately well suited to most locally grown crops. They are well suited to most locally grown pasture and hay crops. Most of the acreage is wooded, and the rest is pastured or cultivated.

Runoff and the hazard of erosion are severe in cultivated areas. Both can be reduced, soil tilth improved, and crop yields and organic-matter content increased if all crop residue is returned to the soil; tillage is kept at a minimum; soil conserving crops, such as perennial grasses, are grown 75 percent or more of the time; and contour tillage along with stripcropping or diversions, or both, are part of management. Natural draws, field borders, and other needed outlets for disposal of surface runoff can be planted to perennial grasses, preferably a sod-forming type.

CAPABILITY UNIT IVe–2

This unit consists of well-drained, sloping and strongly sloping soils on uplands. The surface layer is loam or clay loam. The subsoil is clay or clay loam. In places part of the original plow layer has been removed through erosion, and the present plow layer is a mixture of the remaining surface material and the subsoil.

Unless limed, these soils are medium acid to very strongly acid. They are difficult to keep in good tilth and can be worked within only a narrow or very narrow range of moisture content. Unless moisture conditions are optimum, crusts and clods form. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crops respond fairly well to applications of lime and fertilizer.

These soils are fairly well suited to most locally grown crops. They are well suited to pasture, hay, and trees.

Runoff and the hazard of erosion are severe in cultivated areas. Slope and erosion are the main limitations to be considered in management. Runoff and the erosion hazard can be reduced, tilth improved, and the organic-matter content and crop yields increased if all crop residue is returned to the soil; tillage is kept at a minimum; close-growing crops are grown 75 percent or more of the time; and contour tillage along with stripcropping or diversions, or both, are part of management. Natural draws, field borders, and other needed outlets for disposal of surface runoff can be planted to sod-forming, perennial grasses.

CAPABILITY UNIT IVw–1

This unit consists of poorly drained, nearly level to gently sloping soils on flood plains and in depressions and draws in the uplands. The surface layer is fine sandy loam, and the subsoil is friable to firm loam, sandy clay loam, or sandy clay.

Unless limed, these soils are medium acid to very strongly acid. Natural fertility is low, and the content of organic matter is medium. Permeability is moderately slow or moderate, and available water capacity is high. Crop response is fair to fairly good to applications of lime and fertilizer.

If drained, these soils are fairly well suited to a few locally grown crops. They are well suited to trees and pasture. Most of the acreage is wooded. Only a small part is cultivated or pastured.

A seasonal high water table, flooding, and seepage from adjacent uplands are the main limitations. Wetness is a severe hazard. A complete drainage system is needed for all crops and most pasture. In cultivated areas, tilth can be improved and organic-matter content maintained if all crop residue is returned to the soil. Crops can be grown each year, but a better cropping system is 1 or more years of a close-growing crop followed by 1 or 2 years of row crops.

CAPABILITY UNIT VIe–1

This unit consists of well-drained, strongly sloping to moderately steep soils on uplands. The surface layer is sandy loam, loam, or gravelly sandy loam. The subsoil ranges from friable clay loam to firm clay. In places, part of the original plow layer has been removed through erosion, and the present plow layer is a mixture of the remaining surface material and the subsoil.

The soils range from strongly acid to neutral. Natural fertility is low to medium, and the content of organic matter is low. Permeability is moderate or moderately slow, and available water capacity is medium. Crop response is fair to fairly good to applications of lime and fertilizer.

In most areas these soils are too steep to be suited to cultivated crops. They are fairly well suited to locally grown pasture grasses and legumes, and they are well suited to trees. Most of the acreage is wooded, and the rest is used mainly for pasture.

Pasture seeding or renovation, particularly on the steeper slopes, can be done in alternate strips to reduce the erosion hazard. Pastures can be stocked at a rate that maintains a top growth of not less than 3 inches. Pastures are best maintained by rotation grazing. By this method, animals graze the pasture down to the 3-inch level and are then rotated to another pasture.

CAPABILITY UNIT VIe–2

Cecil clay loam, 10 to 25 percent slopes, severely eroded, is the only soil in this unit. It is well drained and is on uplands. Many shallow gullies and a few deep gullies have formed. The surface layer is clay loam, and the subsoil is dominantly firm clay. In most places, the original plow layer has been removed through erosion, and the present plow layer is a mixture of the subsoil material and only a small amount of the original surface material.

Unless limed, this soil is strongly acid to very strongly acid. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium. Crop response is only fair to applications of lime and fertilizer.

This soil is not suited to cultivated crops because it is steep, gullied, and highly erodible. It is poorly suited to pasture and is only fairly well suited to trees. Most of the acreage is wooded. A small part is pastured.

If this soil is used for pasture, seeding or renovation can be done in alternate strips to reduce the hazard of erosion. More intensive management is required in the severely eroded and gullied areas to establish any type of vegetation.

CAPABILITY UNIT VIIe–1

Pacolet gravelly sandy loam, 25 to 45 percent slopes, is the only soil in this unit. It is well drained and is on uplands. The surface layer is gravelly sandy loam. The subsoil is friable or firm clay loam or firm clay.

Unless limed, this soil is strongly acid. Natural fertility and the content of organic matter are low. Permeability is moderate, and available water capacity is medium.

This soil is too steep to be suitable for cultivation. It is best suited to forest, wildlife, and recreation. Most of the acreage is wooded or idle.

CAPABILITY UNIT VIIe–2

Only Gullied land is in this unit. It consists of areas, mostly on the steeper parts of uplands, that have been cut by numerous, deep and shallow gullies. The surface layer is dominantly clay loam. In most places, the gullies have cut into the parent material and are so numerous that only narrow ridges of the original soil remain between the gullies.

Gullied land is not suitable for cultivation. All the acreage is wooded or idle.

Special management practices are needed to establish any kind of vegetation on Gullied land. Planting trees, kudzu, or other close-growing plants would prevent further damage to the surrounding areas and reduce silting of streams.

Estimated yields

Estimated yields of the principal crops grown in Catawba County are shown in table 2. Yields depend on the kind of soil, the climate, the kind of crop, and the level of management. The estimates in table 2 are based on high-level management. Under high-level management—

1. Fertilizer and lime are applied according to the needs indicated by the results of soil tests.
2. High-yielding varieties of crops are planted.
3. Legumes are inoculated.
4. Soils are properly tilled, and crops are properly cultivated.
5. Weeds, insects, and diseases are controlled.
6. Crop rotations selected conserve moisture and protect the soils from erosion.
7. Runoff is adequately controlled.
8. Overgrazing is avoided, and pasture is well managed.

The estimates in table 2 are based on experience with the crops and soils of the county and on assumptions of average rainfall over a long period, no supplemental irrigation, adequate drainage, and no flooding or ponding.

Woodland [4]

All the area that is now Catawba County was originally forest. The forests were predominantly hardwoods consisting of many different kinds of broadleaf deciduous trees and also some needleleaf cone-bearing species, such as pine, hemlock, and eastern redcedar. Shade-tolerant trees, shrubs, and woody vines made up the understory. On north-facing slopes, especially in the western part of the county in the vicinity of Baker Mountain, mountain-laurel and rhododendron (rosebay) were dominant in the flora of the understory.

On the uplands and high stream terraces were scarlet, red, white, black, southern red, chestnut, blackjack, and post oaks; mockernut and pignut hickory; blackgum and sweetgum; yellow-poplar, American chestnut, persimmon, winged elm, and basswood; some shortleaf, Virginia, and pitch pine; and in the western part of the county, scattered eastern white pine. In the understory were dogwood, sourwood, serviceberry, and holly.

[4] By JOHN E. WIGGINS, JR., forester, Soil Conservation Service, U.S. Department of Agriculture.

TABLE 2.—*Estimated average acre yields of dryfarmed crops under superior management*

[Absence of figure indicates that the crop is not commonly grown on the soil or no data are available on which to base an estimate]

Soil	Corn	Soybeans	Oats	Wheat	Barley	Silage		Hay		Pasture
						Corn	Soybeans and sorghum	Fescue	Red clover	Fescue
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*A.U.D.*[1]
Altavista fine sandy loam, clayey variant	95	42	80	65	60	20	15	2.3	2.4	260
Appling sandy loam, 2 to 6 percent slopes	90	40	85	65	60	18	14	2.1	2.2	260
Appling sandy loam, 6 to 10 percent slopes, eroded	80	30	80	60	55	15	12	1.9	2.0	240
Appling sandy loam, 10 to 25 percent slopes, eroded	65	25	70	55	50	12	10	1.7	1.6	220
Buncombe loamy sand	55	20	55	------	40	10	8	1.0	------	150
Cecil sandy loam, 2 to 6 percent slopes, eroded	90	40	85	65	60	18	14	2.1	2.2	260
Cecil sandy loam, 6 to 10 percent slopes, eroded	80	32	80	60	55	15	10	1.9	2.0	240
Cecil sandy loam, 10 to 15 percent slopes, eroded	70	25	70	55	50	12	8	1.7	1.6	220
Cecil clay loam, 2 to 6 percent slopes, eroded	70	30	60	50	40	12	10	1.7	1.8	200
Cecil clay loam, 6 to 10 percent slopes, eroded	60	20	50	45	35	10	8	1.5	1.6	180
Cecil clay loam, 10 to 25 percent slopes, severely eroded	------	------	------	------	------	------	------	1.3	1.4	140
Chewacla loam	100	------	80	------	------	20	12	2.4	------	265
Congaree complex	110	45	80	75	65	22	18	2.4	2.6	270
Enon fine sandy loam, 2 to 6 percent slopes	75	32	60	50	45	15	12	2.0	2.1	240
Gullied land	------	------	------	------	------	------	------	------	------	------
Hiwassee loam, 2 to 6 percent slopes, eroded	90	42	85	75	65	18	14	2.2	2.3	260
Hiwassee loam, 6 to 10 percent slopes, eroded	80	35	80	70	60	15	12	2.0	2.1	240
Hiwassee loam, 10 to 15 percent slopes, eroded	70	28	70	60	50	12	10	1.8	1.9	220
Hiwassee loam, 15 to 25 percent slopes	------	------	------	------	------	------	------	1.6	1.7	200
Hiwassee clay loam, 2 to 6 percent slopes, eroded	70	30	60	50	45	12	12	1.8	1.9	220
Hiwassee clay loam, 6 to 10 percent slopes, eroded	60	25	50	45	40	10	10	1.6	1.7	200
Leveled clayey land	------	------	------	------	------	------	------	------	------	------
Madison gravelly sandy loam, 2 to 6 percent slopes, eroded	85	35	80	60	55	16	12	2.0	2.1	240
Madison gravelly sandy loam, 6 to 10 percent slopes, eroded	75	28	70	50	50	14	10	1.8	1.9	220
Madison gravelly sandy loam, 10 to 25 percent slopes, eroded	------	------	------	------	------	------	------	1.6	1.5	200
Pacolet gravelly sandy loam, 25 to 45 percent slopes	------	------	------	------	------	------	------	------	------	140
Pacolet gravelly fine sandy loam, 2 to 6 percent slopes	85	35	80	60	55	16	12	2.0	2.1	240
Pacolet gravelly fine sandy loam, 6 to 10 percent slopes	75	28	70	50	50	14	10	1.8	1.9	220
Pacolet soils, 10 to 25 percent slopes	------	------	------	------	------	------	------	1.6	1.7	200
Wehadkee fine sandy loam	55	------	------	------	------	12	------	1.8	------	180
Wilkes loam, 10 to 25 percent slopes	------	------	------	------	------	------	------	1.4	------	180
Worsham fine sandy loam	------	------	------	------	------	------	------	1.6	------	160

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

On the better drained soils of the low stream terraces and the flood plains of the Catawba River and its main tributaries were red, white, swamp, and chestnut oaks; white and green ash; American and slippery elm; shagbark hickory, yellow-poplar, sweetgum, sycamore, southern sugar maple, sugarberry, and some shortleaf pine. Red mulberry, hophornbeam, and holly were present in the understory of these stands.

On the poorly drained soils of the flood plains were black willow, river birch, green ash, red maple, water and willow oaks, and sweetgum.

Colonial settlement of the Catawba area began about 1747. Since then most of the forest has been subjected to repeated disturbances. Nearly all of the tillable part of the county has been cleared at one time or another, and some areas have been cleared more than once. The early clearing for farming and for wood products was followed by abandonment of many of the fields because the natural fertility of the soils declined. Shortleaf and Virginia pines invaded the fields, and pure or mixed stands of these species became established. Many of these second-growth stands have been cut to meet an increasing demand for wood products. This cutover land is now cultivated. As a result of these disturbances, most of the original forest has been converted to stands of pine or mixed pine and hardwoods.

Forests now occupy 28,626 acres (*10*) of Catawba County, and are one of its most valuable natural resources. About 99.7 percent of the forest land is privately owned. Only 300 acres is in public ownership. The greatest part of the privately owned forest is held by farmers. Most of it is in tracts that are less than 100 acres in size.

Woodland management

The suitability of the soils of Catawba County for producing wood crops is shown in table 3. Ratings are based on measurements by foresters and forest managers. They are a means of expressing information useful in managing soils for forestry purposes. Erosion

hazard, equipment restriction, and seedling mortality are concerns in management. Windthrow is not generally considered a hazard on soils in Catawba County, except when winds are abnormally high, for example, during a hurricane. Soil-related factors important to tree growth and management in Catawba County are defined in the paragraphs that follow.

Potential productivity is expressed as a site index for a given tree species. Site index is the average total height, in feet, of the dominant and codominant trees in an even-aged stand at 50 years of age. Published research data are available for converting site index to expected yields (*5*, *7*).

Erosion hazard is expressed as *slight*, *moderate*, or *severe*, depending on the erodibility of the particular soil, the depth, and the slope.

Equipment restriction refers to the physical characteristics and topographic features of the soil that restrict or prohibit the use of equipment commonly used in constructing access roads, harvesting tree crops, and controlling fire and undesired vegetation. Excess water, clayey texture, and steep slope are the chief factors restricting equipment use in Catawba County. The rating is *slight* if conventional equipment can be used any time during the year, except for short periods after heavy rainfall, and if the soil is moderately well drained to well drained, is not subject to prolonged flooding or excessive water, and has slopes of less than 15 percent. The rating is *moderate* if conventional equipment can be used from March to December, flooding is only occasional, the water table is generally below the surface, or seldom above the surface for extended periods, and slopes are less than 45 percent. The rating is *severe* if conventional equipment can be used only during the driest months, or between periods of flooding, or if slopes exceed 45 percent.

Seedling mortality refers to the loss of tree seedlings of preferred species, established by planting, direct seeding, or natural seeding, as a result of adverse soil characteristics or topographic features. In evaluating mortality, it is assumed that plant competition is not a limiting factor. For planted seedlings, it is assumed that healthy seedlings of good quality have been properly planted. An adequate seed source is assumed for seedlings established by natural reseeding. Normal environmental conditions are assumed for both planted and naturally established seedlings. The rating is *slight* if average mortality does not ordinarily exceed 25 percent. The rating is *moderate* if average mortality is 25 to 50 percent. The rating is *severe* if average mortality exceeds 50 percent.

Preferred species for planting are the principal commercial species to be favored in existing stands and those preferred for planting. Preferred species were selected on the basis of their growth rates and the quality, value, and general marketability of the wood crop.

Woodland grouping

The soils in Catawba County are grouped according to their suitability for woodland use and management. Such groupings simplify the arrangement and presentation of the information in the paragraphs that follow. A woodland group consists of soils that have comparable potential productivity, produce similar tree crops, and require the same management.

Information about potential productivity, hazards and limitations of the soils that affect management, and preferred tree species for planting are shown for each woodland group in table 3.

Each group is identified by a three-part symbol, for example, 1w8, 2s8, and 4o1. The first numeral in the symbol denotes relative potential productivity, or site quality. The numeral 1 denotes very high potential productivity (fig. 8); 2, high; 3, moderately high; 4, moderate; and 5, low.

The second part of the symbol is a small letter that denotes the soil property or physiographic characteristic that imposes a moderate or severe hazard or limitation in managing the soil for wood crops. The letter *w* denotes excessive wetness. Water in or on the soil, either seasonally or year round, is the chief limitation and adversely affects tree growth and management. Such soils have restricted drainage, a seasonal high water table, or are subject to flooding. The letter *c* denotes management restrictions or limitations caused by the kind or amount of clay in the upper part of the soil profile. The letter *s* denotes management restrictions caused by the amount of sandy material in the soil profile. Such soils have little or no textural B horizon, low available water capacity, and are normally low in available plant nutrients. The letter *r* denotes that the main limitation is steep slope. The letter *o* denotes no significant soil-related limitation. Some soils have more than one limiting characteristic. In such cases priority is assigned in the order that the characteristics are listed above.

The third part of the symbol is a numeral that denotes the degree of hazard or limitation and the general suitability of the soils for certain kinds of trees.

The *numeral 1* indicates soils that have no limitations or only slight limitations and are best suited to needleleaf trees.

The *numeral 2* indicates soils that have one or more moderate limitations and are best suited to needleleaf trees.

The *numeral 3* indicates soils that have one or more severe limitations and are best suited to needleleaf trees.

The *numeral 7* indicates soils that have no limitations or only slight limitations and are suited to either needleleaf or broadleaf trees.

The *numeral 8* indicates soils that have one or more moderate limitations and are suited to either needleleaf (fig. 9) or broadleaf trees.

The *numeral 9* indicates soils that have one or more severe limitations and are suited to either needleleaf or broadleaf trees.

The letter *e*, following the last numeral of the symbol, is used to indicate severely eroded soils.

The woodland group to which each soil mapping unit is assigned can be determined by referring to the Guide to Mapping Units.

Wildlife [5]

Wildlife species are associated with given types of plant communities, which, in turn, are directly related to particular kinds of soil. The soils of Catawba County

[5] By JOHN P. EDWARDS, biologist, Soil Conservation Service.

TABLE 3.—*Woodland groups, wood*

Woodland group and map symbols	Potential productivity	
	Tree species	Site class [1]
1o7. Well drained, nearly level soils that have a friable loamy subsoil; on flood plains; subject to very frequent flooding; very high potential productivity; suitable for broadleaf and needleleaf trees. Cy.	Green ash	90
	Loblolly pine	90
	White pine	100
	Cherrybark oak	110
	Sweetgum	100
	Sycamore	90
	Yellow-poplar	110
1w8. Somewhat poorly drained, nearly level soils that have a friable loamy subsoil; on flood plains; subject to very frequent flooding; very high potential productivity; suitable for broadleaf and needleleaf trees. Cw.	Cherrybark oak	100
	Cottonwood	100
	Water oak	90
	Willow oak	90
	Loblolly pine	100
	White pine	100
	Sweetgum	100
	Yellow-poplar	100
1w9. Poorly drained, nearly level soils that have a friable loamy subsoil; on flood plains; subject to very frequent flooding; very high potential productivity; suitable for broadleaf and needleleaf trees. Wd.	Cottonwood	90
	Loblolly pine	100
	Water oak	90
	Willow oak	90
	Sweetgum	90
	Yellow-poplar [2]	100
2w8. Moderately well drained and poorly drained, nearly level to gently sloping soils that have a friable or firm loamy or clayey subsoil; subject to infrequent flooding; high potential productivity; suitable for broadleaf and needleleaf trees. Af, Wo.	Loblolly pine	90
	Shortleaf pine	80
	White pine	90
	Sweetgum	90
	Yellow-poplar	100
2s8. Somewhat excessively drained, nearly level soils that have a loose sandy subsoil; on flood plains; subject to very frequent flooding; high potential productivity; suitable for broadleaf and needleleaf trees. Bn.	Cottonwood	100
	Loblolly pine	90
	Shortleaf pine	80
	White pine	90
	Yellow-poplar	100
3o7. Well-drained, gently sloping to sloping soils that have a friable to firm loamy and clayey subsoil; moderately high potential productivity; suitable for broadleaf and needleleaf trees. AsB, AsC2, CmB2, CmC2, CmD2, CnB2, CnC2, HsB2, HsC2, HsD2, HwB2, HwC2, MgB2, MgC2, PcB, PcC.	Red oaks	70–80
	Loblolly pine	80
	Shortleaf pine	70
	Virginia pine	70+
	White pine	80
	Sweetgum	80
	Yellow-poplar	90
3r8. Well-drained, strongly sloping to very steep soils that have a friable to firm loamy and clayey subsoil; on uplands; moderately high potential productivity; suitable for broadleaf and needleleaf trees. AsE2, HsE, MgE2, PaF, PeE.	Red oaks	70–80
	Loblolly pine	80
	Shortleaf pine	70
	Virginia pine	70+
	White pine	80
	Sweetgum	80
	Yellow-poplar	90
4o1. Well-drained, gently sloping soils that have a very friable to very firm clayey subsoil; on uplands; moderate potential productivity; better suited to needleleaf trees. EnB.	Loblolly pine	70
	Shortleaf pine	60
	Virginia pine	60
	White pine	70–80
4c2e. Well-drained, strongly sloping soils that have a firm clayey subsoil; on uplands; erosion hazard and seedling mortality associated with high clay content in the upper profile; moderate potential productivity; better suited to needleleaf trees. CnE3.	Loblolly pine	70
	Shortleaf pine	60
	Virginia pine	60
	White pine	70
4r2. Well-drained, strongly sloping to moderately steep soils that have a firm clayey or loamy subsoil; on uplands; moderate potential productivity; better suited to needleleaf trees. WkE.	Loblolly pine	70
	Shortleaf pine	60
	Virginia pine	60
	White pine	70

[1] Site class is the numerical designation of the relative potential productivity of the soil for the specified species. It is based on site index, which is the average height, in feet, of the dominant and codominant trees in an even-aged stand at age 50. Site index was rounded to the nearest 10-foot interval to determine site class. For some trees, especially broadleaf species, site class is based on the comparative site class of other species on the same soil.

crops, and factors in management

Management limitations			Species preferred for planting	
Erosion hazard	Equipment restrictions	Seedling mortality	Broadleaf	Needleleaf
Slight	Slight	Slight	Green ash, white ash, cherrybark oak, northern red oak, Shumard oak, southern red oak, white oak, sycamore, black walnut, yellow-poplar.	Loblolly pine, shortleaf pine, white pine.
Slight	Moderate	Slight	Cottonwood, green ash, white ash, cherrybark oak, northern red oak, Shumard oak, southern red oak, water oak, white oak, willow oak, sweetgum, sycamore, yellow-poplar.	Loblolly pine, shortleaf pine, white pine.
Slight	Severe [3]	Severe [3]	Cottonwood, green ash, cherrybark oak, Shumard oak, water oak, white oak, willow oak, sweetgum, sycamore, swamp tupelo, yellow-poplar.[4]	Loblolly pine, white pine.[4]
Slight	Moderate	Slight to moderate.	Cottonwood, green ash, water oak, willow oak, sweetgum, sycamore, yellow-poplar.	Loblolly pine, shortleaf pine, white pine.
Slight	Moderate	Moderate	Cottonwood, green ash, sycamore, yellow-poplar	Loblolly pine, shortleaf pine, white pine.
Slight	Slight	Slight	Northern red oak, white oak, yellow-poplar	Loblolly pine, shortleaf pine, white pine.
Slight	Moderate	Moderate	Northern red oak, white oak, yellow-poplar	Loblolly pine, shortleaf pine, Virginia pine, white pine.
Slight	Slight	Slight	No broadleaf species suitable	Loblolly pine, shortleaf pine, Virginia pine, white pine.
Moderate	Moderate	Moderate	No broadleaf species suitable	Loblolly pine, Virginia pine, white pine.
Moderate	Moderate	Slight	No broadleaf species suitable	Loblolly pine, Virginia pine, white pine.

[2] Potential productivity is attainable if drainage is adequate.
[3] Moderate if drainage is adequate.
[4] Tree planting is not usually feasible in ponded areas.

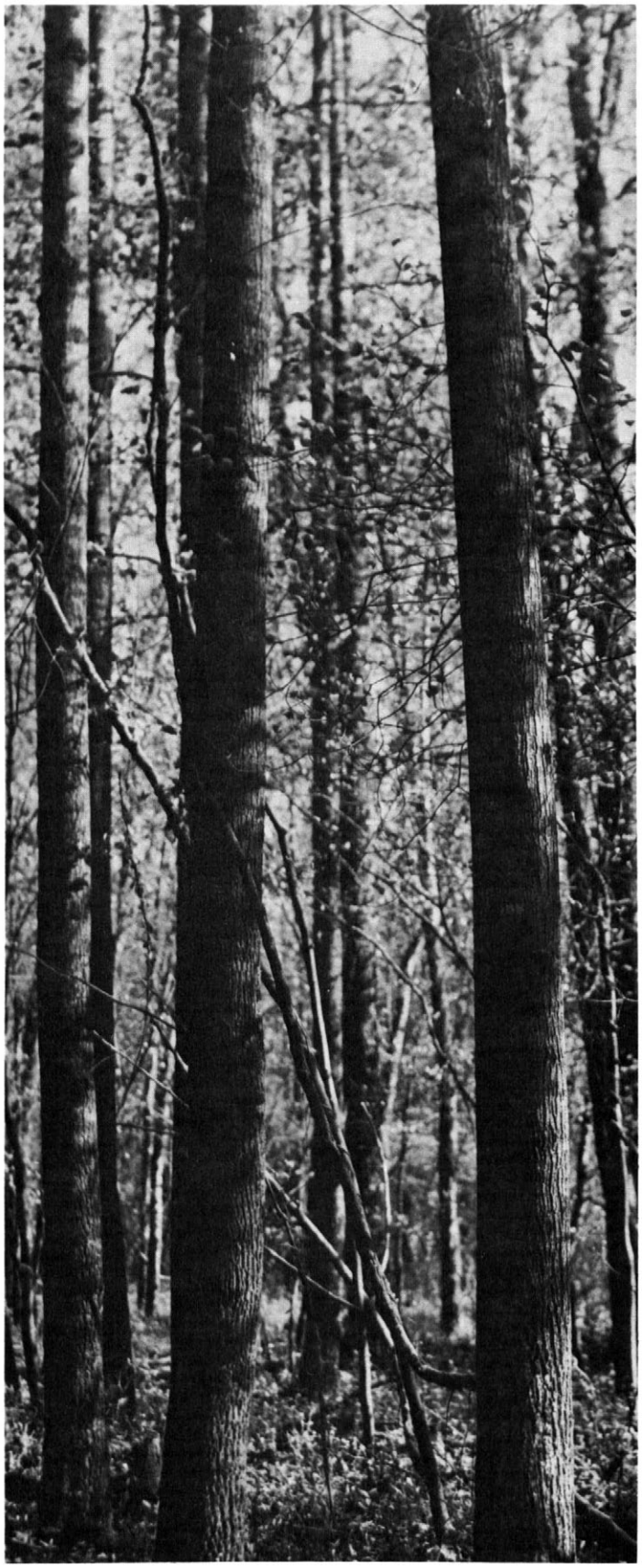

Figure 8.—Natural stand of yellow-poplar on Chewacla loam.

produce a wide variety of plants that provide food, cover, and protection for many species of wildlife.

Upland game species, such as quail, fox, doves, rabbits, and squirrels, and nongame birds are abundant in much of the county. Furbearers include mink, raccoon, muskrat, and opossum. Waterfowl species include black ducks, mallards, widgeon, wood ducks, ringnecks, and greenwing teal. All are fairly abundant along the Catawba River and its tributaries during winter. Also found here in winter is the woodcock.

In table 4 the soils of the county are rated according to their suitability for producing seven elements of wildlife habitat and for supporting three different kinds of wildlife. Following is a brief explanation of each element of the habitat.

Grain and seed crops: Mostly agricultural crops that provide food for wildlife. Examples are proso millet, browntop millet, corn, wheat, and oats.

Grasses and legumes: Plants that furnish food and cover for wildlife. Examples are fescue, clover, shrub lespedeza (fig. 10), annual lespedeza, soybeans, ryegrass, lovegrass, and kudzu.

Wild herbaceous plants: Native or introduced perennials that furnish food and cover to game species. Examples are pokeweed, tick clover, ragweed, and wild strawberries.

Hardwood trees and shrubs: Also vines. All fruit, buds, nuts, and foliage used by wildlife for food and cover. Examples are oak, hickory, grapes, autum olive, pyracantha, dogwood, poplar, and multiflora rose.

Coniferous trees and shrubs: Mostly pines. Used by wildlife mainly for cover. Pine seeds are used as food to some extent.

Wetland food and cover plants: Trees and wild herbaceous plants associated with wetland. Examples are rushes, sedges, smartweed, cattails, water tupelo, swamp tupelo, cypress, and Carolina ash.

Shallow water developments: Shallow ponds or flooded areas.

The different kinds of wildlife one can expect to find on a given soil are defined as follows.

Openland wildlife: Birds and mammals generally associated with open areas. Examples are mourning dove, quail, red fox, cottontail rabbit, woodchuck, and many species of song birds.

Woodland wildlife: Mammals found mostly in woodland communities. Examples are deer, bear, marsh rabbit, bobcat, and squirrel.

Wetland wildlife: Birds and mammals found mostly in swamps, marshes, or ponds. Examples are muskrat, mink, raccoon, redwing blackbirds, and ducks.

Each soil in the county is rated well suited, suited, poorly suited, or not suited, depending on the degree of limitation for a given use. Permeability, flood hazard, texture, and slope were among the soil properties considered in the ratings.

The ratings shown in table 4 are to be used as guidelines and do not provide specific site analysis. For example, a soil rated as well suited for grasses and legumes may be unsuited for certain species of each, although

Figure 9.—**Natural stand of shortleaf pine on Appling sandy loam, 2 to 6 percent slopes.**

most species commonly grown in the county can be expected to do well. Onsite investigation is required in planning individual management.

Engineering [6]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, dwellings, facilities for water storage, earthen dams, erosion-control structures, drainage systems, recreational facilities, and the suitability of soils for topsoil, road fill, and subgrade. Among the properties most important to engineers are permeability, compaction characteristics, shrink-swell potential, grain size, plasticity, reaction, drainage, topography, and depth to the seasonal high water table.

Information concerning these and related soil properties is given in tables 5, 6, and 7. The estimates and interpretations in these tables can be used to—

1. Make studies that will aid in selecting and evaluating areas for developing industrial, commercial, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning earthen dams, excavated pits, drainage systems, sewage disposal systems, and sprinkler irrigation systems.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting highway and airport locations and in planning detailed investigations at the selected locations.
4. Locate sources of construction materials.
5. Correlate performance of engineering structures with soil mapping units to obtain information useful in designing and maintaining the structures.
6. Determine the suitability of the soils for cross-country movement of vehicles and construction equipment.

With the soil map for identification of soil areas, the engineering interpretations reported here can be useful for many purposes. It should be emphasized, however, that these interpretations will not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations greater than the depth of layers here reported (ordinarily about 5 feet). Even in these situations, the soil map is useful in

[6] CHARLES R. COBB and S. T. CURRIN, civil engineers, Soil Conservation Service, helped prepare this section.

TABLE 4.—*Suitability for elements of*

Soil	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees and shrubs
Altavista: Af [1]	Well suited	Well suited	Well suited	Well suited
Appling:				
AsB	Well suited	Well suited	Well suited	Well suited
AsC2	Suited	Well suited	Well suited	Well suited
AsE2 [2]	Poorly suited	Suited	Well suited	Well suited
Buncombe: Bn	Not suited	Poorly suited	Poorly suited	Poorly suited
Cecil:				
CmB2	Well suited	Well suited	Well suited	Well suited
CmC2	Suited	Well suited	Well suited	Well suited
CmD2	Suited	Well suited	Well suited	Well suited
CnB2	Suited	Suited	Suited	Well suited
CnC2	Suited	Suited	Suited	Well suited
CnE3 [3]	Poorly suited	Suited	Suited	Well suited
Chewacla: Cw	Not suited	Poorly suited	Poorly suited	Well suited
Congaree: Cy	Poorly suited	Suited	Suited	Well suited
Enon: EnB	Suited	Well suited	Well suited	Well suited
Gullied land: Gu. Variable soil material.				
Hiwassee:				
HsB2	Well suited	Well suited	Well suited	Well suited
HsC2	Suited	Well suited	Well suited	Well suited
HsD2	Suited	Well suited	Well suited	Well suited
HsE	Poorly suited	Suited	Well suited	Well suited
HwB2	Suited	Suited	Suited	Well suited
HwC2	Suited	Suited	Suited	Well suited
Leveled clayey land: Lc. Variable soil material.				
Madison:				
MgB2	Suited	Well suited	Well suited	Well suited
MgC2	Suited	Well suited	Well suited	Well suited
MgE2 [4]	Poorly suited	Suited	Well suited	Well suited
Pacolet:				
PaF	Not suited	Poorly suited	Well suited	Well suited
PcB	Suited	Well suited	Well suited	Well suited
PcC	Suited	Well suited	Well suited	Well suited
PeE [4]	Poorly suited	Suited	Well suited	Well suited
Wehadkee: Wd	Not suited	Poorly suited	Poorly suited	Well suited
Wilkes: WkE	Poorly suited	Poorly suited	Suited	Suited
Worsham: Wo	Not suited	Poorly suited	Poorly suited	Well suited

[1] All ratings applicable if slope is 2 to 6 percent.

[2] All ratings applicable if slope is 15 to 25 percent. If slope is 10 to 15 percent, ratings for grain and seed crops, grasses and legumes, and open land wildlife can be raised one factor.

wildlife habitat and kinds of wildlife

Elements of wildlife habitat—Continued			Kinds of wildlife		
Low-growing coniferous woody plants	Wetland food and cover plants	Shallow water development	Open land wildlife	Woodland wildlife	Wetland wildlife
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Not suited	Not suited	Poorly suited	Poorly suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Suited	Not suited	Poorly suited	Well suited	Poorly suited.
Suited	Not suited	Poorly suited	Suited	Well suited	Poorly suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Well suited	Well suited	Not suited.
Poorly suited	Not suited	Not suited	Suited	Well suited	Not suited.
Well suited	Well suited	Not suited	Poorly suited	Well suited	Suited.
Suited	Not suited	Not suited	Poorly suited	Suited	Not suited.
Well suited	Well suited	Not suited	Poorly suited	Well suited	Suited.

[3] All ratings applicable if slope is 15 to 25 percent. If slope is 10 to 15 percent, ratings for grain and seed crops can be raised one factor

[4] All ratings applicable if slope is 15 to 25 percent. If slope is 10 to 15 percent, ratings for grain and seed crops, grasses and legumes and open land wildlife can be raised one factor.

Figure 10.—**Field border of shrub lespedeza on Hiwassee loam, 2 to 6 percent slopes, eroded, provides needed food and cover for wildlife and also reduces runoff and erosion.**

planning more detailed field investigations and in indicating the kinds of problems that may be expected.

Some of the terms used by soil scientists have special meanings in soil science that may not be familiar to engineers. These terms are defined in the "Glossary."

Engineering test data

Soil samples, representing four soil series taken from six profiles in the county, were tested in accordance with standard procedures to help evaluate the soils for engineering purposes. The tests were made by the North Carolina State Highway Commission in cooperation with the U.S. Department of Commerce, Bureau of Public Roads. The results of these tests are shown in table 5. They indicate the characteristics of the soil at the specified location. The physical characteristics of similar soils at other locations may vary from those of the soil sampled. All samples were obtained at a depth of less than 7 feet. For the soil series not tested, classification was estimated from descriptions of soil profiles.

The engineering classifications in table 5 are based on data obtained by mechanical analysis and by tests made to determine the liquid and plastic limits. The mechanical analysis was made by combined sieve and hydrometer methods.

Tests to determine plastic limit and liquid limit measure the effect of water on the consistency of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from a solid to a semisolid to plastic. As the moisture content is further increased, the material changes from plastic to liquid. The plastic limit is the moisture content at which the material passes from semisolid to plastic. The liquid limit is the moisture content at which the material passes from plastic to liquid. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which soil material is plastic.

Engineering classification

The two systems most commonly used in classifying soils for engineering are the systems approved by the

American Association of State Highway Officials (AASHO) and the Unified system.

The AASHO system (*1*) is used to classify soils according to those properties that affect use in highway construction. In this system all soil material is classified in seven principal groups. The groups range from A–1, which consists of soils that have the highest bearing strength and are the best soils for subgrade, to A–7, which consists of soils that have the lowest strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0, for the best material, to 20, for the poorest. The group index number is shown in parentheses following the soil group system (see table 5).

In the Unified system (*11*) soils are classified according to their texture and plasticity and their performance as engineering construction material. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. GP and GW are clean gravels, and GM and GC are gravels that include, respectively, an appreciable amount of nonplastic and plastic fines. SP and SW are clean sands. SM and SC are sands that include fines of silt and clay. ML and CL are silts and clays that have a low liquid limit, and MH and CH are silts and clays that have a high liquid limit. Soils on the borderline between two classes are designated by symbols for both classes; for example, ML–CL.

Soil scientists use the USDA textual classification (*8*). In this, the texture of the soil is determined according to the proportion of soil particles smaller than 2 millimeters in diameter, that is, the proportion of sand, silt, and clay. Textural modifiers, such as gravelly, stony, shaly, and cobbly, are used as needed.

Table 5 shows the AASHO and Unified Classification of specified soils in the county, as determined by laboratory tests. Table 6 shows the estimated classification of all the soils in the county according to all three systems of classification.

Estimated properties

Table 6 lists some of the significant characteristics of the soils of the county. It also shows the engineering classification of the principal horizons of typical profiles.

The depth to the seasonal high water table is based on field observations.

The soil material in the main horizons is classified according to USDA textural terms. Except for the soils listed in table 5, for which engineering test data are available, the classifications shown for the Unified and AASHO systems are estimates based on the USDA classification of texture and the description of the soils.

The estimated permeability rates are for soil material in its natural state. They are based on field observations and limited laboratory data.

Available water capacity refers to the capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of water held in the soil at field capacity and the amount held at permanent wilting point; that is, between one-third atmosphere and 15 atmospheres of tension. The amount is based on laboratory tests of a limited number of soils; for soils not tested, estimates are based on similar soils.

Reaction, or the degree of acidity or alkalinity, is given in terms of pH values.

Shrink-swell potential indicates the expected change in volume when the moisture content changes. It is estimated on the basis of the amount and type of clay in a soil. In general, soils classified as CH and A–7 have a high shrink-swell potential. Sandy soils have a low shrink-swell potential.

Engineering interpretations

The suitability of soils for various engineering uses is estimated in table 7.

Erosion-control practices are needed on sloping, cultivated soils. If slope is no more than 6 percent, all but the shallow, rocky, and plastic soils can be terraced.

Adequate outlets are needed for safe disposal of surface runoff from terraces, diversions, and other drainageways. Vegetation is needed in these waterways.

Topsoil refers to soil material used to grow vegetation. Factors considered in determining the suitability of a soil for use as topsoil are texture, slope, coarse fragments, drainage, and thickness of usable material.

Road fill is material moved from borrow areas and used as subgrade for highways. The ratings are based on the engineering classification and the shrink-swell potential and drainage of the soil to be used.

The soils in Catawba County are not rated as a source of sand and gravel because sand and gravel deposits are not extensive and contain appreciable quantities of silt and clay. These deposits occur along stream flood plains.

Factors considered in determining the suitability of a soil as a site for dwellings are flood hazard, depth to seasonal high water table, shrink-swell potential, and slope.

Ratings for septic tank absorption fields are based on soil permeability, slope, depth to seasonal high water table, flood hazard, and depth to bedrock. Standards used in rating a soil are based on the ability of a soil to absorb effluent.

Ratings for campsites, picnic areas, and intensive play areas are based on slope, stoniness, flood hazard, wetness, and texture of the surface layer.

Factors considered in rating the suitability of a soil as a site for light industry are drainage, shrink-swell potential, slope, flood hazard, and depth to seasonal high water table.

Soil features affecting the location of streets and low cost roads are shrink-swell potential, depth to bedrock, slope, flood hazard, and drainage.

Permeability of the undisturbed soil and depth to bedrock or coarse-textured material are the factors considered in rating the suitability of a soil as a site for a reservoir.

Ratings of soils to be used in compacted embankments are based on features of disturbed soil that affect earth fills. These features are compaction characteristics, compacted permeability, susceptibility to piping, and compressibility.

TABLE 5.—*Engineering*

[Tests performed by North Carolina State Highway Commission

Soil name and location	Parent material	Report No.	Depth	Moisture density [1]	
				Maximum dry density	Optimum moisture
		S65NC-18	*Inches*	*Lbs. per cu. ft.*	*Pct.*
Appling sandy loam:					
In a wooded area 6 miles east of Newton, about 1½ miles north of Balls Creek School on County Road 1810, and 100 feet west of highway. Modal.	Residuum from acidic rocks.	2–3	3–8	118	12
		2–5	12–27	99	23
		2–6	27–42	95	26
Cecil sandy loam:					
In a wooded area 5¼ miles southeast of Newton on State Highway 16, 1¼ miles south of Mount Olin Church, 450 yards north of County Road 1877, and 50 feet northeast of a private road. Modal.	Residuum from acidic rocks.	4–2	0–2	107	16
		4–5	10–30	88	30
		4–8	50–75	101	20
Hiwassee loam:					
In a cultivated field 3½ miles southwest of Newton, 220 yards west of County Road 2013, and 50 feet east of woods along field boundary. Modal.	Residuum from mixed acidic and basic rocks.	5–3	0–6	101	18
		5–5	6–30	101	22
		5–8	56–108	99	21
Madison gravelly sandy loam:					
In a wooded area 5¼ miles southeast of Newton on State Highway 16, one-eighth mile south on County Road 1810, 2⅛ miles southeast on County Road 1858, 2 miles west on County Road 1874, and 500 feet north of road. Modal.	Chiefly quartz mica-schist.	1–2	0–6	113	15
		1–4	9–30	93	21
		1–6	35–66	107	17

[1] Based on AASHO Designation: T 99–70, Methods A and C (*1*).

[2] Mechanical analysis according to the AASHO Designation: T 88–70 (*1*). Results by this procedure may differ somewhat from results by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters

Formation and Classification of the Soils

This section describes the major factors of soil formation and tells how these factors have affected the soils of Catawba County. It also defines the current system for classifying soils and classifies the soils of the county according to that system.

Factors of Soil Formation

The characteristics of a soil at any given place depend on the parent material, climate, plant and animal life, relief, and time. All of these factors affect the formation of each soil and determine its present characteristics. The relative importance of each factor differs from place to place; sometimes one is more important, and sometimes another. In many places one or two of the factors dominate in the formation of a soil and fix most of its properties.

The five factors of soil formation as they occur in Catawba County are described in the paragraphs that follow.

Parent material

Parent material is the mass of disintegrated and partly weathered rock from which a soil forms. It is mostly responsible for the chemical and mineralogical composition of soils. The parent material of the soils in Catawba County differs greatly from one part of the county to another, in mineral and chemical composition and in physical characteristics. Major differences, such as texture, can be determined in the field. Minor differences in mineralogical composition are determined only by careful laboratory analysis.

Many differences in the soil reflect the original differences in the characteristics of the geological materials. Most of the parent material of the soils in Catawba County is residual; that is, the soils formed in place in material derived from weathering of the underlying rock. The rocks underlying the soils in the county are primarily schist, gneiss, and granite containing a small amount of diorite. The soils along the larger streams in the county formed in material washed from residual soils in the watershed area.

Cecil, Appling, and Pacolet soils formed in residuum derived from acidic rock, high in quartz content, for example, granite and mica-gneiss. These soils have a surface layer of sandy loam, clay loam, gravelly fine sandy loam, and gravelly sandy loam and a subsoil of red to strong-brown clay to sandy clay loam. They occur throughout the county. The largest area of Cecil and Appling soils is east of Newton, and the largest area of Pacolet soil is around Baker Mountain.

Hiwassee and Enon soils formed in residuum derived from mixed acidic and basic rock, or from basic rock,

test data

Department of Materials and Tests, Raleigh, N.C.]

Mechanical analysis [2]												Liquid limit	Plasticity index	Classification	
Percentage passing sieve—								Percentage smaller than—							
1½ in.	1 in.	¾ in.	⅜ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [3]	Unified [4]
------	100	-----	98	96	84	55	35	33	27	16	9	27	5	A–2–4(0)	SM–SC
------	-----	-----	------	100	92	77	64	62	59	49	42	60	28	A–7–5(18)	MH–CH
------	-----	-----	------	100	88	70	55	54	51	44	40	74	27	A–7–5(15)	MH
------	-----	-----	------	100	99	78	42	39	33	20	13	30	5	A–4(1)	SM
------	-----	-----	------	--------	100	90	77	76	71	59	52	80	37	A–7–5(20)	MH
------	-----	-----	------	100	99	78	50	45	32	16	11	47	6	A–5(4)	MH
------	-----	-----	------	100	99	83	41	38	30	18	11	31	5	A–4(1)	SM
------	-----	-----	------	--------	100	88	64	61	59	46	39	50	23	A–7–6(13)	ML–CL
------	-----	-----	------	--------	100	85	55	49	39	25	20	45	8	A–5(5)	ML
100	95	94	91	87	81	61	36	35	30	18	12	34	5	A–4(0)	SM
------	-----	-----	------	100	90	81	66	65	64	56	50	72	31	A–7–5(17)	MH
------	-----	-----	------	100	83	55	31	29	24	15	11	45	5	A–2–5(0)	SM

in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for namign textural classes for soil.

[3] Based on AASHO Designation: M 145–66 (*1*).

[4] SCS and BPR have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of borderline classification obtained by this use are SM–SC and MH–CH.

such as horneblende-gneiss and diorite. They have a surface layer of loam, clay loam, and fine sandy loam and a subsoil of dark-red to light olive-brown clay to clay loam. Wilkes soils have the same parent material as Hiwassee and Enon soils, but have a loam or sandy loam surface layer and a clay to sandy clay loam subsoil. These soils occur mostly in the central part of the county.

Madison soils formed in residuum derived from acidic rock, chiefly mica-schist. They have a surface layer of gravelly sandy loam and a subsoil of red to yellowish-red clay, clay loam, and sandy clay loam fairly high in mica content.

Congaree, Chewacla, Wehadkee, Buncombe, Worsham, and Altavista soils formed in alluvial deposits along streams and in depressions. They have a surface layer of loam, silt loam, fine sandy loam, and loamy sand and a subsoil of sand to clay.

Climate

Climate affects the physical, chemical, and biological relationships of soil through the influence of precipitation and temperature. Water dissolves minerals, is necessary for biological activity, and transports minerals and organic residues throughout the soil profile. The amount of water that actually moves through the soil depends mainly on the amount and duration of rainfall, the relative humidity, the length of the frost-free period, and the permeability of the soil. Temperature influences the kind, amount, and growth of organisms and the speed of physical and chemical reaction in the soil.

Catawba County is warm and humid. The average annual temperature is 59° F., and the average annual low is 48°. The monthly temperature ranges from 42° in December and January to 78° in July and August. Precipitation is well distributed throughout the county and throughout the year and averages 49.2 inches per year. There are approximately 205 frost-free days, from mid-April to late October.

The relatively mild temperature and abundant moisture cause fairly rapid decomposition of organic matter and speed up chemical reactions in the soil. The fairly high rainfall leaches out a large amount of soluble nutrients, and less soluble fine materials are moved deeper into the soil.

The most important influence of climate on the soils is the alteration of parent material by temperature changes and precipitation, and the effect of this alteration on plant and animal life.

Plant and animal life

Plants and animals that live on and in the soil influence soil formation. They determine the kind and amount of organic material and the way it is incorporated in the soil. They transfer nutrients and soil material from one part of the soil to another. They affect the gain and loss of organic matter and plant

TABLE 6.—*Estimates of soil*

[The symbol > means more than;

Soil series and map symbols	Depth to bedrock	Depth to seasonal high water table	Depth from surface (typical profile)	Classification		
				USDA texture	Unified	AASHO
	Feet	*Feet*	*Inches*			
Altavista clayey variant: Af	>5	[1] 2	0–6	Fine sandy loam	SM	A–4, A–2
			6–55	Clay laom to clay	CL, MH	A–6, A–7
			55–100	Gravelly coarse sand	SP	A–1
Appling: AsB, AsC2, AsE2	>5	>7	0–8	Sandy loam	SM–SC, SC	A–2, A–4
			8–47	Clay, sandy clay loam	MH, CH	A–6, A–7
			47–90	Sandy loam	SM, MH	A–2, A–7
Buncombe: Bn	>10	[1] 2	0–10	Loamy sand	SM	A–2
			10–55	Sand	SM, SP–SM	A–2
			55–65	Sandy loam	SM	A–2
Cecil: CmB2, CmC2, CmD2, CnB2, CnC2, CnE3.	>5	>10	0–10	Sandy loam	SM	A–4
			10–50	Clay, clay loam	MH	A–7
			50–75	Sandy loam	SM, ML	A–5
Chewacla: Cw	>4	[1] 1	0–10	Loam	ML, SM	A–4, A–2
			10–64	Loam, clay loam	ML, CL	A–4, A–6
Congaree: Cy	>10	[1] 3	0–10	Loam	ML, SM	A–4, A–2
			10–31	Silt loam	ML	A–4, A–6
			31–70	Silty clay, loam, clay loam.	ML	A–6
Enon: EnB	>4	>10	0–7	Fine sandy loam	SM	A–2
			7–31	Clay	MH, CH	A–7
			31–39	Clay loam	CL	A–6
Gullied land: Gu. No valid estimates can be made.						
Hiwassee: HsB2, HsC2, HsD2, HsE, HwB2, HwC2.	>5	>5	0–6	Loam	ML, SM	A–4, A–2
			6–56	Clay, clay loam	MH, ML-CL	A–6, A–7
			56–108	Loam	ML, SM	A–4, A–5
Leveled clayey land: Lc. No valid estimates can be made.						
Madison: MgB2, MgC2, MgE2	>3	>10	0–6	Gravelly sandy loam	SM	A–4, A–2
			6–35	Clay, sandy clay loam	MH	A–7
			35–66	Sandy loam	SM	A–2, A–4
Pacolet: PaF, PcB, PcC, PeE	>5	>5	0–6	Gravelly fine sandy loam	SM	A–2, A–4
			6–35	Clay loam, sandy clay loam.	MH	A–6
			35–60	Sandy loam	SM	A–2, A–4
			>60	Rock.		
Wehadkee: Wd	>4	[1] 0	0–8	Fine sandy loam	SM, ML	A–4
			8–40	Sandy clay loam, loam	CL, SC	A–6, A–2
			40–50	Sandy loam	SM	A–4, A–2
Wilkes: WkE	2–4	>10	0–5	Loam	ML	A–4
			5–15	Clay loam	MH, CL	A–6, A–4
			15–42	Sandy loam	SM	A–2, A–4
			>42	Rock.		
Worsham: Wo	>5	[1] 0	0–9	Fine sandy loam	SM, ML	A–4
			9–60	Sandy clay, sandy clay loam.	CL, CH	A–7

[1] Subject to flooding.

properties significant in engineering

the symbol < means less than]

Percentage less than 3 inches passing sieve—				Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 40	No. 200				
				Inches per hour	*Inches per inch of soil*	*pH*	
98–100	90–98	70–85	15–40	2. 0–6. 3	0. 11–0. 13	5. 6–6. 5	Low.
98–100	95–100	90–95	51–90	0. 63–2. 0	0. 12–0. 14	5. 6–6. 0	Moderate.
98–100	40–60	25–40	0–4	>6. 3	0. 04–0. 06	5. 6–6. 0	Low.
95–100	80–98	52–70	13–40	>6. 3	0. 11–0. 13	4. 5–5. 5	Low.
98–100	85–100	70–95	52–80	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Moderate.
98–100	80–98	68–90	25–60	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low.
98–100	98–100	90–95	13–35	>6. 3	0. 06–0. 08	5. 6–6. 5	Low.
95–100	95–100	90–95	5–15	>6. 3	0. 05–0. 07	5. 6–6. 0	Low.
95–100	90–98	60–70	13–35	>6. 3	0. 11–0. 13	5. 6–6. 0	Low.
98–100	95–100	70–80	36–45	>6. 3	0. 12–0. 14	4. 5–5. 5	Low.
98–100	98–100	90–95	60–90	0. 63–2. 0	0. 13–0. 15	5. 1–5. 5	Moderate.
98–100	98–100	75–85	36–60	0. 63–2. 0	0. 13–0. 15	5. 1–5. 5	Moderate.
98–100	95–100	80–95	25–55	0. 63–2. 0	0. 13–0. 15	5. 1–6. 0	Low.
95–100	95–100	75–95	51–75	0. 63–2. 0	0. 17–0. 19	5. 1–6. 0	Low.
98–100	95–100	70–80	30–60	0. 63–2. 0	0. 13–0. 15	5. 1–6. 0	Low.
98–100	95–100	90–100	70–90	0. 63–2. 0	0. 14–0. 16	5. 1–6. 0	Low.
98–100	95–100	90–100	70–90	0. 63–2. 0	0. 12–0. 15	5. 1–6. 0	Moderate to low.
98–100	98–100	75–85	13–35	2. 0–6. 3	0. 11–0. 13	5. 6–6. 5	Low.
98–100	98–100	90–100	70–90	<0. 20	0. 13–0. 15	5. 6–6. 5	High.
98–100	98–100	90–100	55–85	<0. 20	0. 13–0. 15	5. 6–6. 5	Moderate.
98–100	98–100	80–95	25–60	2. 0–6. 3	0. 13–0. 15	5. 6–6. 0	Low.
98–100	98–100	85–100	51–90	0. 63–2. 0	0. 12–0. 14	5. 6–6. 0	Moderate.
85–100	75–100	60–85	40–60	0. 63–2. 0	0. 12–0. 14	5. 6–6. 0	Moderate to low.
85–100	80–95	55–85	15–40	>6. 3	0. 10–0. 12	5. 1–5. 5	Low.
98–100	85–100	80–90	55–85	0. 63–2. 0	0. 12–0. 14	5. 1–5. 5	Moderate.
98–100	80–90	55–70	30–49	0. 63–2. 0	0. 10–0. 12	5. 1–5. 5	Low.
85–100	85–100	40–60	15–40	>6. 3	0. 11–0. 13	5. 1–5. 5	Low.
98–100	98–100	60–80	51–80	0. 63–2. 0	0. 12–0. 14	5. 1–5. 5	Moderate.
80–100	80–100	60–70	30–40	0. 63–2. 0	0. 11–0. 13	5. 1–5. 5	Low.
98–100	98–100	70–85	40–55	2. 0–6. 3	0. 14–0. 16	5. 6–6. 0	Low.
98–100	98–100	80–95	20–55	0. 63–2. 0	0. 16–0. 20	5. 6–6. 0	Low.
98–100	98–100	40–60	15–40	2. 0–6. 3	0. 14–0. 16	5. 6–6. 0	Low.
98–100	98–100	70–85	60–75	2. 0–6. 3	0. 13–0. 15	5. 6–7. 3	Low.
98–100	98–100	90–100	55–90	0. 2–0. 63	0. 14–0. 16	6. 6–7. 3	High.
98–100	98–100	60–70	35–40	0. 63–2. 0	0. 09–0. 11	6. 1–6. 5	Low.
98–100	98–100	90–100	40–55	0. 63–2. 0	0. 12–0. 14	4. 5–5. 5	Low.
98–100	96–100	90–100	70–90	0. 20–0. 63	0. 15–0. 17	4. 5–5. 5	Moderate.

TABLE 7.—*Engineering*

Soils	Suitability as source of—		Degree and kind of limitation for—	
	Topsoil	Road fill	Dwellings	Septic tank absorption fields
Altavista: Af	Poor: less than 6 inches of suitable material.	Fair: moderate shrink-swell potential.	Severe: infrequent flooding.	Severe: infrequent flooding.
Appling:				
AsB	Fair: less than 8 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
AsC2	Fair: less than 8 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
AsE2	Fair: less than 8 inches of suitable material.	Fair: moderate shrink-swell potential.	Severe: slope	Severe: slope
Buncombe: Bn	Poor: sandy surface layer.	Good	Severe: very frequent flooding.	Severe: seasonal high water table; very frequent flooding.
Cecil:				
CmB2	Fair: less than 10 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
CmC2	Fair: less than 10 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
CmD2	Fair: less than 10 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
CnB2	Poor: less than 6 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
CnC2	Poor: less than 6 inches of suitable material.	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
CnE3	Poor: less than 6 inches of suitable material.	Fair: moderate shrink-swell potential.	Severe: slope	Severe: slope
Chewacla: Cw	Good	Fair: somewhat poorly drained.	Severe: very frequent flooding.	Severe: 1 foot to seasonal high water table; very frequent flooding.
Congaree: Cy	Good	Fair: ML material	Severe: very frequent flooding.	Severe: very frequent flooding.

interpretations

Degree and kind of limitation for—Continued						
Recreation			Light industries	Roads and low cost streets	Earthen dams	
Campsites	Picnic areas	Intensive play areas			Reservoir area	Compacted embankment
Moderate: wetness.	Moderate: wetness.	Moderate: infrequent flooding.	Severe: infrequent flooding.	Moderate: infrequent flooding.	Moderate: coarse sand and gravel at a depth of 55 inches.	Moderate: low resistance to piping.
Slight	Slight	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility.
Slight	Slight	Severe: slope	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Moderate: medium compressibility.
Moderate: sandy surface layer.	Moderate: sandy surface layer.	Moderate: flooding; sandy surface layer.	Severe: very frequent flooding.	Severe: very frequent flooding.	Severe: rapid permeability.	Severe: rapid permeability.
Slight	Slight	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Slight	Slight	Severe: slope	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Moderate: clayey surface layer.	Moderate: clayey surface layer.	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Moderate: clayey surface layer.	Moderate: clayey surface layer.	Severe: slope	Moderate: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Severe: high compressibility when compacted and saturated.
Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: somewhat poorly drained.	Severe: very frequent flooding.	Slight	Moderate: low resistance to piping.
Slight	Slight	Severe: very frequent flooding.	Severe: very frequent flooding.	Severe: very frequent flooding.	Moderate: moderate permeability.	Moderate: low resistance to piping.

TABLE 7.—*Engineering*

Soils	Suitability as source of—		Degree and kind of limitation for—	
	Topsoil	Road fill	Dwellings	Septic tank absorption fields
Enon: EnB	Fair: less than 8 inches of suitable material.	Poor: high shrink-swell potential.	Severe: high shrink-swell potential.	Severe: slow permeability.
Gullied land: Gu. No interpretations. Material too variable.				
Hiwassee: HsB2	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
HsC2	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
HsD2	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
HsE	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Severe: slope	Severe: slope
HwB2	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
HwC2	Poor: less than 6 inches of suitable material.	Poor: mostly MH material.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
Leveled clayey land: Lc. No interpretations. Material too variable.				
Madison: MgB2	Poor: coarse fragments	Poor	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
MgC2	Poor: coarse fragments	Poor	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
MgE2	Poor: coarse fragments	Poor	Severe: slope	Severe: slope

interpretations—Continued

Degree and kind of limitation for—Continued						
Recreation			Light industries	Roads and low cost streets	Earthen dams	
Campsites	Picnic areas	Intensive play areas			Reservoir area	Compacted embankment
Moderate: slow permeability.	Moderate: slow permeability.	Moderate: slope.	Severe: high shrink-swell potential.	Severe: high shrink-swell potential.	Slight	Severe: low shear strength when compacted and saturated.
Slight	Slight	Moderate: slope.	Slight	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Slight	Slight	Severe: slope	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Moderate: slope.	Moderate: slope.	Severe: slope	Severe: slope	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Moderate: clayey surface layer.	Moderate: clayey surface layer.	Moderate: slope.	Slight	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Moderate: clayey surface layer.	Moderate: clayey surface layer.	Severe: slope	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility when compacted and saturated.
Slight	Slight	Moderate: slope.	Slight	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility.
Slight	Slight	Severe: slope	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Moderate: medium compressibility.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Moderate: medium compressibility.

TABLE 7.—*Engineering*

Soils	Suitability as source of—		Degree and kind of limitation for—	
	Topsoil	Road fill	Dwellings	Septic tank absorption fields
Pacolet:				
PaF	Poor: coarse fragments	Fair: moderate shrink-swell potential.	Severe: slope	Severe: slope
PcB	Poor: coarse fragments	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
PcC	Poor: coarse fragments	Fair: moderate shrink-swell potential.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.
PeE	Poor: coarse fragments	Fair: moderate shrink-swell potential.	Severe: slope	Severe: slope
Wehadkee: Wd	Poor: poorly drained	Poor: poorly drained	Severe: very frequent flooding.	Severe: seasonal high water table at the surface; very frequent flooding.
Wilkes: WkE	Poor: less than 6 inches of suitable material.	Poor: high shrink-swell potential.	Severe: slope	Severe: moderately slow permeability; slope.
Worsham: Wo	Poor: poorly drained	Poor: poorly drained	Severe: poorly drained	Severe: moderately slow permeability; seasonal high water table at the surface.

nutrients in the soil, and also affect soil structure, soil porosity, and certain other characteristics of the soil.

As fallen leaves, twigs, roots, and whole plants decay, plant nutrients and organic acids are released and move down through the soil. Roots take up some of the nutrients, while organic acids dissolve some of the less soluble soil components and increase the rate of leaching of inorganic material. The effect of these organic acids on soil formation is conditioned by the climate and other factors. Organic matter decays more rapidly in well-drained soils, such as Cecil and Hiwassee soils. The decay of organic matter is slower on the wetter soils, such as Wehadkee and Chewacla soils, because the oxidation process is retarded by excess moisture. The wetter soils, therefore, have a higher content of organic matter in the surface layer.

Relief

Relief is largely determined by the underlying rock formations, the geologic history of the area, and the development of the landscape through slope retreat. It influences soil formation through its effect on soil moisture, erosion, temperature, and plant cover.

In Catawba County slopes range from 0 to about 45 percent. The percentage of slope affects soil formation. The nearly level to gently sloping upland soils, such as Cecil, Appling, and Hiwassee soils, have fairly thick, well-defined profiles. Steep soils like Wilkes and Pacolet, in contrast, have thinner, less distinct horizons.

Relief also affects the natural drainage of the soils. Upland soils are mostly well drained, whereas many of the nearly level soils on flood plains are somewhat poorly drained or poorly drained.

Time

The formation of a soil profile requires a long time. Some of the differences among soils reflect differences in the age of the soil. Mature soils generally have deeper, better defined profiles than young soils. In Catawba County the older Cecil, Appling, and Hiwassee soils on uplands have deep, well-defined profiles. In contrast, the Congaree, Buncombe, Chewacla, and Wehadkee soils on flood plains have not been in place long enough for the formation of well-defined horizons.

Classification of the Soils

The purpose of soil classification is to help us remember the significant characteristics of soils, assemble our knowledge about the soils, see their relationships to one another and to the whole environment, and develop principles relating to their behavior and their response to manipulation. First through classification and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

interpretations—Continued

Degree and kind of limitation for—Continued						
Recreation			Light industries	Roads and low cost streets	Earthen dams	
Campsites	Picnic areas	Intensive play areas			Reservoir area	Compacted embankment
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Severe: high compressibility.
Slight	Slight	Moderate: slope	Slight	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility.
Slight	Slight	Severe: slope	Moderate: slope.	Moderate: moderate shrink-swell potential.	Moderate: moderate permeability.	Severe: high compressibility.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderate permeability.	Severe: high compressibility.
Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: poorly drained.	Severe: poorly drained; very frequent flooding.	Moderate: moderate permeability.	Moderate: medium compressibility.
Severe: slope	Severe: slope	Severe: slope	Severe: slope	Severe: slope	Moderate: moderately slow permeability.	Severe: high compressibility.
Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: poorly drained.	Severe: poorly drained.	Moderate: moderately slow permeability.	Severe: high compressibility.

The current system of soil classification (*6*, *9*) was adopted by the Cooperative Soil Survey in 1965. It is a comprehensive system, designed to accommodate all soils and is under continued study.[7] In this system classes of soils are defined in terms of observable or measurable properties. The properties chosen are primarily those that result in the grouping of soils of similar genesis, or mode of origin. Genesis does not, however, appear in the definitions of the classes.

The current system of classification has six categories. Beginning with the most inclusive, the categories are the order, suborder, the great group, the subgroup, the family, and the series. Table 8 shows the classification of the soils of Catawba County according to this system. Brief descriptions of the six categories follow.

Order.—Ten soil orders are recognized: Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate orders are those that tend to give broad climatic groupings of soils. Two exceptions to this generalization are the Entisols and the Histosols, both of which occur in many different climates. Four of the ten orders are represented in Catawba County: Alfisols, Entisols, Inceptisols, and Ultisols.

Suborder.—Each order is divided into suborders, mainly on the basis of soil characteristics that result in grouping soils according to genetic similarity. The climatic range is narrower than that of the order. The properties used are mainly those that reflect either the presence or absence of waterlogging or differences in climate or vegetation.

Great group.—Each suborder is divided into great groups on the basis of similarity in the kind and sequence of the major horizons and in major soil properties. The horizons considered are those in which clay, iron, or humus have accumulated and those in which pans that interfere with the growth of roots and the movement of water have formed. The properties are soil temperature, chemical composition (mainly content of calcium, magnesium, sodium, and potassium), and the like.

Subgroup.—Each great group is divided into subgroups, one that represents the central (typic) concept of the group, and others, called intergrades, that have one or more properties of another great group, suborder, or order.

Family.—Families are established within each subgroup, primarily on the basis of properties important to the growth of plants or properties significant in engineering. Texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence are among the properties considered.

[7] See the unpublished working document "Selected Chapters from the Unedited Text of the Soil Taxonomy" available in the SCS State Office, Raleigh, N.C.

TABLE 8.—*Soil series classified according to the current system of classification*

Series	Family	Subgroup	Order
Altavista, clayey variant.	Clayey, mixed, thermic	Aquic Hapludults	Ultisols.
Appling	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Buncombe	Mixed, thermic	Typic Udipsamments	Entisols.
Cecil	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Chewacla	Fine-loamy, mixed, thermic	Aquic Fulventic Dystrochrepts	Inceptisols.
Congaree	Fine-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Enon	Fine, mixed, thermic	Ultic Hapludalfs	Alfisols.
Hiwassee [1]	Clayey, kaolinitic, thermic	Typic Rhodudults	Ultisols.
Madison	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Pacolet	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Wehadkee	Fine-loamy, mixed, nonacid, thermic	Fluventic Haplaquepts	Inceptisols.
Wilkes	Loamy, mixed, thermic, shallow	Typic Hapludalfs	Alfisols.
Worsham	Clayey, mixed, thermic	Typic Ochraquults	Ultisols.

[1] Some Hiwassee soils in Catawba County are taxadjuncts to the Hiwassee series. In dry soil, the color value in the lower part of the argillic horizon is higher than is defined in the range for the series.

Series.—A series is a group of soils that have horizons similar in all important characteristics, except for texture of the surface layer, and similar in arrangement in the profile. (See the section "How This Survey Was Made.")

General Nature of the County

Catawba County was settled by the Germans and the Scotch-Irish. Its name was derived from the Catawba Indians, a large Siouan tribe that originally inhabited the area. The county was formed from part of Lincoln County in 1842 (*4*). The town of Newton, the county seat, was incorporated in 1855. Hickory, the largest city in Catawba County, was incorporated in 1870.

The history and growth of the county are vitally linked with the development of the railroad. The first railroad crossed the river near the town of Catawba and ran west to Hickory through Claremont and Conover. The early pioneers were mostly farmers.

Physiography, Relief, and Drainage

Catawba County is in the Piedmont physiographic province. Interstream areas represent a peneplain that has been dissected by moderately swift streams, most of which flow eastward and southeastward. A few prominent peaks rise above the upland plain. Baker Mountain has an elevation of 1,812 feet, and Anderson Mountain is 1,547 feet above sea level. The relief is gently sloping, except in the steeper, mountainous areas, and interstream areas are fairly broad.

The average elevation in the county is 1,165 feet above sea level. The highest point is on Baker Mountain, and the lowest elevation is approximately 760 feet above sea level, where the Catawba River leaves the county.

Erosion has greatly altered the topography of the county. In most places a thick layer of soil and soft weathered rock overlie bedrock. In some parts of the county, road cuts expose this soft weathered material to a depth of more than 20 feet. Stone lines in many places, at varying depths in the soil material, indicate that repeated cutting and filling have occurred until the present landscape of broad, gently sloping ridges and smooth slopes has become more or less stable.

The county is drained by the Catawba River and its tributaries, principally Jacob Ford and Clark, Pott, Lyle, McLin, Ball, and Maiden Creeks. These creeks flow generally east or southeast into the Catawba River, which forms the northern and eastern boundaries of the county. Lake Norman, Lake Hickory, and Lookout Shoals Lake have been built on the river.

About 95 percent of the county is well drained, approximately 4 percent is somewhat poorly drained or moderately well drained, and about 1 percent is poorly drained.

Water Supply

The municipal and domestic water supply is almost unlimited in Catawba County. Lake Hickory, Lake Norman, and Lookout Shoals Lake, on the northern and eastern boundaries of the county, can provide water for all foreseeable future needs. Ground water in the county is accessible and suitable for most uses. The yield of water from wells is generally low, but yields of 35 gallons per minute are not uncommon. The highest yields from wells are obtained from a wide belt through the center of the county, where the area is underlain by hornblende-gneiss (*3*).

Hickory, Brookford, and Longview obtain water from Lake Hickory. Newton obtains water from the Catawba River. The supply for Conover comes from deep wells. Maiden, Claremont, and Catawba have municipally owned well-water systems.

Climate [8]

Catawba County is distinctly rolling. Elevations above sea level range from less than 100 feet in the lowest streambed to more than 1,800 feet on the highest peak. Most of the county, however, is approximately 1,000 to 1,200 feet above sea level. The Catawba River, flowing east and then south, forms the northern and eastern boundaries of the county. The river is controlled by a number of dams that form artificial lakes. The largest, Lake Norman, is at the southeast corner of the county.

[8] Prepared by A. V. HARDY, climatologist, NOAA, North Carolina.

The average distance from the Atlantic Ocean to the southeastern part of the county is about 180 miles. The Blue Ridge Mountains, about 40 miles to the northwest, form a northeast-southwest barrier that is 3,000 to 5,000 feet higher than most of Catawba County. Temperature data are from observations in or near Hickory; precipitation data are from Hickory and near Catawba. Some variation is to be expected within the county. Temperature and precipitation data are shown in table 9.

The average length of the freeze-free growing season at Hickory is about 205 days. It extends from about the first week in April until the beginning of November. Table 10 shows the probability of freezes of various intensities in spring and fall. The temperature falls below 32°F. at Hickory on more than half the days in winter, but rarely remains that low for a full 24 hours. It drops as low as 0°, on the average, only once in several years, and rises above 100° only slightly more often. Temperatures of 90° are possible from the end of March until early in October. On an average, the temperature registers in the 90's on about 40 days in summer.

Much of the rainfall during the growing season comes from thunderstorms. The amount varies from place to place and from season to season. Hail occasionally accompanies a thunderstorm, but ordinarily, only a small area is affected. Periodically, a given area is without significant rainfall for 1 to 3 weeks. Rainfall in winter, resulting mainly from low-pressure storms moving through or near the area, is less variable than in summer. The county has no distinct wet and dry seasons. On the average, measurable rainfall occurs on 1 to 3 days per week at all times of the year.

Some snow falls every winter, but accumulation can range from 1 inch to 2 feet or more. The average accumulation in winter is about 8 inches. Usually only a few inches accumulate at one time, and such accumulations melt within a few days. Once in several years 8 to 12 inches fall in a day or so, and about as often, snow covers the ground for a week or more. In 1960, about 30 inches fell in Catawba County during February and March. The snow accumulated to a depth of 13 inches at Catawba, and some remained on the ground continuously from March 2 through March 22.

The average amount of cloud cover during daylight is a little more than half. The most cloudiness is in winter, and the least is in fall. The sun shines about half the daylight hours in winter and nearly two-thirds in other seasons. The average relative humidity is around 80 percent at sunrise and drops to about 50 percent at mid-afternoon.

Tropical storms from the Atlantic Ocean and the Gulf of Mexico are usually much weakened if they move as far inland as Catawba County. High winds are most often the result of summer thunderstorms; such winds affect limited areas and are of short duration. Hail damage, affecting very small areas, is reported in the county less than once a year on the average; and tornado damage, affecting even smaller areas, is reported only about once in 10 years.

Surface winds are variable at all seasons. The most persistent winds are from the northeast, northwest, and southwest. The strongest come mostly from the northwest. The average wind speed near the earth's surface is about 8 miles per hour.

Farming

Cotton was the major cash crop for many years. In the early 1930's, it was reported that 22,000 acres of cot-

TABLE 9.—*Temperature and precipitation*

[All data from Hickory or Catawba, or estimated as indicated]

Month	Temperature				Precipitation					
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with—		Average total	One year in 10 will have—		Days with snow cover of 1 inch or more	Average depth of snow on days with snow cover	Estimated soil temperature at 4-inch depth (bare, level ground)
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—			
	°F.	°F.	°F.	°F.	*Inches*	*Inches*	*Inches*	*Number*	*Inches*	°F.
January	51	31	64	15	4.1	1.6	8.3	3	3	42
February	53	31	67	19	4.1	1.5	6.8	2	2	42
March	61	37	77	26	4.7	2.8	8.0	1	3	50
April	71	47	85	34	3.8	1.4	6.3	0	0	59
May	79	55	90	44	3.6	1.3	5.0	0	0	70
June	86	64	94	53	3.9	1.4	6.7	0	0	78
July	88	66	95	60	5.0	2.2	8.2	0	0	79
August	87	65	95	59	5.6	1.9	11.0	0	0	78
September	82	59	91	48	3.8	.7	8.2	0	0	73
October	73	48	84	35	3.4	.8	8.3	0	0	63
November	61	37	76	26	3.1	.9	7.4	(1)	(2)	51
December	52	31	64	15	4.1	1.8	7.1	1	3	43
Year	70	48	[3] 97	[4] 8	49.2	37.3	62.5	7	3	61

[1] Less than one-half day.
[2] Less than one-half inch.
[3] Average annual maximum temperature.
[4] Average annual minimum temperature.

TABLE 10.—*Probabilities of last freezing temperatures in spring and first in fall*

[From temperature observations near Hickory, modified for a rural environment]

Probability	Dates for given probability and temperature				
	16° F. or lower	20° F. or lower	24° F. or lower	28° F. or lower	32° F. or lower
Spring:					
1 year in 10 later than	March 6	March 19	March 31	April 11	April 22
2 years in 10 later than	February 26	March 12	March 24	April 4	April 17
5 years in 10 later than	February 11	February 26	March 10	March 23	April 6
Fall:					
1 year in 10 earlier than	November 28	November 19	November 9	October 29	October 17
2 years in 10 earlier than	December 3	November 24	November 15	November 5	October 22
5 years in 10 earlier than	December 15	December 5	November 25	November 15	November 2

ton was grown during 1 year. By 1953, the acreage had dropped to 4,500, and by 1967, the acreage had dropped to 17. In 1967, crop acreages in the county amounted to 12,848 acres of corn, more than 12,000 acres of small grain, and 7,423 acres of soybeans.

This county had long been noted for purebred dairy cattle, particularly Jerseys. Dairies in the county numbered 106 in 1953. In the past few years, dairying has declined and production of beef cattle has increased.

Industry and Transportation

Furniture, hosiery, and textile manufacturing are the leading industries. Approximately 135 hosiery mills, 80 furniture manufacturers, and 40 textile plants are located within the county (*2*). More than 1,850 enterprises and businesses provide jobs for about 40,000 people.

The county is served by 2 railroads, 37 trucking terminals, and commercial jet and chartered airlines.

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Glossary

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Available water capacity (also termed available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material.

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

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

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

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture.

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and have mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood hazard. Water from stream overflow, from runoff or seepage, standing or flowing on the soil surface.

Frequency: None, less often than once in 50 years; very infrequent, once in 20 to 50 years; infrequent, once in 5 to 20 years; frequent, once in 1 to 5 years; very frequent, more often than once every year.

Duration: Extremely brief, shorter than 2 days; very brief, 2 to 7 days; brief, 7 days to 1 month; long, 1 month to 6 months; very long, longer than 6 months.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Forest type. A term used to describe stands that are similar in composition and development because of ecological factors. A forest type is temporary if its character has been caused by logging, fire, or other passing influences; it is permanent if no appreciable change is expected and its character is the result of ecological factors alone.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon, but may be immediately beneath an A or B horizon.

Land classification. The classification of units of land for the purpose of showing their relative suitabilities for some specific use.

Mapping unit. Areas of soil of the same kind outlined on the soil map and identified by a symbol.

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows: Abundance—*few, common,* and *many;* size—*fine, medium,* and *coarse;* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Parent material. Disintegrated and partly weathered rock from which soil has formed.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

Phase, soil. A subdivision of a soil series or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Mildly alkaline	7.4 to 7.8
Very strongly acid	4.5 to 5.0	Moderately alkaline	7.9 to 8.4
Strongly acid	5.1 to 5.5	Strongly alkaline	8.5 to 9.0
Medium acid	5.6 to 6.0	Very strongly alkaline	9.1 and higher
Slightly acid	6.1 to 6.5		
Neutral	6.6 to 7.3		

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

GUIDE TO MAPPING UNITS

For complete information about a mapping unit, read both the description of the mapping unit and that of the soil series to which it belongs. For complete information about a capability unit, read both the introduction "Crops and Pasture" and the description of the capability unit in this section. For information about the suitability of soils for woodland and wildlife, read the introduction to these sections and refer to the tables in each section. Woodland groups are described on page 25. Other information is given in tables as follows:

Acreage and extent, table 1, page 4.
Estimated yields, table 2, page 24.

Engineering uses of soils, tables 5, 6, and 7, pages 34 through 42.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group
			Symbol	Page	Number
Af	Altavista fine sandy loam, clayey variant	5	IIe-2	18	2w8
AsB	Appling sandy loam, 2 to 6 percent slopes	5	IIe-1	18	3o7
AsC2	Appling sandy loam, 6 to 10 percent slopes, eroded	6	IIIe-1	20	3o7
AsE2	Appling sandy loam, 10 to 25 percent slopes, eroded	6	IVe-1	22	3r8
Bn	Buncombe loamy sand	6	IIIs-1	22	2s8
CmB2	Cecil sandy loam, 2 to 6 percent slopes, eroded	8	IIe-1	18	3o7
CmC2	Cecil sandy loam, 6 to 10 percent slopes, eroded	8	IIIe-1	20	3o7
CmD2	Cecil sandy loam, 10 to 15 percent slopes, eroded	8	IVe-1	22	3o7
CnB2	Cecil clay loam, 2 to 6 percent slopes, eroded	8	IIIe-2	21	3o7
CnC2	Cecil clay loam, 6 to 10 percent slopes, eroded	8	IVe-2	22	3o7
CnE3	Cecil clay loam, 10 to 25 percent slopes, severely eroded	9	VIe-2	23	4c2e
Cw	Chewacla loam	9	IIIw-1	21	1w8
Cy	Congaree complex	10	IIw-1	19	1o7
EnB	Enon fine sandy loam, 2 to 6 percent slopes	11	IIe-3	19	4o1
Gu	Gullied land	11	VIIe-2	23	---
HsB2	Hiwassee loam, 2 to 6 percent slopes, eroded	12	IIe-1	18	3o7
HsC2	Hiwassee loam, 6 to 10 percent slopes, eroded	12	IIIe-2	21	3o7
HsD2	Hiwassee loam, 10 to 15 percent slopes, eroded	13	IVe-2	22	3o7
HsE	Hiwassee loam, 15 to 25 percent slopes	13	VIe-1	23	3r8
HwB2	Hiwassee clay loam, 2 to 6 percent slopes, eroded	13	IIIe-2	21	3o7
HwC2	Hiwassee clay loam, 6 to 10 percent slopes, eroded	13	IVe-2	22	3o7
Lc	Leveled clayey land	13	-----	--	---
MgB2	Madison gravelly sandy loam, 2 to 6 percent slopes, eroded	14	IIe-1	18	3o7
MgC2	Madison gravelly sandy loam, 6 to 10 percent slopes, eroded	14	IIIe-1	20	3o7
MgE2	Madison gravelly sandy loam, 10 to 25 percent slopes, eroded	14	VIe-1	23	3r8
PaF	Pacolet gravelly sandy loam, 25 to 45 percent slopes	15	VIIe-1	23	3r8
PcB	Pacolet gravelly fine sandy loam, 2 to 6 percent slopes	15	IIe-1	18	3o7
PcC	Pacolet gravelly fine sandy loam, 6 to 10 percent slopes	15	IIIe-1	20	3o7
PeE	Pacolet soils, 10 to 25 percent slopes	15	VIe-1	23	3r8
Wd	Wehadkee fine sandy loam	16	IVw-1	22	1w9
WkE	Wilkes loam, 10 to 25 percent slopes	17	VIe-1	23	4r2
Wo	Worsham fine sandy loam	17	IVw-1	22	2w8

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