SOIL SURVEY
Carroll and Haralson Counties
Georgia

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATIONS

Issued March 1971

Major fieldwork for this soil survey was done in the period 1962–66. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1966. Soil names and descriptions were approved in 1966. This survey was made cooperatively by the Soil Conservation Service and the University of Georgia, College of Agriculture, Agricultural Experiment Stations, as part of the technical assistance furnished to the West Georgia Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY REPORT

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

Locating Soils

All of the soils of Carroll and Haralson Counties are shown on the detailed map at the back of this survey. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with the numbers shown on the Index to Map Sheets.

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

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, woodland suitability group, and other groups in which the soil has been placed.

Interpretations not included in the text can be developed by using the soil map and 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 slight limitations for a given use can be colored green, those with moderate limitations can be colored yellow, and those with severe limitations can be colored red.

Farmers and those who work with farmers can learn about the soils in the soil descriptions and in the discussions of the capability units and woodland suitability groups.

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

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

Engineers and builders will find under "Engineering Uses of the Soils" tables listing soil features that affect engineering practices and structures.

Community planners and others concerned with community development can read about the soil properties that affect the choice of soils for homes, sewage disposal, and recreational sites under "Nonfarm Uses of Soils."

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

Newcomers to the two counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the Area."

Cover picture: **Herd grazing fescue and Ladino clover on Chewacla soils, frequently flooded. Fescue is on Grover gravelly fine sandy loam, 10 to 15 percent slopes, in near foreground and in background.**

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REPORT BY J. F. BROOKS, SOIL CONSERVATION SERVICE

SOILS SURVEYED BY J. F. BROOKS, T. N. CRABB, AND R. D. WELLS, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE, AGRICULTURAL EXPERIMENT STATIONS

CARROLL AND HARALSON COUNTIES are in the northern half of Georgia on the western boundary of the State (fig. 1). The Chattahoochee River flows along the southeastern boundary. Douglas and Paulding Counties join these counties on the east and separate the two counties from the metropolitan area of Atlanta.

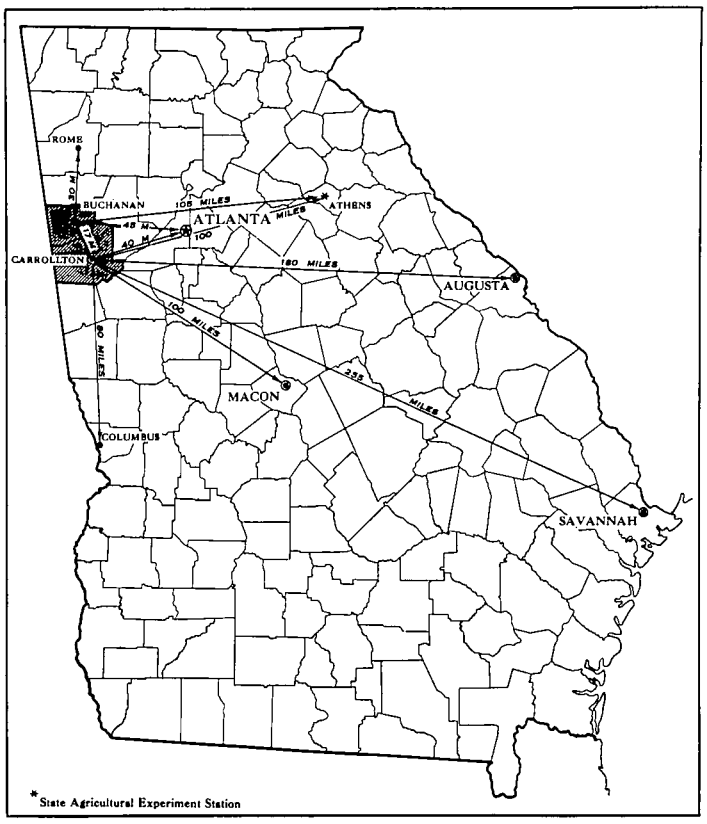

Figure 1.—Location of Carroll and Haralson Counties in Georgia.

The total area of Carroll and Haralson counties is 780 square miles, or 499,200 acres. The dominantly loamy soils in these counties are mainly rolling, but in places are hilly.

Most of the income from farming is from the sale of poultry, livestock, and livestock products. Corn, cotton, pimento peppers, and vegetables are grown for sale on a number of farms.

The population of the two counties was 48,775 in 1950 and 50,994 in 1960. About 60 percent of the people live in the rural areas. Carrollton is the largest town and county seat of Carroll County, and Buchanan is the county seat of Haralson County.

The climate of the area is characterized by long, moderately hot summers and short, mild winters. In summer, daytime temperatures between 85° and 90° F. are common, but the nights are moderately cool. Occasionally the temperature drops to around 15° in winter, but only for short periods. Precipitation averages about 51 inches per year.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Carroll and Haralson Counties, where they are located, and how they can be used.

The soil scientists went into the survey area knowing they likely would find many soils they had already seen and perhaps some they had not. As they traveled over the two counties, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures.

The soil series and the soil phase are the categories 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 that soil was first observed and mapped. Madison and Grover, for example, are the names of two soil series. All the soils in the United States having the same series are essentially alike in natural characteristics.

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

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

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

Some mapping units are made up of soils in a series that have different textures in their surface layer. In Carroll and Haralson Counties, Congaree soils are a mapping unit of this kind that is called an undifferentiated group. In this group each of the Congaree soils having a different texture could be mapped individually, but all of them are mapped as one unit because, for the purpose of the survey, there is no value in separating them. The pattern and proportion of the soils are not uniform. Another undifferentiated group in the survey is Chewacla soils, frequently flooded.

In most places surveyed there are areas where the soil material is so rocky, so shallow, or so severely eroded that it cannot be classified by soil series. These areas 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 the only land type mapped in Carroll and Haralson Counties.

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

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

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, and 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 present 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 Carroll and Haralson Counties. 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 an area, who want to compare different parts of an area, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, or for choosing the site for a building or other structure, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Soil associations and delineations on the general soil map in this soil survey do not fully agree with those of the general soil maps in adjacent counties published at a different date. Differences in the maps are the result of improvements in the classification of soils, particularly in the modifications or refinements in soil series concepts. In addition, more precise and detailed maps are needed because the uses of the general soil maps have expanded in recent years. The more modern maps meet this need. Still another difference is caused by the range in slope that is permitted within associations in different surveys.

Of the 11 soil associations in Carroll and Haralson Counties, two consist of nearly level soils on bottom lands and low stream terraces; five consist of gently sloping and moderately sloping soils of uplands; and four consist of strongly sloping and steep soils of uplands. These associations are described in the following pages.

Nearly Level Soils on Bottom Lands and Low Stream Terraces

The soils on the bottom lands are loamy or sandy and generally are mottled with brown and gray. They are nearly level and lie along the Little Tallapoosa and Tallapoosa Rivers and along major creeks. Soils of the low terraces are mostly loamy or clayey and mottled with olive gray, yellowish brown, or gray. They are chiefly along the outer edges of the major alluvial plains. Two associations in Carroll and Haralson Counties are on bottom lands and low terraces.

1. Chewacla-Augusta association

Somewhat poorly drained, nearly level soils on frequently flooded bottom lands and on low stream terraces

This association is characterized by nearly level soils on broad to narrow bottom lands along streams and around heads of drainageways. Stream channels are shallow, for they are partly filled with sediment and debris. They meander in many places and overflow frequently. This association occupies about 8 percent of the two counties.

The Chewacla soils make up about 80 percent of this association; the Augusta soils, about 8 percent; and minor soils, the remaining 12 percent.

Chewacla soils occupy the first bottoms along streams. These soils have a dark-brown silt loam surface layer about 8 inches thick. The subsoil extends to a depth of about 46 inches or more and consists of light olive-brown silt loam underlain by olive-gray sandy clay loam. The subsoil is mottled in the upper part and is gleyed in the lower part. Chewacla soils formed in recent alluvium deposited by the frequent floods.

Augusta soils occur on low stream terraces in and around the heads of drainageways. These soils have a dark grayish-brown loam surface layer about 9 inches thick. The subsoil extends to a depth of about 72 inches and is pale-olive, light olive-gray, and yellowish-brown sandy clay loam in the upper part and mainly light-gray and yellowish-brown clay loam in the lower part. The subsoil is mottled throughout. Augusta soils formed in old alluvium.

Minor soils in this association are the Worsham, Congaree, Buncombe, and Masada. The Worsham soils are on stream terraces and are poorly drained. Masada soils occupy higher stream terraces and are well drained to moderately well drained. The well drained Congaree and excessively drained Buncombe soils are on first bottoms.

This association is widely distributed throughout the counties and is a part of most farms. Most of the acreage has been cleared and is cultivated or pastured. The major soils are suited to many locally grown crops, such as corn, grain sorghum, fescue, dallisgrass, and white clover. In many places excavation of stream channels and ditching to improve drainage are required before cultivated crops can be grown. Except in the wetter spots, tilth is generally good.

Because of the flooding hazard, the major soils in this association have severe limitations if used for homesites, intensive play areas, sites for light industries, and trafficways. Oxidation ponds can be built only in areas that are near the base of upland slopes and are not severely flooded, and even in these areas there is a moderate limitation because of the moderate permeability of the dominant soils.

2. Congaree-Buncombe association

Well-drained to excessively drained, nearly level soils on infrequently flooded bottom lands

This association consists of nearly level soils on broad to narrow bottom lands and around the heads of drainageways. The streams seldom overflow, and their channels have little sediment or debris. This association occupies about 2 percent of the two counties.

The Congaree soils make up about 85 percent of this association; the Buncombe soils, about 10 percent; and minor soils, the remaining 5 percent.

Congaree soils are well drained. They are on first bottoms and around the heads of drainageways. These soils have a reddish-brown fine sandy loam surface layer about 16 inches thick. It is underlain by dark-brown sandy loam that is over reddish-brown fine sandy loam. In some places gray mottles occur below a depth of 30 inches. Congaree soils formed in recent alluvium along streams and drainageways.

Buncombe soils are on first bottoms and are excessively drained. These soils have a dark yellowish-brown loamy sand surface layer about 13 inches thick. It is underlain by layers of loamy sand that are yellowish brown, dark brown, and dark yellowish brown. Buncombe soils formed in recent sandy alluvium.

Minor soils in this association are the Chewacla. These soils are in fairly large areas along streams and drainageways. Chewacla soils are somewhat poorly drained and frequently flooded.

This association is widely distributed throughout the two counties and is a small part of many farms. Most of the acreage has been cleared and is cultivated or pastured. The soils are suited to many locally grown crops, such as corn (fig. 2), grain sorghum, bermudagrass, tall fescue, dallisgrass, and white clover. An abundant source of irrigation water is available in nearby streams. Tilth is good, and except during the wetter periods, the soils can be worked easily.

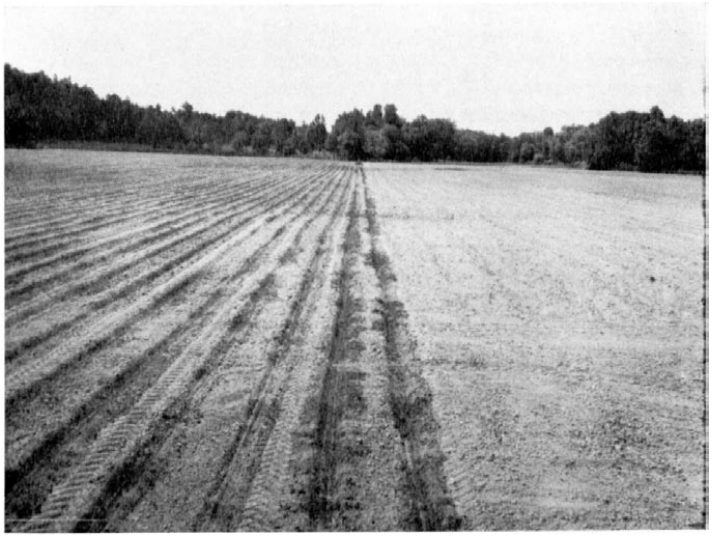

Figure 2.—Planting corn on the Congaree-Buncombe soil association.

Because of the flood hazard, the major soils in this association have severe limitations if used for homesites, campsites, intensive play areas, sites for light industries, and trafficways.

Gently Sloping and Moderately Sloping Soils of the Uplands

In five soil associations the soils are gently sloping and moderately sloping and occur chiefly on ridgetops and interstream divides. Slopes generally range from 1 to 10 percent. These soils are dominantly yellowish brown to

dark red and have a clayey or loamy subsoil. In most places they formed in residual parent materials, such as diorite, hornblende gneiss, quartz mica, and phyllite, but the soils in the Masada association formed in stream terrace deposits.

3. *Madison-Tallapoosa association*

Well-drained, micaceous soils that have a subsoil of red clay or clay loam

This association consists of soils on the tops and sides of broad and narrow ridges (fig. 3). Slopes are 6 to 10 percent in about 90 percent of this association and 2 to 6 percent in the rest. This association occupies about 21 percent of the two counties.

The Madison soils make up about 80 percent of the association; the Tallapoosa soils, about 15 percent; and minor soils, the remaining 5 percent.

Madison soils occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. These soils have a brown gravelly fine sandy loam surface layer about 5 inches thick. The subsoil extends to a depth of 32 inches and is red clay and clay loam that is friable to very friable. Soft micaceous rock occurs at a depth of 24 to 45 inches. Depth to hard rock exceeds 10 feet.

Tallapoosa soils occur on narrow, broken ridgetops and hillsides that are dissected in many places by drainageways and streams. These soils have a brown gravelly fine sandy loam surface layer about 4 inches thick. The subsoil extends to a depth of 12 inches and is yellowish-red, friable clay loam. Soft micaceous rock occurs at a depth of 14 to 20 inches. Depth to hard rock exceeds 10 feet.

Minor soils in this association are the Hulett and Grover. The Hulett soils are well drained and occur on low ridges and their side slopes. Grover soils are also well drained and are on medium and narrow ridgetops and their side slopes.

This association is widely distributed throughout Carroll County and the southern part of Haralson County. Most of the acreage has been cleared and is cultivated or pastured. The soils are well suited to cotton, corn, small grains, pimento peppers, soybeans, bermudagrass, tall fescue, and lespedeza. Tilth is generally good, and these soils can be worked easily throughout a wide range of moisture content. In the severely eroded soils, however, plowing extends into the upper part of the subsoil and tilth is poor. Severely eroded soils make up about 25 percent of this association.

Most of the farms in the association are small and are family owned and operated. Farming is chiefly of the general type, but the trend is to specialized farming, such as raising broilers, dairying, and raising beef cattle. Many farms are operated by part-time farmers who commute daily to industrial jobs in nearby towns.

The major soils in the association have only slight limitations if used for homesites or picnic areas. Limitations are moderate if the soils are used for septic tank filter fields, sites for light industries, and trafficways.

Figure 3.—Cattle grazing on soils of the Madison-Tallapoosa soil association on broad ridgetops and their side slopes.

4. Grover association

Well-drained, micaceous soils that have a subsoil of yellowish-red to strong-brown clay loam

This association is on ridges and interstream divides of narrow to medium width. Slopes are 6 to 10 percent in about 80 percent of the association, and are 2 to 6 in the rest. The larger areas occur in the northern and western parts of Haralson County. This association makes up about 4 percent of the two counties.

The Grover soils make up about 80 percent of the association; and minor soils, the remaining 20 percent.

Grover soils have a brown gravelly fine sandy loam surface layer about 5 inches thick. The subsoil extends to a depth of 36 inches and is strong-brown to yellowish-red, friable clay loam and silty clay loam. Soft micaceous rock occurs at a depth of 24 to 40 inches. Depth to hard rock exceeds 10 feet.

Minor soils in the association are the Tallapoosa and Madison. The Tallapoosa soils occur on narrow, broken ridgetops and hillsides that are dissected in many places by drainageways and streams. They are well drained. The Madison soils are also well drained but occur on broad, smooth interstream ridges and on slopes adjacent to drainageways.

A greater part of the acreage of this association has been cleared and is cultivated or pastured. The soils are well suited to cotton, corn, small grains, pimento peppers, soybeans, bermudagrass, tall fescue, and lespedeza. Tilth is good, and the soils can be worked easily throughout a wide range of moisture content.

Most of the farms in the association are small and are family owned and operated. The trend is to specialized farming, such as raising broilers, dairying, and raising beef cattle. Many farms are operated by part-time farmers who commute daily to industrial jobs in nearby towns.

The major soils of this association have only slight limitations if used for homesites and picnic areas. Limitations are moderate if these soils are used for septic tank filter fields, sites for light industries, and trafficways.

5. Hulett-Grover association

Well-drained soils that have a subsoil of yellowish-brown to yellowish-red clay or clay loam

This association is on tops and sides of low interstream divides. It is dissected by drainageways that reach almost to the ridgetops. Slopes are 2 to 6 percent in about 40 percent of this association, are 6 to 10 in about 45 percent, and are 10 to 15 in the rest. The largest areas occur in Carroll County north and west of Villa Rica, around Bowdon Junction, and between Temple and Draketown. Smaller areas are widely distributed throughout the two counties. This association occupies about 10 percent of the two counties.

The Hulett soils make up about 80 percent of the association; the Grover soils, about 15 percent; and minor soils, the remaining 5 percent.

Hulett soils occur on low ridges and their side slopes. These soils have a brown gravelly sandy loam surface layer about 6 inches thick. The subsoil extends to a depth of about 43 inches and is yellowish-brown to red sandy clay loam, clay, and clay loam. Soft, weathered micaceous material is at a depth of 36 to 50 inches. Depth to hard rock exceeds 10 feet.

Grover soils occur on medium and narrow ridgetops and their side slopes. These soils have a brown gravelly fine sandy loam surface layer about 5 inches thick. The subsoil extends to a depth of about 36 inches and is strong-brown to yellowish-red, friable clay loam and silty clay loam. Soft micaceous rock occurs at a depth of 24 to 40 inches. Depth to hard rock exceeds 10 feet.

Minor soils in the association are the Louisburg and Madison. The Louisburg soils are on uplands and are somewhat excessively drained. Madison soils are well drained. They occur on broad, smooth interstream ridges and on slopes adjacent to drainageways.

Most of the acreage of this association has been cleared and is cultivated or pastured. The soils are well suited to cotton, corn, small grains, pimento peppers, soybeans, bermudagrass, tall fescue, and lespedeza. Tilth is good, and these soils can be worked easily throughout a fairly wide range of moisture content.

Most of the farms in this association are small and are family owned and operated. Farming is chiefly of the general type, but the trend is to specialized farming, such as raising broilers, dairying, and raising beef cattle. Many farms are operated by part-time farmers who commute daily to industrial jobs in nearby towns.

The major soils in the association have slight to moderate limitations if used for homesites, picnic areas, intensive play areas, golf fairways, and trafficways. Limitations are moderate to severe if oxidation ponds are constructed.

6. Masada association

Well-drained soils that occur on stream terraces and have a brownish clay loam subsoil

This association extends from the stream terraces that are adjacent to the flood plains to higher stream terraces of the uplands. Slopes are 2 to 6 percent in about 90 percent of this association and are 6 to 10 percent in the rest. This association is widely distributed in small areas and occupies about 2 percent of the two counties.

The Masada soils make up about 75 percent of this association; and minor soils, the remaining 25 percent.

Masada soils formed in old alluvium, mainly on high stream terraces. These soils have a dark-brown gravelly sandy loam surface layer about 7 inches thick. The subsoil extends to a depth of 54 inches and is yellowish-brown and strong-brown clay loam that is friable to very friable. Depth to hard rock exceeds 8 feet.

Minor soils in this association are the Augusta, Madison, Hulett, and Grover. Augusta soils are somewhat poorly drained and formed in old alluvium on low stream terraces and around the heads of drainageways. Madison soils are well drained and occur on slopes adjacent to drainageways. The Hulett soils are well drained and occur on low ridges and their side slopes. Grover soils are well drained and occur on medium and narrow ridgetops and their side slopes.

Most of this association has been cleared and is cultivated. The soils are suited to most crops grown locally. An abundant supply of irrigation water is available in nearby streams. Tilth is generally good, and the soils can be worked easily throughout a wide range of moisture content.

The soils in most of the higher areas have slight limitations if used for foundations for dwellings, picnic areas, and septic tank filter fields. They have moderate limitations if used for oxidation ponds, sites for light industries, and trafficways. Limitations for these uses vary in the lower areas, which are less well drained and sometimes flooded.

7. *Davidson-Musella association*

Well-drained soils that have a dark-red clay loam or clay subsoil

This association consists of soils on broad and narrow ridgetops and of gently sloping soils on side slopes. The larger areas occur between Villa Rica and Carrollton in Carroll County and near Draketown in Haralson County. Slopes are 6 to 10 percent in about two-thirds of this association and are 2 to 6 percent in the rest. This association occupies about 4 percent of the two counties.

The Davidson soils make up about 85 percent of the association; Musella soils, about 10 percent; and minor soils, the remaining 5 percent.

Davidson soils occur on broad ridges and slopes adjacent to drainageways. These soils have a dark reddish-brown gravelly loam surface layer about 4 inches thick. The subsoil extends to a depth of 60 inches and is dark-red, firm clay loam and clay. Depth to hard rock exceeds 6 feet.

Musella soils occur on narrow, broken ridgetops. These soils have a dark reddish-brown gravelly clay loam surface layer about 5 inches thick. The subsoil extends to a depth of 18 inches and is dark-red, friable gravelly clay loam. Fractured rock lies beneath this layer at a depth of 1 to 5 feet.

Minor soils in this association are the Madison, Wilkes, and Iredell. The well-drained Madison soils are micaceous and occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. The Wilkes soils are well drained to somewhat excessively drained and occur on uplands. Iredell soils are moderately well drained to somewhat poorly drained and occur in low areas of the uplands.

Most of this association has been cleared and is cultivated or pastured. The soils are well suited to cotton, corn, small grains, pimento peppers, soybeans, bermudagrass, tall fescue, and lespedeza. In most areas the soils are in good tilth, but they can be worked easily only within a narrow range of moisture content. In about 35 percent of this association the soils are severely eroded and plowing extends into the upper part of the subsoil. In these areas, tilth is poor.

Most of the farms in the association are small and are owned by part-time farmers who are converting cropland to pasture and pine forest. Beef-cattle farms and dairy farms are few.

The major soils of the association have moderate to slight limitations if used for homesites, campsites, picnic areas, intensive play areas, and sites for light industries. Limitations are moderate to severe if oxidation ponds are constructed.

Strongly Sloping and Steep Soils of the Uplands

The soils of four soil associations are strongly sloping and steep and occur mainly on wooded hillsides and narrow ridgetops. Slopes generally range from 10 to 40 percent. These soils range from shallow to deep. They are dominantly yellowish brown to dark red, and they have a subsoil that ranges from coarse loamy sand to clay. These soils formed in residual parent materials, such as hornblende gneiss, quartz mica schist, phyllite, and diorite.

8. *Tallapoosa-Grover association*

Well-drained, micaceous soils that have a thin subsoil of yellowish-red or strong-brown clay loam

This association consists of moderately sloping to steep soils on broken ridges with narrow crests that are adjacent to numerous drainageways. Slopes are 15 to 25 percent in about three-fourths of the association, and 10 to 15 percent in the rest. The larger areas are in the northern and western parts of Haralson County. This association occupies about 14 percent of the two counties.

Tallapoosa soils make up about 70 percent of the association; Grover soils, about 20 percent; and the minor soils, the remaining 10 percent.

The Tallapoosa soils are on narrow, broken ridgetops and hillsides that are dissected by drainageways and streams. These soils have a brown gravelly fine sandy loam surface layer about 4 inches thick. The subsoil is yellowish-red, friable clay loam. Soft micaceous rock is at a depth of 14 to 24 inches. Depth to hard rock exceeds 10 feet.

Grover soils are on medium and narrow ridgetops and their side slopes. These soils have a brown gravelly fine sandy loam surface layer about 5 inches thick. The subsoil extends to a depth of 36 inches and is strong-brown and yellowish-red, friable clay loam and silty clay loam. Soft micaceous rock is at a depth of 24 to 40 inches. Depth to hard rock exceeds 10 feet.

Minor soils in the association are in the Madison and Louisa series. The well-drained Madison soils are micaceous and occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. The Louisa soils are somewhat excessively drained and occur on narrow, broken ridgetops and their side slopes.

Most of this association is still in native trees consisting of mixed oaks, hickory, dogwood, sourwood, and shortleaf pine. A few areas have been cleared and are cultivated or pastured, but in most places the soils are better suited to pasture than to cultivated crops.

Much of this association is sparsely populated. Several large areas belong to timber companies or other absentee owners. Many people commute daily to industrial jobs in nearby towns.

The major soils of this association generally have severe limitations if used for homesites, picnic areas, campsites, intensive play areas, sites for light industries, and oxidation ponds. In some places, however, limitations for homesites and picnic areas are moderate. These soils have moderate limitations if used for trafficways.

9. *Madison-Louisa-Tallapoosa association*

Well-drained to somewhat excessively drained, micaceous soils that have a moderately thick to thin subsoil of red or yellowish-red clay to clay loam

This association consists of moderately sloping to strongly sloping soils on hillsides and strongly sloping to steep soils on narrow, broken ridges. These soils are dis-

sected in many places by branching drainageways. The association is widely distributed throughout Carroll County and the eastern half of Haralson County. The larger areas occur on Blackjack Mountain south of Bowdon, and in the northwest corner of Carroll County. Slopes are 10 to 15 percent in slightly more than one-half of the association, are 15 to 25 percent in about one-third, and are 25 to 40 percent in the rest. This association occupies about 31 percent of the two counties.

The Madison soils make up 65 percent of the association; the Louisa soils, about 20 percent; and the Tallapoosa soils, the remaining 15 percent.

Madison soils are well drained and occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. These soils have a brown gravelly fine sandy loam surface layer about 5 inches thick. The subsoil extends to a depth of 32 inches and is red clay and clay loam that is friable to very friable. Soft micaceous rock occurs at a depth of 24 to 45 inches. Depth to hard rock exceeds 10 feet.

Louisa soils are highly micaceous and are somewhat excessively drained. They occur on narrow, broken ridgetops and on their side slopes. The surface layer of these soils is very dark grayish-brown to dark yellowish-brown fine sandy loam about 5 inches thick. The subsoil extends to a depth of 12 inches and consists of brown and dark-brown, very friable sandy loam. Soft micaceous rock is at a depth of 12 to 20 inches. Depth to hard rock exceeds 10 feet.

Tallapoosa soils are well drained and occur on narrow, broken ridgetops and hillsides that are dissected in many places by drainageways and streams. These soils have a brown gravelly fine sandy loam surface layer about 4 inches thick. The subsoil extends to a depth of 12 inches and is yellowish-red, friable clay loam. Soft micaceous rock occurs at a depth of 14 to 20 inches. Depth to hard rock exceeds 10 feet.

On slopes of 10 to 15 percent, most of the acreage of these soils has been cleared and is cultivated or pastured. The soils on these slopes are better suited to pasture than to crops, but cultivated crops can be grown occasionally. About 30 percent of this acreage is severely eroded, and in these areas plowing extends into the upper part of the subsoil. On slopes of 15 to 40 percent, most of the acreage is still in native vegetation consisting of mixed oaks, hickory, dogwood, sourwood, and pine. Areas that have been cleared are in pasture or are reverting to pine woodland.

The major soils of this association have moderate limitations if used for picnic areas and trafficways. Limitations are moderate where these soils are used for homesites that have community or public sewage systems. On slopes of 15 to 40 percent, however, limitations are severe on homesites that require septic tank filter fields. Use of the steep soils for campsites, picnic areas, sites for light industries, and oxidation ponds is limited by the slope and by adverse soil properties as well.

10. Davidson-Musella association

Well-drained soils that have a subsoil of dark-red clay or clay loam

This association consists of moderately sloping to strongly sloping soils that are on the side slopes of broad and narrow ridges. The association is widely distributed in small areas. One of the larger areas is just southwest of Villa Rica in Carroll County. Slopes are 10 to 15 percent in about two-thirds of the association and are 15 to 25 percent in the rest. The association occupies about 2 percent of the two counties.

The Davidson soils make up about 65 percent of the association; the Musella soils, about 25 percent; and the minor soils, the remaining 10 percent.

Davidson soils are moderately sloping and extend from the broad ridges. These soils have a dark reddish-brown gravelly loam surface layer about 4 inches thick. The subsoil extends to a depth of about 60 inches and is dark-red, firm clay to clay loam. Depth to hard rock exceeds 6 feet.

Musella soils occur on the sides of narrow, broken ridges. These soils have a dark reddish-brown gravelly clay loam surface layer about 5 inches thick. The subsoil extends to a depth of 18 inches and is dark-red, friable gravelly clay loam. Depth to fractured rock ranges from 1 to 5 feet.

Minor soils in this association are the Madison and Wilkes. Madison soils are well drained and occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. Wilkes occur on uplands and are well drained to somewhat excessively drained.

Most of this association has been cleared and is cultivated or pastured. The soils are better suited to pasture than to crops, but cultivated crops are grown in some places. The steeper slopes are wooded. About 30 percent of the association is severely eroded.

The major soils of this association have moderate limitations if used for picnic areas or homesites with community or public sewage systems. Limitations are severe for soils on slopes of 15 to 25 percent if they are used for trafficways, oxidation ponds, or homesites with septic tank filter fields.

11. Louisburg-Wilkes association

Somewhat excessively drained to well-drained, stony, shallow soils that have a coarse sandy loam or silty clay loam subsoil

This association is characterized by narrow, broken ridges that are highly dissected by branching drainageways. Slopes are 15 to 25 percent in about two-thirds of the association and are 6 to 15 percent in the rest. In most areas stones are on the surface and throughout the profile. The larger areas of the association occur east and southwest of Whitesburg in Carroll County and southwest of Draketown in Haralson County. The association occupies about 2 percent of the two counties.

The Louisburg soils make up about 75 percent of the association; the Wilkes soils, about 20 percent; and the minor soils, the remaining 5 percent.

Louisburg soils are somewhat excessively drained and occur on uplands. These stony soils have a very dark grayish-brown to dark-brown loamy sand surface layer about 7 inches thick. The subsoil extends to a depth of 28 inches and is yellowish-brown, friable coarse sandy loam. Depth to hard rock ranges from 2 to 5 feet.

The Wilkes soils occur on uplands and are well drained to somewhat excessively drained. These soils have a loam surface layer that is stony, dark grayish brown, and about 6 inches thick. The subsoil extends to a depth of about 17 inches and is yellowish-red, friable silty clay loam. Depth to hard rock ranges from 2 to 5 feet.

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The minor soils in this association are in the Hulett, Musella, and Iredell series. The Hulett soils are well drained and occur in low areas on ridges and their side slopes. The Musella soils are well drained and occur on uplands. The Iredell soils are moderately well drained to somewhat poorly drained and occur in low areas on uplands.

Most of the acreage of this association remains in native vegetation. A few of the areas of less sloping soils have been cleared and cultivated, but they are reverting to woodland.

On slopes of 15 to 25 percent, the major soils of this association are severely limited if used for intensive play areas, trafficways, or homesites with a public or community sewage system. Limitations are not so severe on the less sloping soils.

Descriptions of the Soils

This section describes the soil series and mapping units in Carroll and Haralson Counties. The approximate acreage and proportionate extent of each mapping unit are given in table 1. Their location is shown on the soil map at the back of this survey.

The procedure in this section is first to describe the soil series, and then the mapping units in the series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. The description of the soil series mentions features that apply to all the soils in a series. Differences among the soils of one series are pointed out in the description of the individual soils or are indicated in the soil name.

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

Soil	Carroll County		Haralson County		Total	
	Acres	Percent	Acres	Percent	Acres	Percent
Augusta loam	855	0. 3	945	0. 5	1, 800	0. 4
Augusta sandy loam, 2 to 6 percent slopes	1, 445	. 4	220	. 1	1, 665	. 3
Buncombe loamy sand	995	. 3	380	. 2	1, 375	. 3
Chewacla soils, frequently flooded	25, 000	7. 9	7, 420	4. 1	32, 420	6. 5
Congaree soils	6, 510	2. 1	3, 955	2. 2	10, 465	2. 1
Davidson gravelly loam, 2 to 6 percent slopes, eroded	4, 205	1. 3	500	. 3	4, 705	. 9
Davidson gravelly loam, 6 to 10 percent slopes, eroded	6, 610	2. 1	1, 450	. 8	8, 060	1. 6
Davidson gravelly loam, 10 to 15 percent slopes, eroded	3, 125	1. 0	905	. 5	4, 030	. 8
Davidson gravelly clay loam, 2 to 6 percent slopes, severely eroded	2, 080	. 7	95	(1)	2, 175	. 4
Davidson gravelly clay loam, 6 to 10 percent slopes, severely eroded	6, 315	2. 0	510	. 3	6, 825	1. 4
Davidson gravelly clay loam, 10 to 15 percent slopes, severely eroded	2, 655	. 8	485	. 3	3, 140	. 6
Grover gravelly fine sandy loam, 2 to 6 percent slopes, eroded	1, 840	. 6	1, 815	1. 0	3, 655	. 7
Grover gravelly fine sandy loam, 6 to 10 percent slopes, eroded	3, 100	1. 0	13, 055	7. 2	16, 155	3. 2
Grover gravelly fine sandy loam, 10 to 15 percent slopes	1, 310	. 4	16, 060	8. 8	17, 370	3. 5
Gullied land	75	(1)	0	-------	75	(1)
Hulett gravelly sandy loam, 2 to 6 percent slopes	1, 705	. 5	725	. 4	2, 430	. 5
Hulett gravelly sandy loam, 2 to 6 percent slopes, eroded	13, 405	4. 2	3, 585	2. 0	16, 990	3. 4
Hulett gravelly sandy loam, 6 to 10 percent slopes, eroded	14, 265	4. 5	3, 360	1. 8	17, 625	3. 5
Hulett gravelly sandy loam, 10 to 15 percent slopes, eroded	5, 195	1. 6	2, 725	1. 5	7, 920	1. 6
Hulett gravelly sandy clay loam, 6 to 15 percent slopes, severely eroded	1, 425	. 4	770	. 4	2, 195	. 4
Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded	150	(1)	475	. 3	625	. 1
Louisa gravelly fine sandy loam, 6 to 10 percent slopes	535	. 2	85	(1)	620	. 1
Louisa gravelly fine sandy loam, 10 to 15 percent slopes	3, 750	1. 2	175	(1)	3, 925	. 8
Louisa gravelly fine sandy loam, 15 to 40 percent slopes	16, 825	5. 3	10, 925	6. 0	27, 750	5. 6
Louisburg stony loamy sand, 6 to 15 percent slopes	1, 780	. 6	0	-------	1, 780	. 4
Louisburg stony loamy sand, 15 to 25 percent slopes	6, 265	2. 0	115	(1)	6, 380	1. 3
Madison gravelly fine sandy loam, 2 to 6 percent slopes, eroded	7, 380	2. 5	1, 365	. 7	9, 195	1. 8
Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded	38, 700	12. 2	10, 560	5. 7	49, 260	9. 9
Madison gravelly fine sandy loam, 10 to 15 percent slopes, eroded	38, 725	12. 2	4, 575	2. 5	43, 300	8. 7
Madison gravelly fine sandy loam, 15 to 25 percent slopes	29, 955	9. 5	7, 815	4. 2	37, 770	7. 6
Madison gravelly clay loam, 2 to 6 percent slopes, severely eroded	3, 000	. 9	5	(1)	3, 005	. 6
Madison gravelly clay loam, 6 to 10 percent slopes, severely eroded	24, 565	7. 8	900	. 5	25, 465	5. 1
Madison gravelly clay loam, 10 to 15 percent slopes, severely eroded	20, 540	6. 5	1, 925	1. 1	22, 465	4. 5
Masada fine sandy loam, 2 to 6 percent slopes	2, 645	. 8	2, 930	1. 6	5, 575	1. 1
Masada gravelly sandy loam, 2 to 6 percent slopes	1, 710	. 5	1, 530	. 8	3, 240	. 6
Masada gravelly sandy loam, 6 to 10 percent slopes, eroded	1, 005	. 3	1, 195	. 7	2, 200	. 4
Musella gravelly clay loam, 6 to 15 percent slopes, eroded	1, 750	. 5	335	. 2	2, 085	. 4
Musella stony clay loam, 15 to 25 percent slopes, eroded	1, 110	. 4	840	. 5	1, 950	. 4
Tallapoosa gravelly fine sandy loam, 6 to 10 percent slopes, eroded	1, 055	. 3	14, 560	8. 1	15, 615	3. 1
Tallapoosa gravelly fine sandy loam, 10 to 15 percent slopes, eroded	2, 870	. 9	9, 700	5. 3	12, 570	2. 5
Tallapoosa gravelly fine sandy loam, 15 to 25 percent slopes, eroded	2, 720	. 9	47, 720	26. 2	50, 440	10. 1
Tallapoosa gravelly clay loam, 10 to 15 percent slopes, severely eroded	635	. 2	1, 500	. 8	2, 135	. 4
Tallapoosa gravelly clay loam, 15 to 25 percent slopes, severely eroded	1, 630	. 5	1, 385	. 8	3, 015	. 6
Wilkes stony loam, 6 to 15 percent slopes	665	. 2	760	. 4	1, 425	. 3
Wilkes stony loam, 15 to 25 percent slopes	870	. 3	150	(1)	1, 020	. 2
Worsham silt loam	900	. 3	445	. 2	1, 345	. 3
Water	2, 500	. 8	1, 470	. 8	3, 970	. 8
Totals	316, 800	100. 0	182, 400	100. 0	499, 200	100. 0

[1] Less than 0.1 percent.

A profile typical for each series is described in two ways. Many will prefer to read the short description in narrative form. It is the second paragraph in the series description. The technical description of the profile is mainly for soil scientists, engineers, and others who need to make thorough and precise studies of soils. Unless otherwise stated, the profile described is that of a moist soil.

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

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the soil map. Listed at the end of each description of a mapping unit is the capability unit, woodland suitability group, and wildlife suitability group in which the mapping unit has been placed. The "Guide to Mapping Units" at the back of this survey lists the pages where each of these groups is described.

Many terms used in the soil descriptions and other sections are defined in the Glossary at the back of this survey and in the "Soil Survey Manual" (*5*).[1]

Descriptions, names, and delineations of soils in this soil survey do not fully agree with soil maps in adjacent counties published at a different date. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, and the extent of soils within the survey. In some places it is more feasible to combine small acreages of similar soils that respond to use and management in much the same way than it is to separate these soils and give them names.

Augusta Series

The Augusta series consists of somewhat poorly drained soils that formed in old alluvium on low stream terraces and in the heads of drainageways. Slopes range from 0 to 6 percent.

In a typical profile the surface layer is dark grayish-brown loam about 9 inches thick. The subsoil is highly mottled pale-olive, light olive-gray, yellowish-brown, and light-gray sandy clay loam and clay loam. Depth to hard rock exceeds 10 feet.

These soils are low to moderate in natural fertility and contain little organic matter. They are strongly acid. Permeability is moderate in the surface layer and subsoil but is slow in the underlying material. Available water capacity is medium.

The Augusta soils are widely distributed along the larger streams, but the acreage in these counties is small. The largest areas are on low stream terraces along the Tallapoosa River and its tributaries in Haralson County, and along the Little Tallapoosa River and its tributaries in Carroll County.

Typical profile of Augusta loam (0 to 2 percent slopes) along a drainage ditch in a low stream terrace 4 miles northeast of Tallapoosa and 0.4 mile east of Beach Creek Bridge on Bagwell Road, Haralson County:

A—0 to 9 inches, dark grayish-brown (10YR 4/2) loam; weak, fine, granular structure; very friable; many fine roots; fine mica flakes common; strongly acid; clear, smooth boundary; horizon 5 to 12 inches thick.

B1t—9 to 14 inches, pale-olive (5Y 6/3) light sandy clay loam with many, medium, distinct mottles of yellowish brown (10YR 5/6) and few, fine, faint mottles of light olive gray; weak, medium, subangular blocky structure; very friable; many fine roots; fine mica flakes common; strongly acid; clear, smooth boundary; horizon 4 to 10 inches thick.

B21tg—14 to 44 inches, mottled light olive-gray (5Y 6/2) and yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular blocky structure; friable; few, thin, patchy clay films on ped surfaces; many fine roots in upper part; fine mica flakes common; few fine pebbles; strongly acid; gradual, smooth boundary; horizon 20 to 36 inches thick.

B22tg—44 to 60 inches, mottled light-gray (5Y 6/1) and yellowish-brown (10YR 5/6) clay loam; moderate, medium, subangular blocky structure; friable; continuous clay films on ped surfaces; common, medium, soft peds that have a center of yellowish red (5YR 4/6); fine mica flakes common; strongly acid; gradual, smooth boundary; horizon 12 to 24 inches thick.

B3tg—60 to 72 inches, mottled light-gray (5Y 6/1) and yellowish-brown (10YR 5/6) clay loam; massive to weak, medium, subangular blocky structure; friable; fine mica flakes common; strongly acid; gradual, smooth boundary; horizon 8 to 15 inches thick.

Cg—72 to 96 inches +, light-gray (5Y 6/1) loam or sandy clay loam with a few, faint, distinct mottles of yellowish brown; massive in place; fine mica common; strongly acid.

The A horizon ranges from grayish brown to dark grayish brown. Texture of the A horizon ranges from loam to sandy loam. Texture of the B horizon is sandy clay loam and clay loam.

Augusta soils occur with Chewacha, Worsham, Congaree, and Masada soils. They are not so well drained as Masada and Congaree soils and are grayer and more highly mottled. Augusta soils are better drained than Worsham soils and have more distinct horizons than Chewacla soils.

Augusta loam (0 to 2 percent slopes) (AsI).—This somewhat poorly drained soil is on low stream terraces. Its profile is the one described as typical for the series (fig. 4).

The root zone is thick, and except in wetter areas, tilth is good. For 1 to 2 months, late in winter and early in spring, the water table is at a depth of about 0 to 15 inches. Flooding occurs once in 1 to 5 years and lasts from 2 to 7 days.

Nearly all of this soil is used for crops and pasture. Because of the seasonal high water table and frequent flooding, use is limited to a narrow range of crops. Floods late in spring delay plantings and sometimes reduce crop growth. (Capability unit IIIw–3; woodland suitability group 6; wildlife suitability group 6)

Augusta sandy loam, 2 to 6 percent slopes (AwB).—This soil is at the heads of drainageways and on low interstream divides, generally in small, narrow areas of less than 10 acres. It has a grayish-brown sandy loam surface layer. The subsoil is mottled yellowish-brown and gray sandy clay loam. The surface layer and subsoil combined range from 42 to 72 inches in thickness. In most places the plow layer is in the original surface layer.

Included with this soil in mapping are small areas of a poorly drained soil, some areas where material from adjacent soils has accumulated on the surface in a thin layer, and a few areas that have a clay or sandy clay subsoil.

This Augusta soil has a thick root zone. It can be worked only during the drier periods, and use is limited to a narrow range of crops. The seasonal high water table fluctuates between depths of 15 to 25 inches for 2 to 6 months in

[1] Italic numbers in parentheses refer to Literature Cited, p. 58.

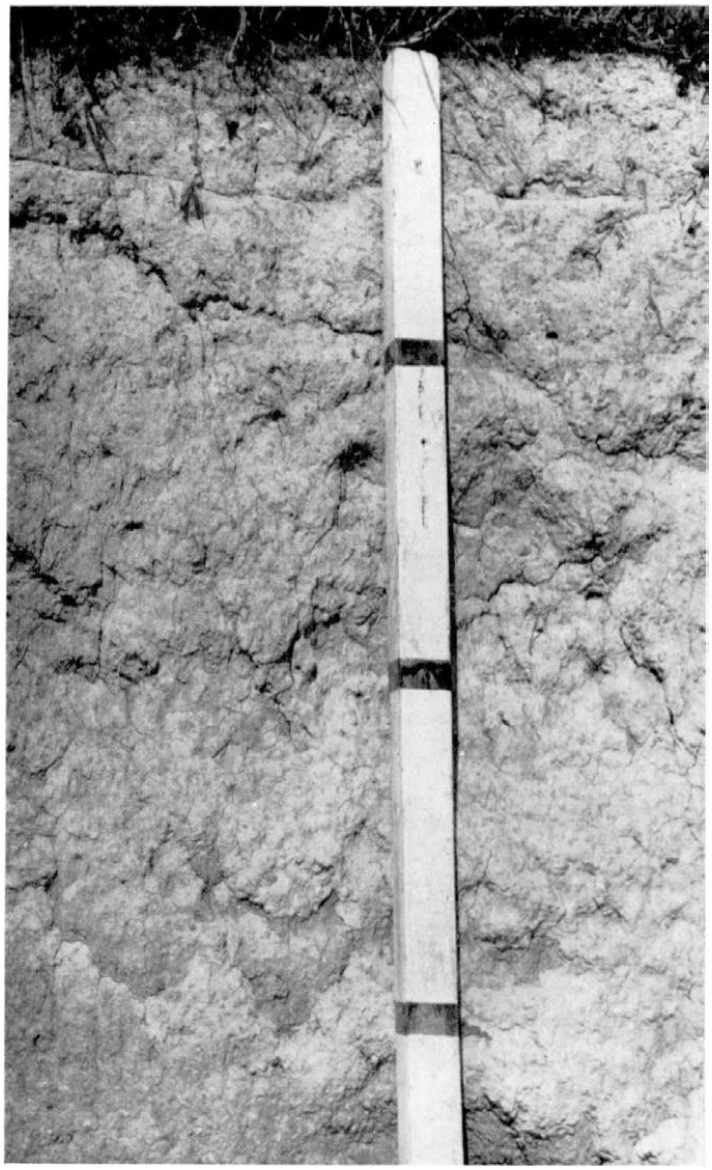

Figure 4.—**Profile of Augusta loam (0 to 2 percent slopes) in a drainage ditch.**

winter and early in spring. Surface runoff is slow, and erosion is not a major hazard.

Most of this soil is pastured. Response is fairly good to good management, especially to fertilization and drainage. (Capability unit IIIw–3; woodland suitability group 6; wildlife suitability group 6)

Buncombe Series

The Buncombe series consists of excessively drained soils that formed in recent sandy alluvium on first bottoms along the larger streams. Slopes range from 0 to 4 percent.

In a typical profile the surface layer is dark yellowish-brown loamy sand about 13 inches thick. Underlying this layer is 41 inches or more of loamy sand that is yellowish brown in the upper part, dark brown in the middle, and dark yellowish brown below. Depth to hard rock exceeds 15 feet.

These soils have low organic-matter content and natural fertility and are very strongly acid. Permeability is rapid, and available water capacity is low.

Buncombe soils are widely distributed along the larger streams, but their acreage is small. Most of the acreage has been cleared and is cultivated or pastured. The native vegetation consisted of oak, elm, birch, ash, poplar, and sycamore.

Typical profile of Buncombe loamy sand, in a cultivated field along the Chattahoochee River, 3.5 miles southwest of Whitesburg in the McIntosh Reserve, 1 mile southeast of the Chief McIntosh Monument and 400 yards south of county road, Carroll County:

Ap—0 to 13 inches, dark yellowish-brown (10YR 4/4) loamy sand; weak, fine and medium, granular structure; very friable to loose; many fine roots; many fine mica flakes; very strongly acid; abrupt, smooth boundary; horizon 6 to 15 inches thick.

C1–13 to 23 inches, yellowish-brown (10YR 5/4) loamy sand; single grain; loose; few fine roots; many fine mica flakes; very strongly acid; clear, smooth boundary; horizon 6 to 18 inches thick.

C2—23 to 48 inches, dark-brown (10YR 4/3) loamy sand; single grain; loose; many fine mica flakes; few thin lenses of silt loam; very strongly acid; clear, smooth boundary; horizon 12 to 24 inches thick.

C3—48 to 54 inches +, dark yellowish-brown (10YR 4/4) loamy sand; massive in place; very friable to loose; many fine mica flakes; few thin lenses of silt loam and coarse sand; very strongly acid.

The color of the Ap horizon ranges from dark yellowish brown through dark brown and dark grayish brown. The C horizon ranges from yellowish brown through dark yellowish brown to brown and to strong brown.

Buncombe soils occur with Congaree soils but are sandier and have a much lower available water capacity.

Buncombe loamy sand (0 to 4 percent slopes) (Bfs).—This soil occurs in long, narrow areas on first bottoms along the larger streams. It has the profile described as typical for the Buncombe series.

Included with this soil in mapping is a soil that has a layer of sandy loam at a depth of about 36 inches.

This Buncombe soil has a thick root zone and is easily cultivated throughout a wide range of moisture content. Permeability is rapid, and available water capacity is low. Once in 1 to 5 years a flood occurs late in winter or early in spring, but it lasts for less than 2 days. Surface runoff is slow, and erosion is not a hazard.

This soil is mostly cultivated or pastured. It is suited to many kinds of crops grown locally, but crop growth is poor occasionally because of the rapid permeability and low available water capacity. (Capability unit IIIs–1; woodland suitability group 1; wildlife suitability group 5)

Chewacla Series

The Chewacla series consists of somewhat poorly drained soils that developed in recent alluvium along the streams and drainageways. Slopes range from 0 to 2 percent.

In a typical profile the surface layer is dark-brown silt loam about 8 inches thick. The subsoil is mottled light olive-brown silt loam in the upper part and olive-gray sandy clay loam below a depth of about 30 inches. Depth to hard rock exceeds 8 feet.

These soils are moderate in organic-matter content and natural fertility, and are strongly acid. Permeabilty is moderate, and available water capacity is medium to high.

Chewacla soils are widely distributed and occur in fairly large areas along streams and drainageways. The native vegetation consisted mainly of poplar, blackgum, beech, willow, other water-tolerant hardwoods, and a few pines. Most of the acreage has been cultivated but now is largely in pasture and water-tolerant hardwoods.

Typical profile of Chewacla soils, frequently flooded, in a pasture 2 miles north of Buchanan, 150 feet east of Abernathy Creek, 200 feet south of bridge on Tallapoosa East Church Road, Haralson County:

Ap—0 to 8 inches, dark-brown (7.5YR 4/4) silt loam with a few, fine, faint, brown mottles; weak, medium, granular structure; very friable; many fine roots; fine mica flakes common; strongly acid; gradual, smooth boundary; horizon 6 to 10 inches thick.

B1—8 to 30 inches, light olive-brown (2.5Y 5/4) silt loam with common, medium, distinct mottles of yellowish brown (10YR 5/8) and olive (5Y 4/3); massive in place breaking into weak, angular blocky structure when removed; very friable; few fine roots; fine mica flakes common; strongly acid; gradual, smooth boundary; horizon 18 to 30 inches thick.

B2g—30 to 46 inches +, olive-gray (5Y 4/2) sandy clay loam; massive in place; some evidence of thin bedding planes; strongly acid.

The Ap horizon ranges from dark brown to dark grayish brown in color. The texture of the Ap horizon is sandy loam in places where there are recent sandy deposits. In other places the texture is silt loam or loam. The B horizons vary in texture and have thin strata of loamy coarse sand in some places and silty clay loam and sandy clay loam in other places. In a few places gravel beds occur at a depth of 3 or 4 feet.

Chewacla soils occur with Congaree, Augusta, and Worsham soils. They are more poorly drained than Congaree soils and have less horizon development than Augusta and Worsham soils.

Chewacla soils, frequently flooded (0 to 2 percent slopes) (Cfs).—These soils are on first bottoms along the streams and drainageways. They have the profile described as typical for the series. The surface layer ranges from silt loam to loam and sandy loam.

Included in mapping are areas of thick, recently deposited soil material in which little or no horizonation has occurred. This occupies about 35 percent of the acreage. It has thin, variable-textured layers, caused by sediments that were deposited by stream overflow.

Chewacla soils have a thick root zone. The surface layer has good tilth, except in the wetter areas. The water table ranges from 0 to 25 inches below the surface for 1 to 2 months late in winter and early in spring. Flooding generally occurs during winter, but occasionally a flood late in spring delays planting.

Because of the frequent flooding and the seasonal high water table, these soils are suited to only a narrow range of crops. Most of these soils are used for pasture and forest. (Capability unit IIIw–2; woodland suitability group 6; wildlife suitability group 6)

Congaree Series

The Congaree series consists of well-drained soils that formed in recent alluvium along streams and drainageways. Slopes range from 0 to 2 percent.

In a typical profile the surface layer is reddish-brown fine sandy loam about 16 inches thick. Underlying this layer is dark-brown sandy loam grading to reddish-brown fine sandy loam at a depth of about 34 inches. Depth to hard rock exceeds 15 feet.

Congaree soils contain a moderate amount of organic matter, are naturally fertile, and are strongly acid to medium acid. Permeability is moderate, and available water capacity is medium.

Congaree soils are widely distributed, but their acreage is small. The native vegetation consisted mainly of oak, elm, beech, sycamore, birch, gum, and poplar. Nearly all of the acreage has been cleared and is cultivated or pastured.

Typical profile of Congaree soils (0 to 2 percent slopes) in a cultivated area on east side of Whooping Creek, 6.5 miles southwest of Whitesburg, 200 feet southeast of Liberty Church Road and 0.5 mile northwest of junction of Whooping Creek and the Chattahoochee River, Carroll County:

A—0 to 16 inches, reddish-brown (5YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; many fine mica flakes; strongly acid; gradual, smooth boundary; horizon 8 to 18 inches thick.

C1—16 to 34 inches, dark-brown (7.5YR 4/4) sandy loam; weak, fine, granular structure; thin bedding planes common; very friable; many fine roots in upper part; many fine mica flakes; medium acid; clear, smooth boundary; horizon 10 to 20 inches thick.

C2—34 to 52 inches +, reddish-brown (5YR 4/4) fine sandy loam; massive but having thin bedding planes; slightly sticky when wet; many fine mica flakes; strongly acid.

The A horizon ranges from silt loam and fine sandy loam to loamy fine sand in texture, and from pale brown and brown to dark brown and reddish brown in color. The C horizons range from sandy loam and fine sandy loam to coarse sandy clay loam. Color ranges from reddish brown and dark brown to strong brown and to dark yellowish brown. In some places gray mottling is present in the C horizon below a depth of 30 inches.

Congaree soils occur with Augusta, Chewacla, Worsham, and Buncombe soils. The Congaree soils are better drained than Augusta, Chewacla, and Worsham soils and are finer textured than Buncombe soils.

Congaree soils (0 to 2 percent slopes) (Cng).—These well-drained soils are on first bottoms adjacent to streams and drainageways. They have the profile described as typical for the series. They are chiefly brownish and loamy to a depth of 40 inches or more. The surface layer ranges in texture from silt loam and fine sandy loam to loamy fine sand.

Included in mapping were small areas of soils that are more highly stratified than Congaree soils. Also included were small areas of soils that have textural horizons underlying a mantle of recent alluvium. These areas are around the heads of drainageways.

Congaree soils have a thick root zone, are easy to work except during wet periods, and are suited to many locally grown crops. Response to good management, especially fertilization and irrigation, is good.

These soils have a seasonal high water table that is 20 to 36 inches below the surface for 1 to 2 months per year. Planting is sometimes delayed by floods that last less than 2 days and occur once in 1 to 5 years during winter and early in spring.

Most of the acreage is in crops and pastures. (Capability unit I–1; woodland suitability group 1; wildlife suitability group 5)

Davidson Series

The Davidson series consists of well-drained soils that formed in materials weathered chiefly from diorite and hornblende gneiss. These soils are on broad ridges and slopes adjacent to drainageways. Slopes range from 2 to 15 percent. Depth to hard rock is more than 6 feet.

In a typical profile the surface layer is dark reddish-brown gravelly loam about 4 inches thick. The subsoil is dark-red clay to clay loam about 56 inches thick.

Davidson soils are low in organic-matter content, medium in natural fertility, and medium acid to strongly acid. Permeability is moderate, and the available water capacity is medium. The root zone is thick.

Davidson soils are fairly extensive. The largest areas extend from Villa Rica southwestward through Carrollton to a point just west of Roopville. Most of the acreage has been cleared of native vegetation, which consisted mostly of various oaks, hickory, dogwood, sourwood, poplar, and shortleaf pine. The less sloping soils that are not severely eroded are suited to most crops grown locally and are generally cultivated and pastured. The natural vegetation on abandoned fields is sassafras and loblolly pine.

Typical profile of Davidson gravelly loam, 2 to 6 percent slopes, eroded, in a cultivated field, 5 miles northwest of Carrollton, 1 mile east of Millers Academy Road on a county road, and 0.4 mile north of bridge on Buck Creek, Carroll County:

Ap—0 to 4 inches, dark reddish-brown (5YR 3/3) gravelly loam; weak, coarse, granular and fine, subangular blocky structure; very friable; many fine roots; few small maganese concretions; 20 to 30 percent gravel; medium acid; clear, smooth boundary; horizon 2 to 6 inches thick.

B2t—4 to 36 inches, dark-red (2.5YR 3/6) clay; strong, fine and medium, subangular blocky structure; firm; many, distinct, continuous clay films on ped surfaces; many fine roots; few small manganese concretions; a few quartz pebbles; medium acid to strongly acid; diffuse, wavy boundary; horizon 17 to 37 inches thick.

B3t—36 to 60 inches, dark-red (2.5YR 3/6) clay loam with few, fine, distinct mottles of strong brown (7.5YR 5/6); moderate, fine and medium, subangular blocky structure; firm; many, distinct, continuous clay films on ped surfaces; few fine mica flakes; medium acid to strongly acid; diffuse, wavy boundary; horizon 20 to 30 inches thick.

C—60 to 75 inches +, highly weathered basic rock material with pockets of dark-red (2.5YR 3/6) clay loam; common fine mica flakes; medium acid to strongly acid.

The Ap horizon ranges from dark red and dark reddish brown to dusky red and dark brown. In eroded areas the Ap horizon ranges from 3 to 6 inches in thickness, but in severely eroded areas it is only 2 to 5 inches thick and consists of clay loam.

Davidson soils occur with Musella and Iredell soils. The Davidson soils are redder and less sticky in the subsoil than are the Iredell soils. The Davidson soils have more distinct horizons than the Musella soils and are thicker.

Davidson gravelly loam, 2 to 6 percent slopes, eroded (DrB2).—This soil is on broad, convex ridges. It has the profile described as typical for the series (fig. 5). The combined thickness of the surface layer and subsoil ranges from 60 to 72 inches. Ordinary tillage extends into the subsoil and has mixed some of the clayey subsoil with the original surface layer. In some places there is little difference in color between the surface layer and the subsoil.

Figure 5.—**Profile of Davidson gravelly loam, 2 to 6 percent slopes, eroded, along roadbank. Soil auger is 52 inches long.**

Included in the mapping were areas that have a fine sandy loam surface layer.

Good tilth is maintained on this soil if it is tilled only within a fairly narrow range in moisture content. This soil is suited to most crops grown locally and responds well to good management practices, especially fertilization. Surface runoff in barren fields is medium, and erosion is a moderate hazard if the soil is not protected. Most of the acreage is pastured or cultivated. (Capability unit IIe–1; woodland suitability group 2; wildlife suitability group 1)

Davidson gravelly loam, 6 to 10 percent slopes, eroded (DrC2).—This soil occupies the tops and gentle side slopes of broad, convex ridges. It has a dark reddish-brown gravelly loam surface layer that ranges from 3 to 5 inches in thickness and is underlain by a thick, dark-red clay subsoil. The combined thickness of the surface layer and subsoil is 50 to 72 inches. The plow layer consists partly of the

original surface layer and partly of the upper subsoil mixed up during tillage.

Included with this soil in mapping were a few galled spots and a few shallow gullies. Also included was a very small, severely eroded acreage where the plow layer is in the upper part of the subsoil and tilth is poor.

This soil retains its good tilth if it is tilled only within a fairly narrow range of moisture content. It is suited to most crops grown locally and responds to good management, especially fertilization. Because surface runoff is medium to rapid on barren fields, erosion is a severe hazard if the soil is not protected.

Most of the acreage is cultivated and pastured. (Capability unit IIIe–1; woodland suitability group 2; wildlife suitability group 1)

Davidson gravelly loam, 10 to 15 percent slopes, eroded (DrD2).—This soil is on the moderate side slopes of ridges adjacent to drainageways and streams. The surface layer is dark reddish-brown gravelly loam 3 to 5 inches thick. The subsoil is thick, dark-red clay. The combined thickness of the surface layer and subsoil is 50 to 70 inches. Ordinary tillage extends into the subsoil and has mixed some of the clayey subsoil with part of the original surface layer.

Included in mapping were a few severely eroded areas that have a few shallow gullies. In this area the plow layer is in the upper part of the subsoil. A small acreage is included that has slopes of as much as 25 percent.

This soil has fair tilth but is friable only within a narrow range of moisture content. Surface runoff is rapid on barren fields, and erosion is a very severe hazard if the soil is not protected. Because of the erosion hazard, this soil is better suited to permanent pasture and forest than to cultivated crops, but with very careful management, cultivated crops can be grown to a limited extent.

Most of the acreage is pastured and forested. (Capability unit IVe–1; woodland suitability group 2; wildlife suitability group 2)

Davidson gravelly clay loam, 2 to 6 percent slopes, severely eroded (DsB3).—This soil occupies broad ridgetops. It has a dark-red gravelly clay loam surface layer, 2 to 5 inches thick, and a thick, dark-red clay subsoil. The combined thickness of the surface layer and subsoil is 55 to 70 inches. The plow layer consists largely of material from the subsoil. Shallow gullies and galled spots are common.

Tilth is poor, and the soil can be worked only within a narrow range of moisture content. The plow layer bakes and hardens upon drying and is cloddy in many places.

The rate of infiltration is slow, and surface runoff is moderate to rapid on barren fields. If the soil is not protected, the hazard of further erosion is severe. This soil is suited to most crops grown locally, and it responds to good management practices, especially fertilization.

Most of the acreage is used for crops and pastures. (Capability unit IIIe–1; woodland suitability group 3; wildlife suitability group 3)

Davidson gravelly clay loam, 6 to 10 percent slopes, severely eroded (DsC3).—This soil is on broad ridgetops and their side slopes. The surface layer is dark-red gravelly clay loam 2 to 5 inches thick. The subsoil is thick, dark-red clay. The combined thickness of the surface layer and subsoil is 50 to 70 inches. The plow layer is composed largely of material from the subsoil. Shallow gullies and galled spots are common.

Tilth is poor. Because of the clay, this soil can be worked only within a narrow range of moisture content. Upon drying the plow layer bakes and hardens and in many places becomes cloddy. Infiltration is slow, and surface runoff is rapid in areas left bare. Erosion is a very severe hazard if the soil is not protected.

This soil is suited to most locally grown crops, but it is better suited to pasture and hay crops than to cultivated crops. Most of the acreage is in pasture and hay crops. (Capability unit IVe–1; woodland suitability group 3; wildlife suitability group 3)

Davidson gravelly clay loam, 10 to 15 percent slopes, severely eroded (DsD3).—This soil occupies the moderate side slopes of ridges and is adjacent to drainageways and streams. It has a dark-red gravelly clay loam surface layer, 2 to 5 inches thick, and a thick, dark-red clay subsoil. The combined thickness of the surface layer and subsoil is 50 to 60 inches. The plow layer consists largely of material from the subsoil. Shallow gullies and galled spots are common, and there are a few gullies 2 to 5 feet deep.

Included in the mapping were some areas that have slopes as steep as 25 percent.

Tilth is poor, and because of the clay, this soil can be worked only within a narrow range of moisture content. The plow layer bakes and hardens upon drying and is usually cloddy. Infiltration is slow, and surface runoff is rapid in bare areas. The hazard of erosion is very severe if the soil is not protected.

Most of this soil is in pasture or hay crops and forest. The soil is better suited to pasture and hay crops than to cultivated crops because surface runoff is rapid and the hazard of erosion is very severe. (Capability unit IVe–1; woodland suitability group 3; wildlife suitability group 3)

Grover Series

The Grover series consists of well-drained soils that formed in materials weathered chiefly from quartz mica schist and phyllite. These soils are on the tops and sides of medium and narrow ridges. Slopes range from 2 to 15 percent.

In a typical profile the surface layer is brown gravelly fine sandy loam about 5 inches thick. The subsoil extends to a depth of 36 inches. It is strong-brown clay loam in the upper 4 inches and yellowish-red silty clay loam below. Depth to hard rock exceeds 10 feet.

Grover soils are strongly acid and low in organic-matter content and natural fertility. Permeability is moderate, and the available water capacity is medium.

These soils are widely distributed and extensive in the two counties. The largest areas are in the northern and western parts of Haralson County. The native vegetation consisted of mixed oaks, hickory, dogwood, sourwood, poplar, and shortleaf pine. The less sloping soils are mostly cultivated and pastured and are well suited to those uses. The steeper soils are wooded.

Typical profile of Grover gravelly fine sandy loam, 2 to 6 percent slopes, eroded, in a wooded area, 3 miles east of Tallapoosa on U.S. Highway No. 78, then 0.6 mile north of junction on Bagwell Road, Haralson County:

Ap—0 to 5 inches, brown (10YR 5/3) gravelly fine sandy loam; weak, fine, granular structure; very friable; many fine roots; 10 to 20 percent of horizon is fine gravel and schist fragments; a few large pebbles and cobblestones; few fine mica flakes; very strongly acid; abrupt, smooth boundary; horizon 3 to 7 inches thick.

B21t—5 to 9 inches, strong-brown (7.5YR 5/6) clay loam; weak, medium, subangular blocky structure; friable; many fine and medium roots; few fine and large pebbles; few fine mica flakes; few, thin, patchy clay films along pore spaces; very strongly acid; clear, smooth boundary; horizon 3 to 6 inches thick.

B22t—9 to 29 inches, yellowish-red (5YR 4/8) silty clay loam; moderate, medium, subangular blocky structure; friable; few fine roots; few, thin, patchy clay films on ped surfaces; common fine mica flakes that feel slick; strongly acid; gradual, wavy boundary; horizon 10 to 22 inches thick.

B3t—29 to 36 inches, yellowish-red (5YR 4/8) light silty clay loam; weak, medium and coarse, subangular blocky structure; friable; few, thin, patchy clay films on ped surfaces; numerous fine mica flakes that feel slick or greasy; strongly acid; gradual, wavy boundary; horizon 5 to 10 inches thick.

C—36 to 54 inches, reddish-yellow (7.5YR 6/6) highly weathered, micaceous material; strongly acid.

The Ap horizon ranges from brown to grayish brown and light yellowish brown. The B2 horizons range from yellowish red to strong brown in color, and from silty clay loam to clay loam in texture. Thickness of the solum ranges from 21 to 45 inches. The amount of pebbles and cobblestones varies from place to place but makes up 10 to 20 percent of the surface layer.

Grover soils occur with the Hulett, Madison, and Louisa soils. Grover soils contain more fine mica throughout the profile than do the Hulett soils and have a grayer surface layer and a less red subsoil than the Madison soils. The Grover soils have a better developed profile and a thicker solum than the Louisa soils.

Grover gravelly fine sandy loam, 2 to 6 percent slopes, eroded (GlB2).—This soil is on broad ridgetops. Its profile is the one described as typical for the series. Thickness of the surface layer and subsoil combined ranges from 24 to 45 inches. In most places, tillage has mixed some of the upper part of the subsoil with the surface layer.

This soil has a moderately thick root zone. Tilth generally is good, and the soil is easy to work throughout a wide range of moisture content. Surface runoff is medium, and erosion is a moderate hazard in unprotected cultivated areas.

This soil is mostly cultivated or pastured. It is suited to many kinds of locally grown crops and responds well to good management, especially to applications of fertilizer. (Capability unit IIe–2; woodland suitability group 2; wildlife suitability group 1)

Grover gravelly fine sandy loam, 6 to 10 percent slopes, eroded (GlC2).—This soil is on sides of broad ridges and the tops of narrow ridges. It has a brown gravelly fine sandy loam surface layer. The subsoil is yellowish-red silty clay loam. Thickness of the surface layer and subsoil combined ranges from 24 to 40 inches. In most places tillage has mixed clayey material from the subsoil with the surface layer. A few galled spots and a few shallow gullies occur.

The root zone is moderately thick. This soil is easy to work throughout a wide range of moisture content. Surface runoff is medium to rapid, and further erosion is a severe hazard in unprotected cultivated fields.

This soil is mostly cultivated and pastured. It is suited to many kinds of locally grown crops, and it responds well to good management, especially to applications of fertilizer. (Capability unit IIIe–2; woodland suitability group 2; wildlife suitability group 1)

Grover gravelly fine sandy loam, 10 to 15 percent slopes (GlD).—This soil is on the side slopes of ridges and is adjacent to drainageways and streams. It has a gravelly fine sandy loam surface layer, 5 to 6 inches thick, that is dark grayish brown in the upper 1 or 2 inches and is grayish brown below. The subsoil is yellowish-red silty clay loam. Thickness of the surface layer and subsoil combined ranges from 24 to 40 inches.

Included with this soil in mapping is a fairly large acreage that has been cultivated and has had some material from the upper part of the subsoil mixed with the surface layer by tillage. Also included are a few cobbly and stony areas.

This soil has a moderately thick root zone and is easy to work. Surface runoff is rapid, however, and erosion is a very severe hazard in unprotected cultivated areas.

This soil is mostly in forest and pasture. It is better suited to forest and permanent pasture than to cultivated crops, but with careful management cultivated crops may be grown to a limited extent. (Capability unit IVe–1; woodland suitability group 2; wildlife suitability group 2)

Gullied Land

Gullied land (Gul) consists of small, barren areas that have an intricate network of shallow and deep gullies separated by narrow ridges (fig. 6). Only remnants of the original soil remain on the ridges. The dominant texture is clay loam, though in places texture is either coarser or finer. In many places the gullies have cut into weathered rock, but in other places depth to hard rock ranges from 3 to 20 feet. Slopes range from 8 to 20 percent.

The soil material is strongly acid and has low organic-matter content and natural fertility. Infiltration is dominantly very slow, and surface runoff is very rapid.

This land type is not suited to crops or pasture, but plants that help to control erosion can be grown. More technical skill and knowledge is needed to establish such plants than is needed for less eroded areas. (Capability unit VIIe–4; woodland suitability group and wildlife suitability group not assigned)

Hulett Series

The Hulett series consists of well-drained soils on low uplands. These soils formed in materials weathered chiefly from quartz mica schist and mica gneiss. Slopes range from 2 to 15 percent.

In an eroded area, a typical profile has a brown gravelly sandy loam surface layer about 6 inches thick. The subsoil extends to a depth of about 43 inches. It is yellowish-brown sandy clay loam in the upper 3 inches, yellowish-brown clay to a depth of 27 inches, and red clay loam below. The underlying material is red, micaceous, and highly weathered.

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

Figure 6.—Gullied land showing the intricate network of gullies.

Hulett soils are widely distributed and extensive in the two counties. The largest areas of these soils occur between Temple and Draketown and near Bowdon Junction. Most of the acreage has been cleared and planted to crops and improved pasture. The native vegetation consisted of various oaks, hickory, poplar, and shortleaf pine.

Typical profile of Hulett gravelly sandy loam, 2 to 6 percent slopes, eroded, in a pasture, 2.9 miles northeast of Bowdon on State Route 166 and 0.5 mile north of road junction on west side of Burwell Road, Carroll County:

Ap—0 to 6 inches, brown (10YR 4/3) gravelly sandy loam; weak, medium, granular structure; very friable; many fine roots; 15 to 20 percent of horizon is quartz gravel; strongly acid; clear, smooth boundary; horizon 4 to 7 inches thick.

B1t—6 to 9 inches, yellowish-brown (10YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; friable; many fine and medium roots; few pebbles; few, thin, patchy clay films along root channels; strongly acid; gradual, smooth boundary; horizon 2 to 5 inches thick.

B2t—9 to 27 inches, yellowish-brown (10YR 5/8) clay with many, medium and coarse, prominent mottles of red (2.5YR 4/8); moderate, fine and medium, subangular blocky structure; friable to firm; many fine roots between peds; many, distinct, continuous clay films on ped surfaces and along root channels; fine mica flakes common in lower part; mottles become coarser with depth; strongly acid; gradual, smooth boundary; horizon 15 to 23 inches thick.

B3t—27 to 43 inches, red (2.5YR 4/8) clay loam; weak, medium, subangular blocky structure; friable; highly micaceous; few, thin, patchy clay films on ped surfaces and in root channels; few medium roots; strongly acid; diffuse, wavy boundary; horizon 11 to 18 inches thick.

C—43 to 60 inches +, red, highly weathered micaceous material.

In eroded areas the Ap horizon ranges from brown to grayish brown and dark grayish brown. In severely eroded areas the Ap horizon ranges from pale brown to brown, strong brown, yellowish brown, and yellowish red and the texture is sandy clay loam or clay loam. The B2t horizon ranges from yellowish brown to strong brown and yellowish red. Thickness of the solum ranges from 34 to 55 inches.

The Hulett soils occur with Louisburg, Grover, and Madison soils. The subsoil of the Hulett soils is not so red or so micaceous as that of the Madison soils. Hulett soils also contain less mica than the Grover soils. Hulett soils have a thicker solum, a more clayey subsoil, and are deeper to hard rock than the Louisburg soils.

Hulett gravelly sandy loam, 2 to 6 percent slopes (HhB).—This soil is on low, broad ridges. It has a grayish-brown gravelly sandy loam surface layer 7 to 12 inches thick. The subsoil is yellowish-brown sandy clay or clay mottled with red. The surface layer and subsoil combined range from 38 to 55 inches in thickness. In most places the plow layer is in the original surface layer.

Included in mapping are a few areas that have a loamy sand surface layer.

This soil has a thick root zone and is easy to work throughout a wide range of moisture content. Surface runoff is slow to medium, and erosion is a slight to moderate hazard in cultivated fields.

This soil is suited to many kinds of locally grown crops, and most of it is cultivated or pastured. Response to good management practices, especially fertilization, is good. (Capability unit IIe–2; woodland suitability group 2; wildlife suitability group 1)

Hulett gravelly sandy loam, 2 to 6 percent slopes, eroded (HhB2).—This soil is on low, broad ridges. It has the profile described as typical for the series. The surface layer is 4 to 7 inches thick. The surface layer and subsoil combined range from 36 to 52 inches in thickness. In most places tillage has mixed some of the upper part of the subsoil with the surface layer.

Included with this soil in mapping are some areas of a severely eroded soil that has a yellowish-brown sandy clay loam plow layer.

This soil has a thick root zone and is easy to work throughout a wide range of moisture content. Surface runoff is medium, and erosion is a moderate hazard in cultivated fields.

This soil is mostly cultivated and pastured. It is suited to many locally grown crops. It responds well to good management, especially to applications of fertilizer. (Capability unit IIe–2; woodland suitability group 2; wildlife suitability group 1)

Hulett gravelly sandy loam, 6 to 10 percent slopes, eroded (HhC2).—This soil is on the side slopes of low, broad ridges. The surface layer is brown or grayish-brown gravelly sandy loam 4 to 6 inches thick. The subsoil is yellowish-brown or yellowish-red clay mottled with red. The surface layer and subsoil combined range from 36 to 52 inches in thickness. In most places the plow has reached through the original surface layer and has turned up some of the clayey material from the subsoil. A few shallow gullies and severely eroded spots occur.

This soil has a thick root zone and is easy to work throughout a wide range of moisture content. Surface runoff is medium, and further erosion is a moderate to severe hazard in unprotected, cultivated areas.

This soil is suited to many kinds of locally grown crops, and most of it is cultivated or pastured. It responds well to good management practices, especially to applications of fertilizer. (Capability unit IIIe–2; woodland suitability group 2; wildlife suitability group 1)

Hulett gravelly sandy loam, 10 to 15 percent slopes, eroded (HhD2).—This soil is on the side slopes of low, broad ridges and is adjacent to drainageways and streams. It has a brown or grayish-brown gravelly sandy loam surface layer 3 to 6 inches thick. The subsoil is yellowish-brown or yellowish-red clay mottled with red. Thickness of the surface layer and subsoil combined ranges from 35 to 50 inches. In most places tillage has mixed some of the clayey material of the subsoil with the surface layer.

Included with this soil in mapping are a few cobbly spots and shallow gullies. Also included are a few areas of a soil that has a surface layer 15 inches thick.

This soil has a thick root zone and is easy to work throughout a wide range of moisture content. However, it is better suited to hay crops and pasture because further erosion is a severe hazard in cultivated, unprotected areas.

This soil is suited to most kinds of locally grown crops, but it is better suited to pasture and hay than to cultivated crops because of the erosion hazard. (Capability unit IVe–1; woodland suitability group 2; wildlife suitability group 2)

Hulett gravelly sandy clay loam, 6 to 15 percent slopes, severely eroded (HgD3).—This soil is on side slopes and is adjacent to drainageways and streams. The plow layer is yellowish-brown gravelly sandy clay loam. The subsoil is yellowish-brown or yellowish-red clay mottled with red. Thickness of the surface layer and subsoil combined ranges from 34 to 48 inches. The plow layer consists mainly of clayey material from the subsoil. Shallow gullies are common.

The root zone is thick to moderately thick. Tilth is generally poor. The plow layer bakes on drying and hardens into clods. Infiltration is slow, and surface runoff is rapid. The hazard of further erosion is very severe in unprotected areas.

This soil is mostly in forest, hay, and improved pasture. It generally is not suited to cultivated crops because of poor tilth, rapid surface runoff, and severe erosion. (Capability unit VIe–2; woodland suitability group 3; wildlife suitability group 3)

Iredell Series

The Iredell series consists of moderately well drained to somewhat poorly drained soils that formed on low uplands in materials weathered chiefly from dark-colored rocks, such as diorite, gabbro, diabase, hornblende gneiss, and chloritic schist. The slopes range from 2 to 6 percent.

In a typical profile the surface layer is dark grayish-brown gravelly fine sandy loam about 4 inches thick. The subsoil extends to a depth of about 38 inches. It is light olive-brown gravelly sandy clay loam in the upper part, light olive-brown clay in the middle, and mottled dark greenish-gray, brown, and grayish-brown clay in the lower part. The underlying material is soft, weathered basic rock. Depth to hard rock ranges from 2 to 5 feet.

These soils are low in organic-matter content and medium in natural fertility. They are medium acid to strongly acid in the upper 22 to 36 inches but are mildly alkaline below this depth. Permeability is slow, and available water capacity is moderately high. The subsoil has a high shrink-swell potential and cracks during dry periods.

Most of the acreage has been cleared and planted to crops but now is largely in pasture. The larger trees in the native vegetation were blackjack oak, post oak, hickory, dogwood, and a few shortleaf pine. A few areas are planted to loblolly pine.

Typical profile of Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded, in a wooded area, 3 miles northwest of Carrollton on U.S. Highway No. 27, then south 0.5 mile from junction of U.S. Highway No. 27 and Old Bremen Road, and 500 yards west of Old Bremen Road, Carroll County:

A—0 to 4 inches, dark grayish-brown (10YR 4/2) gravelly fine sandy loam; weak, medium, granular structure; slightly sticky; 10 to 20 percent quartz gravel and concretions of iron and manganese; many fine roots; a few cobblestones; strongly acid; clear, smooth boundary; horizon 3 to 6 inches thick.

Blt—4 to 12 inches, light olive-brown (2.5Y 5/4) gravelly sandy clay loam; weak, medium, granular structure; non-

sticky; 40 to 50 percent of material is concretions of iron and manganese; many fine roots; strongly acid; clear, smooth boundary; horizon 3 to 8 inches thick.

B2tg—12 to 22 inches, light olive-brown (2.5Y 5/4) clay that has common, medium, faint mottles of grayish brown (2.5Y 5/2); massive when wet, strong prismatic structure when dry; very sticky and very plastic; few fine roots; small concretions of iron and manganese common; pressure faces common; medium acid; gradual, smooth boundary; horizon 15 to 25 inches thick.

B3tg—22 to 38 inches, mottled dark greenish-gray (5BG 4/1), brown (7.5YR 4/4), and grayish-brown (2.5Y 5/2) clay; massive when wet, weak prismatic structure when dry; sticky and plastic; mildly alkaline; gradual, smooth boundary; horizon 12 to 18 inches thick.

C—38 to 48 inches +, mottled dark greenish-gray (5BG 4/1), brown (10YR 5/3), and grayish-brown (2.5Y 5/2), soft, weathered basic rock having silt loam texture; mildly alkaline.

The A horizon is dominantly dark grayish brown but ranges from grayish brown to brown. The matrix color of the B2tg horizon ranges from light olive brown to yellowish brown, and the mottles from grayish brown to brown. Thickness of the solum ranges from 33 to 45 inches.

Iredell soils occur with Davidson, Musella, and Wilkes soils but have a finer textured, stickier subsoil than those soils.

Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded (IcB2).—This soil is on low interstream divides. It has the profile described as typical for the series. In many places tillage has mixed some of the clayey subsoil with the original surface layer.

Included with this soil in mapping, in an area of about 200 acres, is a soil that has slopes of as much as 8 percent.

The root zone is moderately thick. This soil has fair tilth, but the slowly permeable subsoil limits cultivation to drier periods and often delays plantings and reduces growth of crops. The subsoil cracks when dry. Surface runoff is medium, and the hazard of further erosion is moderate in unprotected, cultivated areas.

This soil is suited to most kinds of locally grown crops, but it is better suited to pasture and hay crops than to cultivated crops. Most of the soil is in pasture and forest. (Capability unit IIe–4; woodland suitability group 4; wildlife suitability group 6)

Louisa Series

The Louisa series consists of somewhat excessively drained, highly micaceous soils on the tops and sides of narrow, broken ridges. These soils formed in material weathered chiefly from mica schist, graphitic schist, phyllite, and mica gneiss. Slopes range from 6 to 40 percent.

In a typical profile, a layer, 2 inches thick, consisting of hardwood leaves and twigs that are decomposed in the lower part, overlies the mineral surface layer. The mineral surface layer is very dark grayish-brown and dark yellowish-brown fine sandy loam about 5 inches thick. The subsoil is brown or dark-brown heavy sandy loam that extends to a depth of about 12 inches. The underlying material is soft weathered quartz mica schist that overlies gray mica schist at a depth of 34 inches. Depth to this less weathered and somewhat harder rock continues downward for as much as 10 feet.

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

Louisa soils are widely distributed in the two counties. Two of the larger areas are on Blackjack and Tally Mountains. Most of the acreage is in forest, but a few areas have been cultivated. Native vegetation consists of various oak, hickory, dogwood, sourwood, and shortleaf pine.

Typical profile of Louisa gravelly fine sandy loam, 15 to 40 percent slopes, in a wooded area, 6 miles north of Carrollton on west side of Will Spence-Center Point Road, 3 miles south of Center Point and 0.5 mile south of bridge over Sharpe Creek, Carroll County:

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

O2—1 inch to 0, partly decomposed hardwood leaves and twigs.

A11—0 to 1 inch, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; very friable; many fine roots; many fine mica flakes; a few fragments of quartz mica schist; strongly acid; abrupt, smooth boundary; horizon 1 to 2 inches thick.

A12—1 to 5 inches, dark yellowish-brown (10YR 4/4) fine sandy loam; weak, fine, granular structure; very friable; many fine roots; many fine mica flakes; 20 to 30 percent is fragments of quartz mica schist; strongly acid; clear, smooth boundary; horizon 3 to 6 inches thick.

B—5 to 12 inches, brown or dark-brown (7.5YR 4/4) heavy sandy loam; weak, medium, granular and subangular blocky structure; very friable; few fine and medium roots; many fine mica flakes; 20 to 30 percent is fragments of quartz mica schist; strongly acid; clear, wavy boundary; horizon 6 to 12 inches thick.

C—12 to 34 inches, soft weathered quartz mica schist; thin tilted plates of broken schist extend from the R horizon into this layer; strongly acid; horizon 8 to 50 inches thick.

R—34 to 60 inches +, weathered and broken gray mica schist that has varying degrees of hardness.

The A1 horizon ranges from very dark grayish brown to dark grayish brown and dark yellowish brown. In cultivated fields the A horizon ranges from brown or dark brown to grayish brown and yellowish brown. The B horizon ranges from brown, dark brown, grayish brown, yellowish brown, and red to yellowish red. The brown or dark-brown sandy loam B horizon is dominant but is discontinuous horizontally. Discontinuous but extending in about 20 to 30 percent of the acreage is a red or yellowish-red clay loam B horizon.

The tilted, thin layers of broken schist that extend from the R horizon into the C occur at random within most pedons.

Louisa soils occur with Madison, Tallapoosa, and Grover soils, but they have a thinner solum, have less distinct horizons, and contain more mica than those soils.

Louisa gravelly fine sandy loam, 6 to 10 percent slopes (lkC).—This soil is on the tops of narrow, broken ridges. The surface layer is brown gravelly fine sandy loam 4 to 6 inches thick. It overlies 6 to 12 inches of brown or dark-brown heavy sandy loam that is not continuous. Alternating with it, in short horizontal distances, is a thin layer of red or yellowish-red clay loam. Because soft mica schist is at a depth of 12 to 20 inches, this soil has a shallow, discontinuous, droughty root zone.

This soil is easy to work throughout a wide range of moisture content. Surface runoff is medium to rapid, and erosion is a severe hazard if the soil is cultivated and not protected.

The soil is poorly suited to most kinds of locally grown crops. It is better suited to permanent pasture, hay, and trees. Most of it is in pasture and forest. (Capability unit IVe–4; woodland suitability group 5; wildlife suitability group 4)

Louisa gravelly fine sandy loam, 10 to 15 percent slopes (lkD).—This soil is on the tops and side slopes of narrow, broken ridges. The surface layer of gravelly fine sandy loam is 4 to 8 inches thick. The upper 1 or 2 inches is dark grayish brown and contains moderate amounts of

organic matter. The lower part is dark yellowish brown. The subsoil is brown or dark-brown sandy loam that is not continuous. Alternating with it, in short horizontal distances, is a thin layer of red or yellowish-red clay loam. Soft mica schist is at a depth of 12 to 20 inches (fig. 7).

The root zone is shallow and droughty. Surface runoff is rapid, and erosion is a severe hazard if the soil is cleared and cultivated.

Most of this soil remains in forest. Cleared areas should be planted to pasture or hay because of the hazard of erosion. (Capability unit VIe–3; woodland suitability group 5; wildlife suitability group 4)

Louisa gravelly fine sandy loam, 15 to 40 percent slopes (lkE).—This soil occupies the steeper slopes of narrow, broken ridges and is adjacent to drainageways and streams. Its profile is the one described as typical for the series. The surface layer ranges from 4 to 8 inches in thickness. Soft mica schist is at a depth of 12 to 20 inches.

Included with this soil in mapping are many, small, scattered, stony areas. In a few areas slopes are steeper than 40 percent.

The root zone is thin and droughty. Surface runoff is rapid, and erosion is a very severe hazard in cultivated areas.

This soil remains in forest because slopes are steep. The soil is shallow, the root zone is droughty, and erosion is a very severe hazard. (Capability unit VIIe–2; woodland suitability group 5: wildlife suitability group 4)

Figure 7.—**Profile of Louisa gravelly fine sandy loam, 10 to 15 percent slopes on a 9-foot roadbank. Micaceous rock can be seen near the surface.**

Louisburg Series

The Louisburg series consists of somewhat excessively drained soils that formed on uplands in materials weathered from light-colored granite, gneiss, and quartzite. Slopes range from 6 to about 25 percent.

In a typical profile several inches of organic material composed of fresh hardwood litter and pine straw overlie the surface layer. The surface layer is very dark grayish-brown to dark-brown stony loamy sand about 7 inches thick. The subsoil is yellowish-brown coarse sandy loam that extends to a depth of 28 inches. The underlying material is highly weathered coarse-grained rock overlying hard granitic rock. Depth to this hard rock ranges from 2 to 5 feet.

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

The acreage of these soils is small and is mostly in the vicinity of Whitesburg, in Carroll County. These soils remain mostly in woodland. The native vegetation consists of mixed oaks, hickory, sourwood, poplar, dogwood, and pine.

Typical profile of Louisburg stony loamy sand, 15 to 25 percent slopes, in a wooded area, 3 miles southwest of Whitesburg, 0.5 mile south of State Route 5 on McIntosh Road in county rock quarry, Carroll County:

O1—2 inches to 0, fresh hardwood litter and pine straw.

A11—0 to 4 inches, very dark grayish-brown (10YR 3/2) stony loamy sand; weak, medium, granular structure; very friable; many fine roots; common fine gravel; moderate amounts of organic matter; strongly acid; clear, smooth boundary; horizon 2 to 5 inches thick.

A12—4 to 7 inches, dark-brown (10YR 4/3) stony loamy sand; weak, medium, granular structure; very friable; many fine roots; common fine gravel; strongly acid; clear, smooth boundary; horizon 2 to 4 inches thick.

B—7 to 28 inches, yellowish-brown (10YR 5/4) coarse sandy loam; weak, medium, granular structure; very friable; many fine roots; about 25 percent fine gravel; strongly acid; gradual, wavy boundary; horizon 12 to 24 inches thick.

C—28 to 42 inches, brownish-yellow (10YR 6/6), highly weathered, coarse-grained rock; very strongly acid; abrupt, irregular boundary; horizon 6 to 20 inches thick.

R—42 inches +, hard granitic rock.

The A horizon ranges from very dark grayish brown and dark grayish brown in wooded areas to grayish brown, pale brown, and brown in disturbed areas. In places there is a thin, discontinuous, yellowish-brown or yellowish-red sandy clay loam Bt horizon. In a few places the solum is on bedrock.

Louisburg soils occur with Hulett soils. Louisburg soils do not have the thick, clayey subsoil that is common in the Hulett soils, and they are shallower than the Hulett soils.

Louisburg stony loamy sand, 6 to 15 percent slopes (LDD).—This soil is on the tops and the moderate sides slopes of narrow, broken ridges. The surface layer is stony loamy sand 5 to 9 inches thick. In wooded areas the upper 3 or 4 inches is very dark grayish brown and contains moderate amounts of organic matter. The rest of the surface layer is dark brown. In cultivated areas the plow layer is brown or grayish brown. The subsoil is yellowish-brown coarse sandy loam that is not continuous. Alternating with it in short horizontal distances, is a thin layer of yellowish-brown or yellowish-red sandy clay loam. A highly weathered mineral layer is at a depth of 18 to 30 inches.

The root zone is thin and droughty. Large boulders and rock outcrops are common. Surface runoff is medium to rapid, and erosion is a severe hazard if the soil is cultivated.

Most of this soil remains as woodland, but it is suited to pasture and hay. Numerous stones on or near the surface make the tillage of cultivated crops impracticable in most of the acreage. (Capability unit VIe–3; woodland suitability group 5; wildlife suitability group 4)

Louisburg stony loamy sand, 15 to 25 percent slopes (LDE).—This soil is on the strong side slopes of narrow, broken ridges and is adjacent to drainageways and streams. The profile is the one that is described as typical for the series. The surface layer is 5 to 9 inches thick. In places the subsoil is yellowish-brown or yellowish-red sandy clay loam. Highly weathered rock is at a depth of 18 to 30 inches.

Included with this soil in mapping are a few acres of rock outcrop and areas of a Louisburg soil on steep slopes that range to about 35 percent.

The root zone is thin and droughty. Surface runoff is medium to rapid, and erosion is a severe hazard if the soil is cultivated.

This soil remains as woodland because of its shallow, droughty root zone, stoniness, and slopes. The large boulders and stones that are common on the surface make the use of most farm machinery impractical. (Capability unit VII–2; woodland suitability group 5; wildlife suitability group 4)

Madison Series

The Madison series consists of well-drained soils that developed in material weathered chiefly from rocks, such as mica schist and mica gneiss. These soils occur on broad, smooth interstream ridges and on slopes adjacent to drainageways. Slopes range from 2 to 25 percent.

In a typical profile the surface layer is brown gravelly fine sandy loam about 5 inches thick (fig. 8). The subsoil is red clay to a depth of 22 inches and is red clay loam below that depth. A few, tilted, thin layers of weathered and broken schist project upward from the rocks below into lower parts of the subsoil. The underlying material occurs at a depth of about 32 inches and consists of highly weathered soil material that is gray, brown, and purple. Depth to hard rock exceeds 10 feet.

These soils are low in organic-matter content and natural fertility and are very strongly acid. Permeability is moderate, and available water capacity is medium.

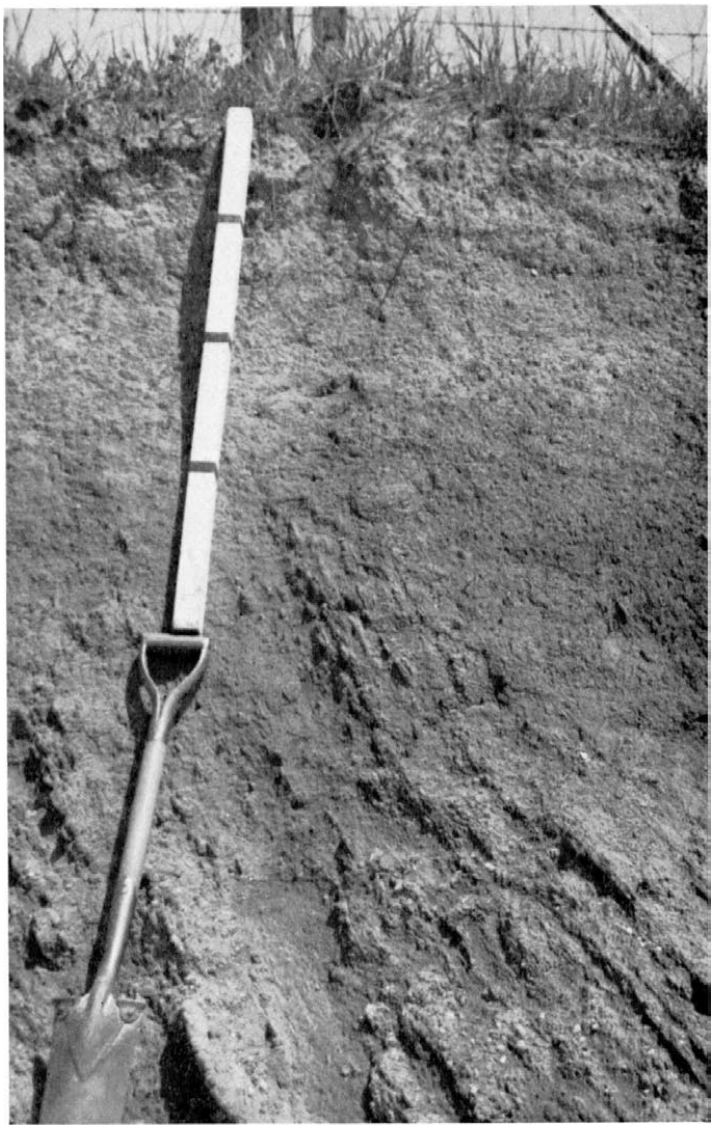

Figure 8.—**Profile of Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded.**

The Madison are the most extensive soils in the two counties. Most of their acreage has been cleared of its native vegetation. Major tree species were oak, hickory, dogwood, sourwood, sweetgum, yellow-poplar, shortleaf pine, and loblolly pine. Where not severely eroded, the less sloping soils are well suited to most locally grown crops, and much of this acreage is used for crops and pasture. Loblolly pine and sweetgum grow on formerly cultivated fields.

Typical profile of Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded, in a wooded area, approximately 4 miles southeast of Carrollton and 0.8 mile northeast of Whooping Creek Church, along Rock Ridge-Clem Road, Carroll County:

Ap—0 to 5 inches, brown (7.5YR 4/4) gravelly fine sandy loam; weak, medium, granular structure; very friable; many fine roots; 15 to 20 percent quartz gravel, schist fragments, and garnet concretions; fine mica flakes common; few cobblestones; very strongly acid; clear, smooth boundary; horizon 4 to 8 inches thick.

B2t—5 to 22 inches, red (2.5YR 4/8) clay; moderate, medium, subangular blocky structure; friable; common fine roots and few medium roots; few quartz pebbles and schist fragments; few, thin, patchy clay films on ped surfaces; many fine and medium mica flakes that give the soil a slick or greasy feel; very strongly acid; diffuse, wavy boundary; horizon 12 to 25 inches thick.

B3—22 to 32 inches, red (2.5YR 4/8) light clay loam; weak, medium, subangular blocky structure; friable to very friable; fragments of quartz mica schist common; few quartz pebbles; few medium roots; numerous fine and medium mica flakes that give soil a slick or greasy feel; few, tilted, thin plates of weathered and broken schist project upward into this horizon from C horizon; very strongly acid; gradual, wavy boundary; horizon 8 to 12 inches thick.

C—32 to 42 inches +, soft, highly weathered micaceous soil material that is gray, brown, and purple; very strongly acid.

The Ap horizon ranges from brown in moderately eroded areas to red or yellowish red in severely eroded areas. It is gravelly clay loam in severely eroded areas. Uncleared areas have a thin, very dark grayish-brown A1 horizon. In some places there is a sandy clay loam B1 horizon 3 to 5 inches thick.

The Madison soils occur with Hulett, Grover, Tallapoosa, and Louisa soils. They have a redder subsoil than Hulett and Grover soils and a thicker solum than Tallapoosa and Louisa soils.

Madison gravelly fine sandy loam, 2 to 6 percent slopes, eroded (MhB2).—This soil is on broad ridgetops. It has a brown gravelly fine sandy loam surface layer 4 to 6 inches thick. The subsoil is friable, red clay. Soft, highly weathered mica schist is at a depth of 30 to 45 inches. In most places tillage has mixed some of the upper part of the subsoil with the surface layer.

The root zone is moderately thick. This soil is easy to work throughout a wide range of moisture content. Surface runoff is medium, however, and erosion is a moderate hazard in cultivated, unprotected areas.

This soil is suited to many kinds of locally grown crops, and most of it is cultivated or pastured. It responds well to good management, especially to applications of fertilizer. (Capability unit IIe–1; woodland suitability group 2; wildlife suitability group 1)

Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded (MhC2).—This soil is on the side slopes of broad ridges and the tops of narrow ridges. It has the profile described as typical for the Madison series. The surface layer is 3 to 5 inches thick. Soft mica schist is at a depth of 24 to 40 inches. In most places tillage has mixed some of the upper part of the subsoil with the surface layer.

Included with this soil in mapping were small areas of an uneroded soil in which the upper 1 to 3 inches of the surface layer is very dark grayish brown. Also included were a few severely eroded areas that have shallow gullies and a few gullies 2 or 3 feet deep.

This soil has a moderately thick root zone and is easy to work throughout a wide range of moisture content. Surface runoff is medium to rapid, however, and erosion is a severe hazard in cultivated, unprotected areas.

This soil is suited to many kinds of locally grown crops, and most of it is cultivated or pastured. It responds well to good management, especially to applications of fertilizer. (Capability unit IIIe–1; woodland suitability group 2; wildlife suitability group 1)

Madison gravelly fine sandy loam, 10 to 15 percent slopes, eroded (MhD2).—This soil is on the moderate side slopes of ridges and is adjacent to drainageways and streams. It has a brown gravelly fine sandy loam surface layer 3 to 5 inches thick. The subsoil is friable, red clay. Soft mica schist is at a depth of 24 to 36 inches. In most places tillage has mixed some of the upper part of the subsoil with the surface layer.

Included with this soil in mapping were small areas of an uneroded soil that is very dark grayish brown in the upper 1 to 3 inches of the surface layer. Also included were a few severely eroded areas that have shallow gullies and a few gullies 2 or 3 feet deep.

This soil has a moderately thick root zone. It is easy to work throughout a wide range of moisture content. Surface runoff is rapid, however, and erosion is a severe hazard if protective cover is not maintained.

This soil is suited to many kinds of locally grown crops, but it is better suited to pasture and hay than to row crops. Most of the acreage is in pasture, hay, and trees. With careful management, however, cultivated crops can be grown in some places. (Capability unit IVe–1; woodland suitability group 2; wildlife suitability group 2)

Madison gravelly fine sandy loam, 15 to 25 percent slopes (MhE).—This soil is on the slopes of narrow ridges adjacent to drainageways and streams. The surface layer is brown gravelly fine sandy loam 4 to 6 inches thick. The subsoil is friable, red clay. Soft mica schist is in the lower part of the subsoil at a depth of 24 to 36 inches.

Included with this soil in mapping were some areas of an uneroded soil that is very dark grayish brown in the upper 1 to 3 inches of the surface layer. Also included were a few severely eroded areas that have shallow gullies and a few deep ones.

This soil has a moderately thick root zone. It is easy to work throughout a wide range of moisture content. Surface runoff is rapid, however, and erosion is a very severe hazard in cultivated areas or where the vegetative cover is poor.

This soil is in pasture, hay, and trees, and it is mainly limited to those uses because of the erosion hazard. (Capability unit VIe–2; woodland suitability group 2; wildlife suitability group 2)

Madison gravelly clay loam, 2 to 6 percent slopes, severely eroded (MDB3).—This soil is on broad ridgetops. The surface layer is red gravelly clay loam 3 to 5 inches thick. The subsoil is friable, red clay. Soft mica schist is at a depth of 24 to 40 inches. The plow layer consists mainly of clayey material from the subsoil. A few shallow gullies occur.

This soil has a moderately thick root zone. Tilth is generally poor. The plow layer bakes on drying and hardens into clods. Infiltration is slow, surface runoff is medium to rapid, and erosion is a severe hazard in cultivated, unprotected areas.

This soil is mostly cultivated or pastured. It is not well suited to most locally grown crops, but it responds to good management, especially to applications of fertilizer. (Capability unit IIIe–1; woodland suitability group 3; wildlife suitability group 3)

Madison gravelly clay loam, 6 to 10 percent slopes, severely eroded (MDC3).—This soil is on gentle side slopes of broad ridges. It has a red gravelly clay loam surface layer 2 to 5 inches thick. The subsoil is friable, red clay.

Soft mica schist is at a depth of 24 to 36 inches. The plow layer consists mainly of clayey material from the subsoil. Shallow gullies are common, and gullies 2 or 3 feet deep are few.

This soil has a moderately thick root zone. Tilth is generally poor because the plow layer bakes on drying and hardens into clods. Infiltration is slow, surface runoff is rapid, and erosion is a severe hazard if a good protective cover is not maintained.

Most of this soil is in pasture and hay. It is moderately well suited to many locally grown crops, but it is better suited to pasture and hay crops than to cultivated crops. With careful management, however, cultivated crops can be grown from time to time. (Capability unit IVe-1; woodland suitability group 3; wildlife suitability group 3)

Madison gravelly clay loam, 10 to 15 percent slopes, severely eroded (MDD3).—This soil is on slopes adjacent to drainageways and streams. The surface layer is red gravelly clay loam 2 to 3 inches thick. The subsoil is friable, red clay. Soft mica schist occurs in places at a depth of 24 to 36 inches. The plow layer consists mainly of clayey material from the subsoil. Shallow gullies are common, and deep gullies are few.

This soil has a moderately thick root zone. Tilth is generally poor because the plow layer bakes on drying and hardens into clods. Infiltration is slow, surface runoff is rapid, and erosion is a very severe hazard where this soil is not protected by a good vegetative cover.

This soil is mostly in pasture, hay, or trees, and it is mainly suited to those uses because the erosion hazard is very severe. (Capability unit VIe–2; woodland suitability group 3; wildlife suitability group 3)

Masada Series

The Masada series consists of well-drained soils that formed in old alluvium chiefly on high stream terraces. Slopes range from 2 to 10 percent.

In a typical profile the surface layer is dark-brown gravelly sandy loam about 7 inches thick. The subsoil extends to a depth of 54 inches. It is yellowish-brown to strong-brown sandy clay loam in the upper part and strong-brown clay loam to silty clay loam in the lower part. Mottles of yellowish red and red occur in the lower part of the subsoil. The underlying material is mottled red, strong-brown, and gray sandy clay loam. Depth to hard rock ranges from 8 to 20 feet.

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

The Masada soils are widely distributed along the larger streams in the two counties. Their total acreage is small. Most of it has been cleared and is in crops and pasture. The native vegetation consisted of mixed oaks, hickory, poplar, gum, and pine.

Typical profile of Masada gravelly sandy loam, 2 to 6 percent slopes, in a cultivated field, approximately 4.5 miles northeast of Buchanan, 10.8 miles north of Five Points on Five Points-Mountain View Church Road, and 300 yards north of the Tallapoosa River, Haralson County:

Ap—0 to 7 inches, dark-brown (10YR 4/3) gravelly sandy loam; weak, fine, granular structure; very friable; 20 to 35 percent gravel; many fine roots; strongly acid; clear, smooth boundary; horizon 5 to 8 inches thick.

B1t—7 to 13 inches, yellowish-brown (10YR 5/4) light sandy clay loam; weak, medium, subangular blocky structure; very friable; many fine roots; a few pebbles; bridging of sand grains; strongly acid; clear, smooth boundary; horizon 4 to 6 inches thick.

B21t—13 to 20 inches, strong-brown (7.5YR 5/6) fine sandy clay loam; moderate, medium, subangular blocky structure; friable; few patchy clay films along root channels and pore spaces; a few pebbles; strongly acid; gradual, smooth boundary; horizon 5 to 20 inches thick.

B22t—20 to 30 inches, strong-brown (7.5YR 5/6) clay loam with common, medium, distinct mottles of yellowish red (5YR 4/8); moderate, medium, subangular blocky structure; friable; few patchy clay films along root channels and ped surfaces; a few pebbles; strongly acid; diffuse, wavy boundary; horizon 8 to 20 inches thick.

B23t—30 to 54 inches, strong-brown (7.5YR 5/6) silty clay loam with many, medium, distinct mottles of red (2.5Y 4/8); moderate, medium, subangular blocky structure; friable; few, thin, patchy clay films on ped surfaces; a few pebbles; strongly acid; diffuse, wavy boundary; horizon 12 to 36 inches thick.

IIC—54 to 72 inches +, mottled red, strong-brown, and gray sandy clay loam that contains pockets of rounded quartz gravel.

The Ap horizon ranges from grayish brown, brown, and dark brown to yellowish brown. The matrix color of the B horizon ranges from strong brown to yellowish red and yellowish brown. In some areas red and light-olive mottles are present at a depth of about 34 inches. In most places beds of gravel underlie the solum at a depth ranging from 4.5 to 8 feet.

Masada soils occur with Augusta soils but occupy higher stream terraces and are better drained.

Masada fine sandy loam, 2 to 6 percent slopes (MoB).—This soil is widely distributed along the larger streams, but the more extensive areas are along the Tallapoosa River in Haralson County. The surface layer is grayish-brown fine sandy loam. The subsoil is yellowish-brown clay loam that is mottled in the lower part with yellowish brown, light olive brown, and yellowish red.

Included with this soil in mapping are small, nearly level soils that are in low-lying areas and are sometimes flooded briefly in winter and spring. Also included are small areas of a soil in which the surface layer and subsoil combined are 36 to 48 inches thick.

This Masada soil is friable and has good tilth. Surface runoff is medium to slow, and erosion is only a slight hazard in cultivated areas.

This soil is mostly cultivated or pastured. It is suited to many locally grown crops and responds well to good management. (Capability unit IIe–1; woodland suitability group 2; wildlife suitability group 1)

Masada gravelly sandy loam, 2 to 6 percent slopes (MpB).—This soil is on tops of stream terraces. Its profile is the one described as typical for the Masada series (fig. 9).

Included with this soil in mapping are a few areas in which the surface layer and subsoil combined are only 36 inches thick.

This soil has a thick root zone, is friable, and has good tilth. Surface runoff is medium to slow, and erosion is a slight to moderate hazard.

This soil is suited to many kinds of locally grown crops, and it responds well to good management, especially to applications of fertilizers. Most of this soil is cultivated or

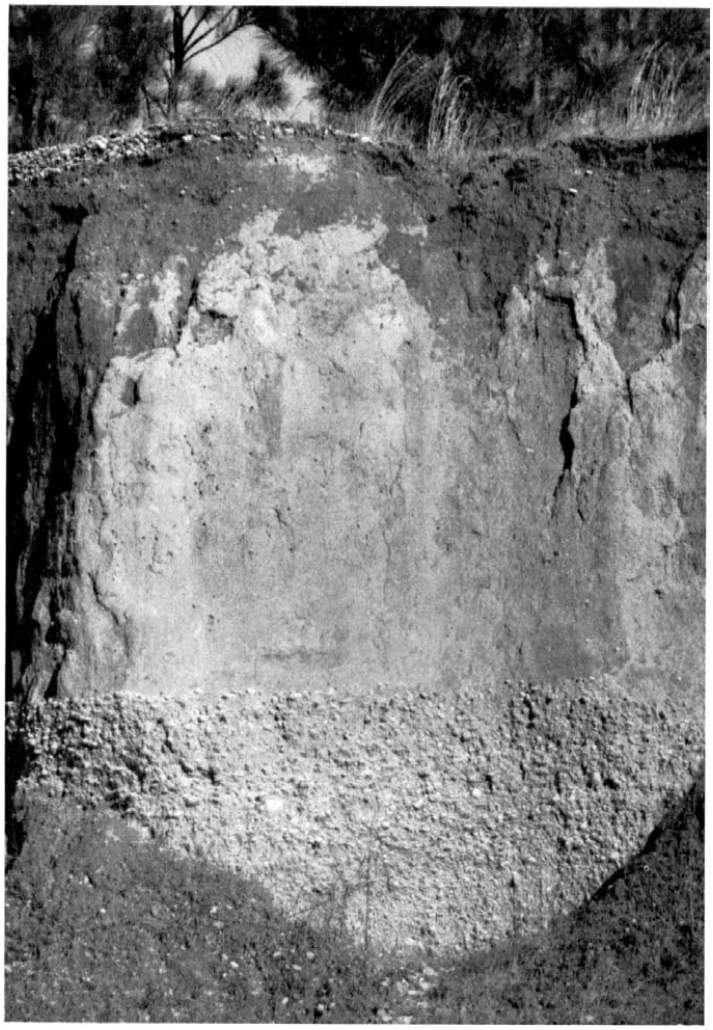

Figure 9.—**Profile of Masada gravelly sandy loam, 2 to 6 percent slopes, in a 12-foot gravel pit. Gravel layers can be seen at a depth of about 8 feet.**

pastured. Because of the location of nearby streams, water for sprinkler irrigation is available. (Capability unit IIe–1; woodland suitability group 2; wildlife suitability group 1)

Masada gravelly sandy loam, 6 to 10 percent slopes, eroded (MpC2).—This soil is on the slopes of stream terraces. It has a brown or dark-brown gravelly sandy loam surface layer and a strong-brown clay loam subsoil that is mottled with yellowish red. The surface layer and subsoil combined range from 48 to 60 inches in thickness. In many places tillage has mixed some of the clayey material from the upper part of the subsoil with the plow layer.

Included with this soil in mapping are areas of a soil in which the surface layer and subsoil combined are only 30 inches thick.

This Masada soil has a thick root zone. It is easy to work throughout a wide range of moisture content. Surface runoff is medium to rapid, and erosion is a severe hazard in cultivated and unprotected areas.

This soil is suited to many kinds of locally grown crops. Most of the acreage is in cropland and pasture. The soil responds well to good management, especially to applications of fertilizer. Water for sprinkler irrigation can be obtained from nearby streams. (Capability unit IIIe–1; woodland suitability group 2; wildlife suitability group 1)

Musella Series

The Musella series consists of well-drained, shallow soils that occur on uplands. These soils developed in materials weathered chiefly from hornblende gneiss, diorite, and gabbro. Slopes range from 6 to 25 percent.

In a typical profile the surface layer is dark reddish-brown gravelly clay loam about 5 inches thick. The subsoil is dark-red gravelly clay loam that is 20 to 30 percent rock fragments. Depth to hard rock ranges from 1 foot to 5 feet.

These soils are low in organic-matter content and natural fertility and are medium acid. Permeability is moderate, and available water capacity is medium to low.

The Musella soils are scattered throughout Carroll and Haralson Counties. The larger areas are in the eastern parts. Much of the acreage has been cleared and cultivated in past years, but it is reverting to loblolly pine, sweetgum, and sassafras. A few areas are cultivated and pastured. The native vegetation consists of oaks, hickory, poplar, and pine.

Typical profile of Musella gravelly clay loam, 6 to 15 percent slopes, eroded, in a wooded area approximately 3.4 miles southwest of Carrollton, 100 yards south of junction of Hays Mills and Oak Grove Roads, in Carroll County:

Ap—0 to 5 inches, dark reddish-brown (2.5YR 3/4) gravelly clay loam; weak, medium, granular and subangular blocky structure; friable; many fine roots; 15 to 20 percent fragments of rock and quartz gravel; a few cobblestones and stones; medium acid; clear, smooth boundary; horizon 3 to 6 inches thick.

Bt—5 to 18 inches, dark-red (2.5YR 3/6) gravelly clay loam that is 20 to 30 percent rock fragments; moderate, fine and medium, subangular blocky structure; friable; many fine roots; few, thin, patchy clay films on ped surfaces and rock fragments; medium acid; abrupt, irregular boundary; horizon 9 to 24 inches thick.

R—18 inches +, fractured bedrock consisting of diorite, hornblende gneiss, and gabbro; few, thin, patchy clay films and fine roots along rock fractures.

The Ap horizon ranges from dark reddish brown and reddish brown to dark brown. In places a thin C horizon overlies fractured rock and is interspersed between the rocks. The solum ranges from 12 to 24 inches in thickness.

Musella soils occur with Davidson, Iredell, and Wilkes soils. The solum is thinner in Musella soils than in Davidson soils, and bedrock is nearer the surface. Musella soils have a thicker, redder, and finer textured subsoil than Wilkes soils but lack the massive, sticky clay subsoil characteristic of Iredell soils.

Musella gravelly clay loam, 6 to 15 percent slopes, eroded (MuD2).—This soil is on the tops and sides of narrow ridges. Its profile is the one described as typical for the series. The surface layer ranges from 3 to 6 inches in thickness.

Included with this soil in mapping is a soil in which the surface layer and subsoil combined are 24 to 40 inches thick. Ordinary tillage has mixed some of the clayey material of the upper part of the subsoil with the original surface layer.

This Musella soil has a thin root zone in most areas. The soil can be cultivated only within a narrow range of moisture content. Surface runoff is rapid, and erosion is a severe hazard if the soil is cultivated and not protected.

This soil is mostly in pasture, hay, and forest. (Capability unit VIe–4; woodland suitability group 3; wildlife suitability group 4)

Musella stony clay loam, 15 to 25 percent slopes, eroded (MwE2).—This soil is on side slopes of narrow ridges and is adjacent to drainageways and streams. The surface layer is dark reddish-brown stony clay loam 3 to 5 inches thick. The subsoil is dark-red clay loam that is 20 to 30 percent rock fragments. The surface layer and subsoil combined range from 12 to 24 inches in thickness. In most places 20 to 30 percent of the surface is covered with stones and cobblestones. A few boulders and rock outcrops occur.

Included with this soil in mapping is a soil on slopes as steep as 35 percent.

The root zone is thin. Surface runoff is very rapid, and erosion is a very severe hazard in cultivated areas.

Most of this soil remains in the native vegetation because of the shallow root zone, stoniness, and strong slope. A few areas are pastured. (Capability unit VIIe–2; woodland suitability group 3; wildlife suitability group 4)

Tallapoosa Series

The Tallapoosa series consists of shallow, well-drained soils that developed in materials weathered chiefly from quartz mica schist and phyllite. These soils occur on narrow, broken ridgetops and hillsides that are highly dissected by drainageways and streams. Slopes range from 6 to 25 percent.

In a typical profile the surface layer is brown gravelly fine sandy loam about 4 inches thick. The subsoil is yellowish-red clay loam that extends to a depth of about 12 inches. It is underlain by an intermediate layer of light clay loam. Tilted thin layers of weathered, broken schist and phyllite extend into the lower part of the subsoil. Depth to hard rock exceeds 10 feet.

These soils are low in organic-matter content and natural fertility and are very strongly acid. Permeability is moderate, and the available water capacity is medium to low.

Tallapoosa soils are extensive in the two counties. The larger areas occur in the northern and western parts of Haralson County and in the northwestern part of Carroll County. Much of this soil remains in native vegetation, which consists of mixed oaks, hickory, dogwood, sourwood, and a few pines. The less sloping soils that are not severely eroded are suited to most locally grown crops.

Typical profile of Tallapoosa gravelly fine sandy loam, 15 to 25 percent slopes, eroded, in a wooded area, 5 miles northwest of Tallapoosa and 200 yards west of Steadman Church, Haralson County:

Ap—0 to 4 inches, brown (7.5YR 5/4) gravelly fine sandy loam; weak, medium, granular structure; very friable; 10 to 20 percent quartz gravel and schist fragments; fine mica flakes common; many fine roots; a few cobblestones; very strongly acid; clear, smooth boundary; horizon 3 to 6 inches thick.

B2t—4 to 12 inches, yellowish-red (5YR 5/6) clay loam; weak to moderate, medium, subangular blocky structure; friable; a few pebbles of quartz and fragments of schist; many fine mica flakes that feel slick and greasy and have a silky sheen; thin discontinuous clay films on ped surfaces; many fine roots and few medium roots; very strongly acid; gradual, wavy boundary; horizon 0 to 10 inches thick.

B&C—12 to 17 inches, yellowish-red (5YR 5/6) light clay loam that is between tilted thin layers of weathered, broken schist and phyllite; about 30 to 35 percent of horizon is rock; clay coatings on some schist fragments; many fine mica flakes that feel slick or greasy and have a silky sheen; few roots; very strongly acid; gradual, irregular boundary; horizon 0 to 18 inches thick.

R—17 to 52 inches +, brownish-yellow (10YR 6/6), soft, weathered, micaceous rock having loamy texture lies between tilted thin layers of weathered, broken schist and phyllite; many fine mica flakes; few roots; very strongly acid.

The Ap horizon ranges from brown in moderately eroded areas to yellowish red in severely eroded areas. Texture of the Ap horizon in severely eroded areas is gravelly clay loam. In areas remaining in native vegetation, the A1 horizon is dark grayish brown in the upper 1 or 2 inches. In some places there is a sandy clay loam B1 horizon 2 to 4 inches thick.

The Tallapoosa soils occur with Madison, Grover, and Louisa soils. Tallapoosa soils have a thinner subsoil and a shallower solum than Madison and Grover soils, but they have a thicker solum than Louisa soils.

Tallapoosa gravelly fine sandy loam, 6 to 10 percent slopes, eroded (TiC2).—This soil is on the tops of narrow ridges. It has a brown gravelly fine sandy loam surface layer 3 to 6 inches thick. The subsoil is thin, yellowish-red to red, friable clay loam. Soft mica schist is at a depth of 14 to 20 inches. In most places tillage has mixed some of the upper part of the subsoil into the plow layer.

Included with this soil in mapping are a few cobbly areas and shallow gullies and a small acreage of a soil on 2 to 6 percent slopes. Also included are small areas of Madison soils and Grover soils.

This Tallapoosa soil has a thin root zone. Tilth is generally good, and the soil can be worked easily throughout a wide range of moisture content. Surface runoff is medium, and further erosion is a moderate hazard in unprotected, cultivated areas.

This soil is mostly cultivated and pastured. It is suited to many kinds of locally grown crops. It responds well to good management, especially fertilization, but it is better suited to pasture and hay than to row crops. (Capability unit IVe–4; woodland suitability group 5; wildlife suitability group 4)

Tallapoosa gravelly fine sandy loam, 10 to 15 percent slopes, eroded (TiD2).—This soil is on the tops and sides of narrow, broken ridges. It has a brown gravelly fine sandy loam surface layer 3 to 6 inches thick. The subsoil is thin, yellowish-red or red, friable clay loam. Soft mica schist occurs at a depth of 14 to 20 inches. In most places tillage has mixed some of the upper part of the subsoil into the plow layer.

Included with this soil in mapping are a few cobbly areas, some shallow gullies, and a few gullies that are 2 or 3 feet deep. Also included are small areas of Madison, Grover, and Louisa soils.

This Tallapoosa soil has a thin root zone. Tilth is generally good, and the soil can be worked easily throughout a wide range of moisture content. Surface runoff is rapid, and further erosion is a severe hazard in unprotected areas.

Most of this soil is in pasture, hay, and forest. (Capability unit VIe–3; woodland suitability group 5; wildlife suitability group 4)

Tallapoosa gravelly fine sandy loam, 15 to 25 percent slopes, eroded (TlE2).—This soil is on hillsides that are highly dissected by numerous branching drainageways and streams. Its profile is the one described as typical for the series. The surface layer is 3 to 6 inches thick. The subsoil ranges from yellowish red to red in color. Soft mica schist occurs at a depth of 14 to 20 inches.

Included with this soil in mapping is a fairly large uneroded acreage. Here the upper 1 or 2 inches of the surface layer is dark grayish brown. Also included is a small acreage of a Louisa soil.

The root zone is thin. The soil is easy to work throughout a wide range of moisture content. Surface runoff is rapid, and further erosion is a very severe hazard in cultivated areas or in areas that have a poor vegetative cover.

Most of this soil is in forest because of the very severe erosion hazard. (Capability unit VIIe–2; woodland suitability group 5; wildlife suitability group 4)

Tallapoosa gravelly clay loam, 10 to 15 percent slopes, severely eroded (ThD3).—This soil is on the tops and sides of narrow, broken ridges. It has a yellowish-red gravelly clay loam surface layer 2 to 3 inches thick. The subsoil is thin, yellowish-red to red, friable clay loam. Soft mica schist occurs at a depth of 12 to 20 inches. The plow layer is composed mainly of clayey material from the upper part of the subsoil. Many gullies occur. Most of these are shallow, but a few are 2 to 3 feet deep.

Included with this soil in mapping is a small acreage of a soil on slopes of 8 to 10 percent. Also included are small areas of a Louisa soil.

The root zone is thin. Tilth is generally poor because the plow layer bakes into clods when it dries. Infiltration is slow, surface runoff is rapid, and erosion is a very severe hazard in areas that are not protected by a good vegetative cover.

Most of this soil is in forest because of the very severe erosion hazard. (Capability unit VIIe–2; woodland suitability group 5; wildlife suitability group 4)

Tallapoosa gravelly clay loam, 15 to 25 percent slopes, severely eroded (ThE3).—This soil is on hillsides that are highly dissected by numerous branching drainageways and streams. In most places the surface layer is brown gravelly clay loam about 1 or 2 inches thick. The subsoil is thin, yellowish-red to red, friable clay loam. Soft mica schist is at a depth of 12 to 20 inches. Many gullies occur. Most of these are shallow, but a few are 2 to 3 feet deep.

Included with this soil in mapping is a small area of a Louisa soil.

The root zone is thin. Infiltration is slow, and surface runoff is very rapid. The hazard of further erosion is very severe in areas where a good vegetative cover is not maintained.

This soil is suited mainly to forest because slopes are strong and the erosion hazard is severe. The soil is mostly in forest. (Capability unit VIIe–2; woodland suitability group 5; wildlife suitability group 4)

Wilkes Series

The Wilkes series consists of well-drained to somewhat excessively drained soils on uplands. These soils developed in material weathered chiefly from a mixture of hornblende gneiss, diorite, granite gneiss, and gabbro. Slopes range from 6 to 25 percent.

In a typical profile the surface layer is dark grayish-brown stony loam about 6 inches thick. The subsoil is yellowish-red silty clay loam that extends to a depth of about 17 inches. The next layer is a mixture of weathered rock and soil material that has silt loam texture. Hard rock is at a depth of about 48 inches.

These soils are low in organic-matter content and natural fertility. They are medium acid. Permeability is moderate to slow, and available water capacity is low.

About half of the acreage of these soils has been cultivated or pastured, but all of the Wilkes soils are better suited to trees. The less sloping soils are moderately suited to pasture. The native vegetation consists of mixed oaks, hickory, dogwood, sourwood, and pine.

Typical profile of Wilkes stony loam, 6 to 15 percent slopes, 1.5 miles southwest of Draketown in a wooded area, 0.4 mile south of bridge off State Route 120 along abandoned road, Haralson County:

A—0 to 6 inches, dark grayish-brown (10YR 4/2) stony loam; weak, medium, granular structure; very friable; many fine roots and small amounts of organic matter; 20 to 30 percent fine gravel and schist fragments; medium acid; clear, smooth boundary; horizon 4 to 8 inches thick.

Bt—6 to 17 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; many fine roots; few, thin, patchy clay films on ped surfaces; medium acid; gradual, irregular boundary; horizon 4 to 15 inches thick.

C&R—17 to 48 inches, partly weathered rocks mixed with soil; silt loam texture; medium acid; horizon 0 to 36 inches thick.

R—48 inches +, granitic hard rock with intrusing diorite.

The A horizon ranges from dark grayish brown and dark yellowish brown to light yellowish brown and very dark gray. The texture is dominantly stony loam but in many places is stony fine sandy loam. The Bt horizon ranges from yellowish red to yellowish brown and strong brown. The texture ranges from loam to silty clay loam. In some places the C horizon is absent and the solum is on hard rock.

Wilkes soils occur with Iredell and Musella soils. The subsoil of Wilkes does not have so much clay and is not so sticky as that of Iredell soils. Wilkes soils are not so red as Musella soils.

Wilkes stony loam, 6 to 15 percent slopes (WjD).—This soil is on the tops of narrow, broken ridges. It has the profile described as typical for the series. The surface layer is 3 to 7 inches thick. In some places the subsoil is thin, light olive-brown loam, but it ranges to yellowish-red silty clay loam. Thickness of the surface layer and subsoil combined ranges from 12 to 24 inches. In most of the cleared and cultivated areas, the plow layer has been mixed with the original surface layer (fig. 10).

The root zone is thin. Tilth is fair, but sufficient stones are on or near the surface to interfere with tillage. Surface runoff is medium to rapid, and erosion is a severe hazard in cultivated and unprotected areas.

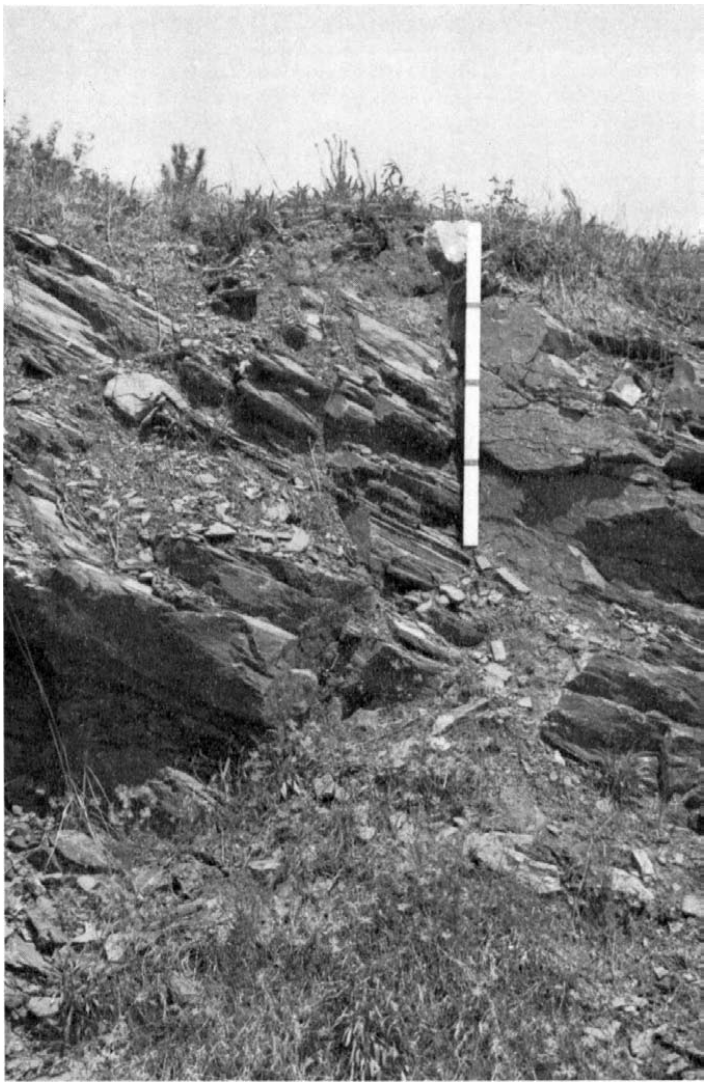

Figure 10.—**Profile of Wilkes stony loam, 6 to 15 percent slopes, in a 15-foot embankment.**

This soil is used mainly for pasture and forest. (Capability unit VIe–3; woodland suitability group 5; wildlife suitability group 4)

Wilkes stony loam, 15 to 25 percent slopes (WjE).—This soil occupies the side slopes of narrow, broken ridges adjacent to drainageways and streams. The surface layer is stony loam 6 to 8 inches thick. The upper 1 or 2 inches is very dark grayish brown, and the rest is dark grayish brown. In some places the subsoil is thin, light olive-brown loam, but it ranges to yellowish-red silty clay loam. Thickness of the surface layer and subsoil combined ranges from 15 to 24 inches.

In a few areas a soil that has slopes of as much as 35 percent is included with this soil in mapping. Also included are a few areas of boulder and rock outcrops.

The root zone is thin. Surface runoff is rapid, and erosion is a very severe hazard in unprotected areas.

Stones are common on or near the surface of this soil, but they do not prevent the use of farm machines on improved pasture. Because of the strong slope, stoniness, and shallow root zone, most of this soil remains in trees. (Capability unit VIIe–2; woodland suitability group 5; wildlife suitability group 4)

Worsham Series

The Worsham series consists of poorly drained soils that occur on low stream terraces and are subject to frequent flooding. Slopes range from 0 to 2 percent.

In a typical profile the surface layer is dark-brown silt loam about 9 inches thick. The subsoil, gray or light-gray silty clay or clay, extends to a depth of 72 inches or more. Mottling begins at a depth of 9 inches and continues through the subsoil. Mottles are strong brown, yellowish brown, and light olive brown. Depth to hard rock exceeds 10 feet.

These soils are very strongly acid and are low in organic-matter content and natural fertility. Permeability is slow, and available water capacity is high. These soils are subject to annual flooding.

Worsham soils are widely distributed along the larger streams. The larger areas are along the Tallapoosa River and its tributaries in Haralson County. The native vegetation consists of blackgum, sweetgum, willow, beech, water oak, maple, and a few pines. Much of the area has been cleared and is planted to pasture and hay.

Typical profile of Worsham silt loam (0 to 2 percent slopes) along a drainage ditch in a pastured area, 4 miles northeast of Tallapoosa, 0.5 mile east of Beach Creek Bridge on Bagwell Road, Haralson County:

A—0 to 9 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular and subangular blocky structure; very friable; many fine roots; very strongly acid; abrupt, smooth boundary; horizon 5 to 12 inches thick.

B21tg—9 to 16 inches, gray (10YR 6/1) silty clay; few, fine, distinct mottles of strong brown (7.5YR 5/6); strong, coarse, columnar structure; firm; many fine roots; few fine pebbles; distinct continuous clay films on ped surfaces; very strongly acid; clear, smooth boundary; horizon 5 to 24 inches thick.

B22tg—16 to 42 inches, light-gray (10YR 6/1) clay; many, medium, distinct mottles of yellowish brown (10YR 5/6); strong, coarse, columnar structure in place; strong, coarse, angular blocky structure when disturbed; firm; few fine roots; distinct, continuous, gray clay films on angular ped surfaces; center of peds yellowish brown; very strongly acid; gradual, smooth boundary; horizon 12 to 30 inches thick.

B23tg—42 to 60 inches, gray (10YR 5/1) clay; many, coarse, distinct mottles of yellowish brown (10YR 5/6); massive in place; sticky; very strongly acid; gradual, smooth boundary; horizon 10 to 20 inches thick.

B24tg—60 to 72 inches +, light-gray (N 6/0) clay; many, coarse, distinct mottles of light olive brown (2.5Y 5/6); massive in place; sticky; very strongly acid.

The A horizon ranges from dark brown and dark grayish brown to grayish brown and light olive brown. The combined thickness of the A and B horizons ranges from 40 to 72 inches or more.

Worsham soils occur with Augusta, Masada, Congaree, and Chewacla soils. Worsham soils are more poorly drained and grayer than those soils.

Worsham silt loam (0 to 2 percent slopes (Wsl).—This poorly drained soil is on low stream terraces and is subject to very frequent flooding. The surface layer receives thin deposits of sediments with each flood. This layer is mainly dark-brown silt loam. The subsoil is mottled gray and yellowish-brown clay.

Texture of the surface layer ranges from fine sandy loam to loam and silty clay loam in a few places. Texture of the subsoil is silty clay loam and sandy clay loam in a few places. The structure of the subsoil in this soil is easy to distinguish (fig. 11). Beds of water-rounded gravel are at depths of 3 to 8 feet in places.

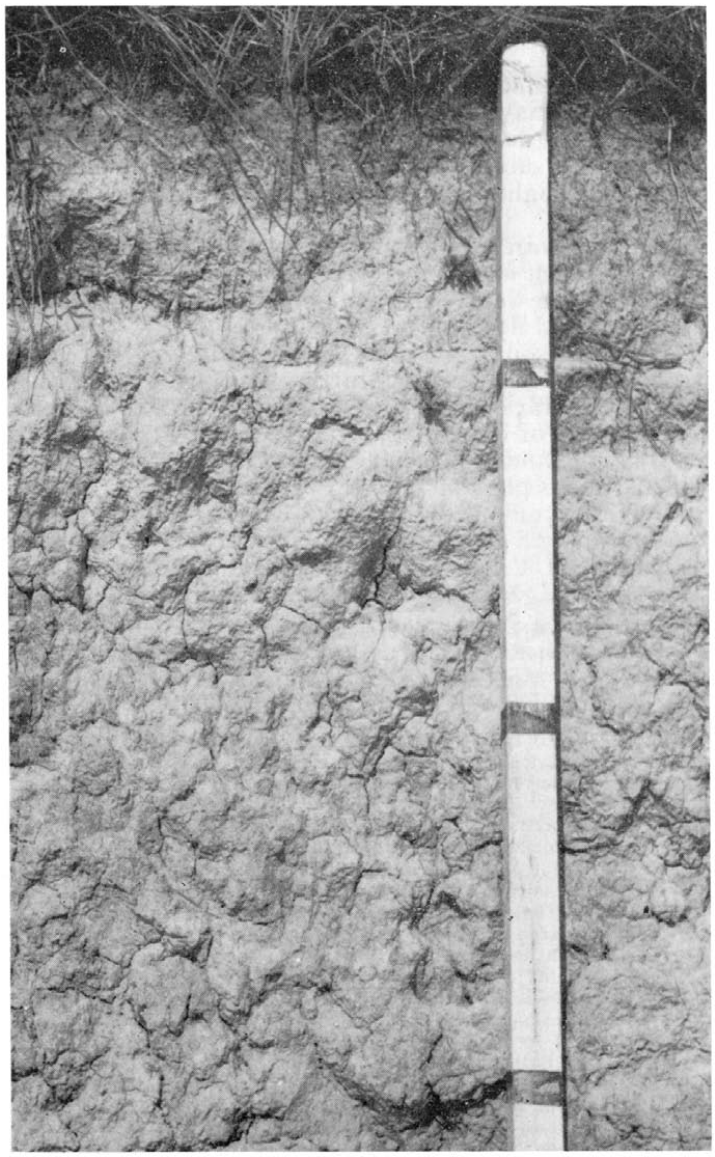

Figure 11.—**Strong, coarse, columnar structure of the Worsham silt loam.**

Because of the wet, slowly permeable subsoil, this soil can be worked only during the drier periods. A seasonal high water table is 0 to 15 inches below the surface for 2 to 6 months each year. Floods occur more often than once a year and last 2 to 7 days. These floods generally occur during winter and early spring.

Because of wetness, this soil is better suited to pasture, hay crops, and forest than to cultivated crops. Most of it is in pasture. (Capability unit Vw–1; woodland suitability group 6; wildlife suitability group 7)

Use and Management of Soils

The soils of Carroll and Haralson Counties, to a large extent, are used for cultivated crops and pasture. This section tells how the soils may be used for those purposes and also as woodland, for wildlife, and in building highways, farm ponds, and other structures.

The management of soils for crops and pasture, as woodland, and for wildlife is discussed by groups of soils. To determine the soils in each of these groups, refer to the "Guide to Mapping Units" at the back of this soil survey.

Use of Soils for Cultivated Crops and Pasture [2]

This subsection explains the system of land classification used by the Soil Conservation Service. It also describes management practices that are suitable for groups of soils having similar properties, limitations to use, and management requirements. Also given are estimated yields of the principal crops and pasture plants grown in the survey area under a high level of management.

Capability groups of soils

Capability classification is the grouping of soils to show, in a general way, their suitability for most kinds of farming. It is a practical classification based on the limitations of the soils, the risk of damage when they are used for the ordinary field crops or sown pastures, and the way they respond to treatment. The classification does not apply to most horticultural crops, or to rice and other crops that have special requirements for production. The soils are classified according to degree and kind of limitations, but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soils; and without consideration of possible major reclamation.

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

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

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

Class II. Soils have some limitations that reduce the choice of plants or 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 restrict the choice of plants, require very careful management, or both.

Class V. Soils subject to little or no erosion but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife food and cover.

[2] James N. Nash, conservation agronomist, Soil Conservation Service, assisted in writing this section.

Class VI. Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture or range, woodland, or wildlife food and cover.

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

Class VIII. Soils and landforms have limitations that preclude their use for commercial plant production without major reclamation and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes. (None in Carroll and Haralson Counties.)

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* is used in those areas where climate is the chief limitation to the production of commonly cultivated crops.

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

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

Management by capability units

The soils in Carroll and Haralson Counties have been grouped in 17 capability units. The soils in each unit have about the same limitations and susceptibility to damage, need about the same management, and respond to management in about the same way.

On the soils in these two counties, the main practices needed are those that control erosion, provide drainage, add organic matter, and increase fertility.

The intensity of the practices used to control erosion depends mainly on (1) the steepness and length of slope, (2) the frequency and intensity of rainfall, and (3) whether the soils are used for crops or pasture. The more gently sloping soils, such as Masada fine sandy loam, 2 to 6 percent slopes, may need only contour cultivation and cropping systems that produce medium to large amounts of crop residue. Steeper soils or soils on long slopes, such as Davidson gravelly loam, 6 to 10 percent slopes, eroded, need erosion control practices, such as contour farming with or without terraces, or stripcropping in a rotation that includes close-growing annuals or perennials or crops that produce large amounts of residue.

The drainage needed depends on the amount of excess water and the kind of crop grown. After suitable drainage practices have been used, only management that maintains good tilth and good crop growth is needed.

Organic matter can be added to the soils by planting crops that produce large amounts of residue and returning the residue to the soils. Crop sequences that include perennial grasses or legumes are most beneficial if all the residue is turned under.

Regular applications of both lime and fertilizer may be needed to maintain fertility and good growth of plants. The lime and the fertilizer should be applied according to the kind of soil and the needs of the plants and in the amounts indicated by soil tests.

Several management practices need to be combined for maintaining good tilth and crop growth and for controlling erosion. Among these are (1) regular applications of lime and fertilizer; (2) good management of crop residue; (3) use of a suitable cropping system; and (4) use of contour farming, terraces, or both.

Complementary practices that are beneficial to the soils in the two counties are (1) using grassed waterways and outlets for disposal of water from straight rows, from fields farmed on the contour, from terraces, or from stripcropped fields; (2) planting perennial grasses in field borders so as to control erosion at the edge of the field and to reduce the growth of weeds; and (3) locating farm roads and fences where the watershed divides or on the contour. The location of these roads and fences should be such that permits a crop row arrangement favoring efficient farm operations. The fences may be located in or adjacent to natural waterways.

In the following pages each capability unit in the two counties is described and management suitable for the soils in each unit is suggested. In a description of a capability unit, the mention of the soil series does not mean that all the soils in the series are in the unit. To determine the soils in the capability unit, turn to the "Guide to Mapping Units" at the back of this soil survey. The numbers of the units are not in numerical order, because in Georgia capability grouping is a statewide system, and all the units in the State are not in the two counties.

CAPABILITY UNIT I–1

Only Congaree soils are in this capability unit. These are well-drained soils that occur along streams and drainageways. They are loamy to a depth of more than 40 inches. Slopes range from 0 to 2 percent.

These soils have a thick root zone, and except during the wetter periods, they can be worked easily. They contain moderate amounts of organic matter and plant nutrients and are strongly acid. Permeability is moderate; available water capacity is medium. Seasonally the water table is 2 to 3 feet below the surface.

Congaree soils are suited to corn, some kinds of small grains, soybeans, truck crops, and other crops grown locally. Cotton, wheat, and pimento peppers commonly are not grown on these soils. Tall fescue, dallisgrass, white clover, and bermudagrass are generally grown for pasture.

Flooding from nearby streams does not prevent the growing or harvesting of crops, but occasionally it delays planting in spring. The floods last for less than 2 days.

These soils are easy to manage. Corn or other crops that produce a large amount of residue can be grown continuously if all the residue is left on or near the surface. Pasture and hay plants grow better if fertilizer and lime are added.

CAPABILITY UNIT IIe–1

In this unit are well-drained soils that are slightly eroded and moderately eroded. These soils are in the Davidson, Madison, and Masada series. They occur on smooth uplands and high stream terraces. They have a loamy surface layer and a clayey to loamy subsoil. Much of the acreage is gravelly. Slopes range from 2 to 6 percent.

These soils have a moderately thick root zone. Except for the Davidson soil, they are easy to work throughout a wide range of moisture content. When wet, the Davidson soil tends to stick to the plow.

The soils of this unit are low in organic-matter content and plant nutrients. They are medium acid to very strongly acid. Permeability is moderate, and available water capacity is medium. Surface runoff is medium or slow, and the hazard of erosion is moderate in most cultivated areas.

The soils in this unit are suited to locally grown crops, such as cotton, corn, pimento peppers, small grains, soybeans, and grain sorghum. These soils are also suited to most locally grown pasture grasses and legumes. Among the pasture plants are bermudagrass, fescue, and dallisgrass, and the legumes are annual lespedeza, sericea lespedeza, crimson clover, and white clover. Millet and other crops may be grazed temporarily (fig. 12).

Erosion can be controlled by using a combination of the following practices: Terracing, contour tillage, stripcropping, mulch planting, using vegetated waterways, and using crop rotations that include grasses and legumes. The combination of practices selected depends mainly on the steepness and length of slope. Clean-cultivated crops should not be grown year after year. Additions of fertilizer and lime are needed for row crops and close-growing crops.

Good tilth and soil structure can be maintained and improved by leaving the residue from the annual grasses or legumes on the surface between the periods when crops are grown and by plowing this residue under before the crops

Figure 12.—**Beef cattle grazing millet on soils in capability unit IIe–1.**

are planted. The growth of pasture plants and hay is increased by applying fertilizer and lime, controlling weeds by mowing or by applying herbicides, and controlling grazing.

CAPABILITY UNIT IIe–2

In this unit are well-drained soils that occur on smooth uplands and are slightly eroded to moderately eroded. These soils are in the Grover and Hulett series. They have a loamy surface layer and a clayey to loamy subsoil. Slopes range from 2 to 6 percent.

These soils have a moderately thick to thick root zone. They are easy to work throughout a wide range of moisture content, and they respond well to good management, especially fertilization. They are strongly acid and are low in organic-matter content and natural fertility. Permeability is moderate, and available water capacity is medium. Surface runoff ranges from medium to slow, and the hazard of erosion is slight to moderate.

The soils in this unit are suited to cotton, corn, pimento peppers (fig. 13), small grains, soybeans, and grain sorghum. Bermudagrass, fescue, dallisgrass, lespedeza, and crimson clover are suitable pasture and hay plants.

If these soils are cultivated, soil losses can be held within allowable limits by using a combination of erosion control practices and a cropping system that provides close-growing annuals or perennials, or crops that produce large amounts of residue.

Residue of annual grasses and legumes helps to maintain tilth and soil structure, if left on the surface all winter and on or near the surface when possible during the growing season. Growth of pasture or hay crops is improved if fertilizer and lime are applied, weeds are controlled by mowing or by applying herbicides, and grazing is controlled.

CAPABILITY UNIT IIe–4

Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded, is the only soil in this capability unit. This is a moderately well drained to somewhat poorly drained soil on smooth uplands and low divides. It has a gravelly fine sandy loam surface layer and a sticky and plastic, firm clay subsoil. Slopes range from 2 to 6 percent.

This soil has a moderately thick root zone, but the firm clay subsoil limits root growth. Although tilth is fair, the slowly permeable subsoil limits cultivation to the drier periods. Also wetness often delays plantings and lessens crop growth. This soil has low organic-matter content and moderate natural fertility. It is medium acid to strongly acid in the upper 22 to 36 inches of the soil. Permeability is slow, and available water capacity is moderately high. Surface runoff is medium, and erosion is a moderate hazard in cultivated fields.

This soil is fairly well suited to most locally grown crops, such as cotton, corn, pimento peppers, small grains, and grain sorghum. It is better suited, however, to hay and pasture plants, such as bermudagrass, fescue, dallisgrass, lespedeza, crimson clover, and white clover. Suitable crops grow well if adequate fertilizer is applied and if spring planting is not delayed by a high water table.

Surface runoff is slowed and erosion controlled by using some of the following practices: Contour tillage, provid-

Figure 13.—Pimento peppers on Hulett gravelly sandy loam, 2 to 6 percent slopes. Capability unit IIe–2.

ing adequately fertilized close-growing crops in the cropping system, stripcropping, terracing, and keeping the waterways in grass. Some ditching may be needed in depressions so as to remove ponded water. Good soil tilth and structure can be maintained by planting legumes or by turning under the residue of other crops. Pasture and hay plants grow better if fertilizer and lime are applied.

CAPABILITY UNIT IIIe–1

In this unit are well-drained, gravelly soils that are eroded and severely eroded. These soils are in the Davidson, Madison, and Masada series. They have a loamy surface layer and a clayey to loamy subsoil. Slopes range from 2 to 10 percent.

The root zone of these soils is moderately thick to thick. Except on the Davidson soils and in severely eroded areas, tilth is good. In severely eroded areas the plow layer is made up chiefly of material from the upper part of the subsoil. Tillage is somewhat difficult, and these soils can be cultivated without clodding only within a narrow range of moisture content. Davidson soils stick to the plow. The soils in this unit are low in organic-matter content, medium to low in natural fertility, and medium acid to very strongly acid. Permeability is moderate, and available water capacity is medium. Erosion is the chief hazard in cultivated fields.

These soils are suited to many locally grown crops, such as cotton, corn, pimento peppers, small grains, soybeans, and grain sorghum. Crop growth can be increased by adding fertilizer in adequate amounts. Suitable hay and pasture plants are bermudagrass, dallisgrass, fescue, lespedeza, crimson clover, and white clover.

Practices that help to reduce erosion are contour tillage, terracing, use of vegetated waterways, stripcropping, and adding fertilizer for the close-growing crops that are included in the cropping system. The cropping system needed depends on both the steepness and the length of the slopes.

Especially needed on the more eroded soils is a suitable perennial in the cropping system because the perennial helps to improve and maintain good tilth and soil structure. Pasture and hay plants grow better if fertilizer and lime are added in proper amounts.

CAPABILITY UNIT IIIe–2

In this unit are well-drained, gently sloping, gravelly soils that occur on uplands and are eroded. These soils are in the Grover and Hulett series. They have a loamy surface layer and a clayey to loamy subsoil. Slopes range from 6 to 10 percent.

These soils have a moderately thick to thick root zone. They are generally in good tilth and can be worked easily throughout a wide range of moisture content. These soils are strongly acid and are low in organic-matter content and natural fertility. Permeability is moderate, and available water capacity is medium. Surface runoff ranges from medium to rapid, and erosion is a moderate to severe hazard in cultivated areas.

The soils in this unit are suited to many locally grown crops, such as cotton, corn, pimento peppers, small grains, soybeans, and grain sorghum. Good crop growth can be expected if fertilizer is added in adequate amounts. Bermudagrass, dallisgrass, fescue, lespedeza, and crimson and white clovers are suitable pasture and hay plants.

Practices that help to reduce erosion are contour tillage, terracing, stripcropping, providing adequate fertilizer and lime, managing plant residue properly and planting close-growing crops in rotation. The cropping system needed depends on both the steepness and length of the slopes.

Crops grow better if their residues are left on the surface during winter and on or near the surface when possible during the growing season. Pasture and hay plants grow better if fertilizer and lime are applied in adequate amounts.

CAPABILITY UNIT IIIs–1

Only Buncombe loamy sand is in this capability unit. This soil is excessively drained and occurs on first bottoms. It has a thick loamy sand surface layer and a loamy sand subsoil. Slopes range from 0 to 4 percent.

This soil has a thick root zone, but droughtiness somewhat limits the growth of roots. The soil can be worked easily throughout a wide range of moisture content. It is low in organic-matter content and natural fertility and is very strongly acid. Permeability is rapid, and available water capacity is low. Surface runoff is slow, and erosion is not a hazard.

This soil is moderately well suited to most locally grown crops, such as corn, small grains, grain sorghum, and soybeans. Cotton is not commonly grown. Bermudagrass is a suitable pasture plant.

The growth of crops and pasture plants can be increased by applying lime and fertilizer in adequate amounts. Also needed is a rotation that includes adequately and frequently fertilized close-growing crops because they increase the content of organic matter and available water capacity.

CAPABILITY UNIT IIIw–2

Only Chewacla soils, frequently flooded, are in this capability unit. These soils are somewhat poorly drained. They occur on first bottoms and are subject to flooding. The surface layer ranges from silt loam to fine sandy loam and is underlain by stratified layers of variable texture. Slopes range from 0 to 2 percent.

These soils have a thick root zone. They are strongly acid and are moderate in natural fertility and content of organic matter. Permeability is moderate to moderately rapid, and available water capacity is medium to high. Except in the wetter areas, these soils have good tilth and are easy to work. Flooding occurs on this soil more than once every year and lasts from 2 to 7 days. Also, the water table is 0 to 15 inches below the surface for 1 to 2 months each year during winter and early in spring.

The soils of this unit are suited to a variety of crops, including corn, soybeans, oats, grain sorghum, and many kinds of truck crops. They are not suited to cotton and pimento peppers. Crop growth is good if enough fertilizer is used and adequate drainage is provided. Some of the better suited pasture and hay plants are dallisgrass, fescue, bermudagrass, lespedeza, and white clover.

Because damaging floods are the chief hazard on this soil, a system of drainage ditches is needed. Also needed are crops that return large amounts of residue to the soil so that the content of organic matter is increased and tilth is improved. Pasture and hay plants grow better if fertilizer and lime are applied in adequate amounts and weeds are controlled by mowing or by using herbicides.

CAPABILITY UNIT IIIw–3

In this capability unit are Augusta soils that are somewhat poorly drained and occur on low stream terraces and in the heads of drainageways. These soils have a sandy loam or loam surface layer and a sandy clay loam or clay loam subsoil. Slopes range from 0 to 6 percent.

The root zone of these soils is thick. Tilth is fair, except in the wetter areas where the soils can be worked only during the drier periods. These soils contain little organic matter and a small to medium amount of plant nutrients. They are strongly acid.

Corn, grain sorghum, and truck crops are most commonly grown. Corn or grain sorghum can be grown year after year if enough plant residue is returned to the soil to maintain good tilth. The soils of this unit are poorly suited to cotton, pimento peppers, or small grains. Suitable pasture and hay plants are bermudagrass, dallisgrass, fescue, white clover, and annual lespedeza. In some years wetness delays spring planting or the seeding of pasture. A system of ditches can be used to remove excess surface water and to improve internal drainage.

CAPABILITY UNIT IVe–1

This capability unit consists of well-drained, gravelly soils that are slightly eroded to severely eroded. These soils are in the Davidson, Grover, Hulett, and Madison series. They have a loamy surface layer and a clayey to loamy subsoil. Slopes range from 6 to 15 percent.

The root zone of these soils is moderately thick to thick. Except for the severely eroded soils, tilth is good. These soils contain a small amount of organic matter and small to medium amounts of plant nutrients. Acidity is medium to very strong. Permeability is moderate, and available water capacity is medium. Surface runoff is rapid, and the hazard of erosion is severe or very severe in cultivated areas.

The Davidson soils and the Madison gravelly clay loam in this group can be worked easily only within a narrow range of moisture content. These soils have fair to poor tilth, and they easily clod or are puddled if plowed when too wet. The other soils in this unit can be worked easily throughout a wide range in moisture content.

These soils are better suited to pasture, hay, and trees than to cultivated crops. Suitable pasture plants include bermudagrass and fescue and the legumes lespedeza, crimson clover, and white clover. The growth of these plants is increased by adding lime and fertilizer and controlling weeds. Cotton, corn, pimento peppers, small grains, soybeans, and grain sorghum can be grown occasionally if management is good and the crop rotation includes a large proportion of grasses or legumes. If these soils are planted to row crops, it is essential to construct a complete drainage system for disposing of water. The row crops should be planted in contour strips alternated with strips of grasses or legumes, or the field should be terraced. Also needed are additions of fertilizer and lime.

CAPABILITY UNIT IVe–4

In this unit are well-drained to somewhat excessively drained, gently sloping, gravelly soils on uplands. These soils are slightly eroded to eroded. They are in the Louisa and Tallapoosa series. They have a loamy surface layer and a loamy subsoil that is weakly developed. Slopes range from 6 to 10 percent.

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The root zone of these soils is thin. Tilth is generally good, and the soils can be worked throughout a wide range of moisture content. In many areas, however, stones interfere with the cultivation of row crops. These soils are low in organic-matter content and natural fertility and are strongly acid to very strongly acid. Permeability is moderate to moderately rapid, and available water capacity is medium to low. Surface runoff is medium to rapid, and erosion is a moderate or severe hazard if the soil is cultivated and not protected.

Cotton, corn, pimento peppers, small grains, soybeans, and grain sorghum are fairly well suited to these soils, but crops grow poorly because of low natural fertility and medium to low available water capacity. These soils are better suited to hay and pasture plants than to crops. Bermudagrass and lespedeza are suitable for hay and pasture.

If these soils are needed for row crops, they can be grown occasionally under careful management. A complete water disposal system that has terraces or stripcrops is essential. When a row crop is grown, the field should be terraced, or the row crop and grass or other close-growing crop should be seeded in alternating parallel strips on the contour. Crops and pasture and hay plants grow better if fertilizer and lime are added.

CAPABILITY UNIT Vw–1

Worsham silt loam is the only soil in this capability unit. This soil is poorly drained, occurs on low stream terraces, and is subject to frequent flooding. It has a silt loam surface layer that overlies a clayey subsoil. Slopes range from 0 to 2 percent.

The root zone is moderately thick because the clayey subsoil is slowly permeable. This soil is very strongly acid and is low in organic-matter content and natural fertility. Permeability is slow, and available water capacity is high. Tilth is poor, and the soil can be worked only during the drier periods. The seasonal high water table is at a depth of about 0 to 15 inches below the surface for 2 to 6 months each year during the wet season. Floods occur more than once a year and last from 2 to 7 days.

Cultivated crops ordinarily are not grown on this poorly drained soil. Drainage ditches remove the ponded water but do little to improve internal drainage. This soil is well suited to fescue, dallisgrass, and white clover. Pasture and hay plants grow well if fertilizer and lime are applied and if weeds are controlled.

CAPABILITY UNIT VIe–2

In this unit are well-drained, gravelly soils that occur on side slopes and are slightly eroded to severely eroded. These soils are in the Hulett and Madison series. They have a loamy or clayey surface layer and a clayey subsoil. Slopes range from 6 to 25 percent.

The root zone is moderately thick or thick. Tilth is good, except in severely eroded areas, where the plow layer is in the upper part of the subsoil. These soils are strongly acid to very strongly acid and low in organic-matter content and natural fertility. Permeability is moderate, and available water capacity is medium. Because these soils are strongly sloping to steep and surface runoff is rapid, the erosion hazard is very severe on barren surfaces.

These soils are not suited to cultivated crops. They are suited to loblolly pine and similar trees and to deep-rooted perennials. They are suited to pasture and hay plants, such

as bermudagrass, fescue, lespedeza, and crimson clover, but a vigorous growth is needed as a protective cover.

In establishing pasture, it is advisable to till and plant on the contour. Special management is needed to control gullies. All pasture and hay plants need lime and an annual application of a complete fertilizer.

CAPABILITY UNIT VIe-3

In this unit are well-drained to somewhat excessively drained soils that are slightly eroded to eroded. These soils are in the Louisburg, Louisa, Tallapoosa, and Wilkes series. They have a loamy surface layer and a loamy subsoil that is weakly developed. Most areas are either stony or gravelly. Slopes range from 6 to 15 percent.

The root zone is thin. Tilth is fair, but in many areas stones interfere with plowing. These soils are medium acid to very strongly acid and low in organic-matter content and natural fertility. Permeability is moderately slow to moderately rapid, and available water capacity is medium to low.

Because these soils are droughty, shallow, and infertile, they are not suited to cultivated crops. Trees, especially loblolly pine, grow better. Pastures should be planted to bermudagrass, fescue, dallisgrass, lespedeza, crimson clover, or similar perennials.

In establishing pasture, it is advisable to till and plant on the contour. Applications of lime and annual applications of a complete fertilizer are needed for improving grazing and maintaining a protective cover.

CAPABILITY UNIT VIe-4

Musella gravelly clay loam, 6 to 15 percent slopes, eroded, is the only soil in this capability unit. This well-drained soil is eroded and occurs on slopes of 6 to 15 percent. Its surface layer is gravelly clay loam, and the subsoil is clay loam 10 to 24 inches thick. Rock fragments make up about 20 to 30 percent of the subsoil by volume.

This soil is medium acid. Tilth is good only within a narrow range of moisture content. Available water capacity is medium to low. Surface runoff is rapid, and erosion is a severe hazard in cultivated or bare areas.

If cultivated when wet, this soil breaks into clods that harden when it dries. This soil is better suited to pasture, hay, and pine trees than to cultivated crops.

CAPABILITY UNIT VIIe-2

In this unit are well-drained to somewhat excessively drained soils that are slightly eroded to severely eroded. These soils are in the Louisburg, Louisa, Musella, Tallapoosa, and Wilkes series. They are strongly sloping to steep. They mainly have a loamy surface layer and a weakly developed loamy to clayey subsoil. Slopes range from 15 to 40 percent.

The root zone of these soils is thin. Tillage is impractical, because stones are on or near the surface in most areas. A few boulders or rock outcrops occur. Organic-matter content and natural fertility are low. These soils are medium acid to very strongly acid. Permeability is moderately rapid to moderately slow, and available water capacity is medium to low.

These soils are not suitable for cultivation. Most of the acreage is in forest. On these soils grazing should be controlled and a protective cover maintained at all times. The hazard of erosion can be reduced by planting tree seedlings in bare areas, by establishing firebreaks, and by logging and performing other forestry operations on the contour wherever practical.

CAPABILITY UNIT VIIe-4

In this unit are small areas of Gullied land where accelerated erosion has removed the soil material. Gullied land consists of small, barren areas that have an intricate network of shallow and deep gullies separated by narrow ridges. In many places the gullies have cut into the weathered rock. The soil that remains between the gullies is generally clay loam. Slopes range from 8 to 20 percent.

This land type has a thin root zone. It is strongly acid and low in organic-matter content and natural fertility. Infiltration is slow, and surface runoff is very rapid.

This land type is not suitable for cultivated crops or for hay or pasture.

A protective mulch of hay or other material is needed to help establish vegetation. Extra care and effort are needed to establish a protective cover.

Estimated yields

In table 2 are estimated average acre yields that can be expected for the principal crops and pasture grasses grown on the soils commonly used for these purposes. The yields listed are those that can be expected under a high level of management. The estimates are based chiefly on records of yields on individual farms, on yields obtained when long-term experiments were conducted, and on estimates made by agronomists who are familiar with the crops and with the soils of the two counties.

In the high level of management needed for obtaining the yields listed in table 2, the farmer (a) carefully chooses plants to be grown and the cropping system to be used; (b) prepares a good seedbed; (c) plants seed by a suitable method, at a suitable rate, and at the appropriate time; (d) controls weeds and insect pests; (e) inoculates the seeds of legumes; (f) uses high-quality seeds; (g) controls excess water by drainage, waterways, contour farming, or stripcropping; and (h) applies fertilizer and lime as indicated by soil tests.

In some columns dashes indicate that for certain crops on some soils yields are so low or management needs are so great that it is not practical to grow the crops. The following mapping units are not listed in table 2, because they are not generally suited to crops or pasture:

Gullied land.
Louisa gravely fine sandy loam, 15 to 40 percent slopes.
Louisburg stony loamy sand, 15 to 25 percent slopes.
Musella stony clay loam, 15 to 25 percent slopes, eroded.
Tallapoosa gravelly fine sandy loam, 15 to 25 percent slopes, eroded.
Tallapoosa gravelly clay loam, 10 to 15 percent slopes, severely eroded.
Tallapoosa gravelly clay loam, 15 to 25 percent slopes, severely
Wilkes stony loam, 15 to 25 percent slopes.

The following paragraphs give the rates of fertilization and seeding, and other practices that are required if the yields in table 2 are to be obtained.

CORN.—The soils used for corn receive, per acre, 90 to 120 pounds of nitrogen (N) and 60 to 75 pounds each of phosphoric acid (P_2O_5) and potash (K_2O). The crop is seeded at a rate that provides 12,000 to 15,000 plants per acre. All crop residue is returned to the soil, or a winter

cover crop is seeded and turned under. Lime is applied according to the need indicated by soil tests.

COTTON.—At planting time the soils used for cotton receive, per acre, 110 to 128 pounds of nitrogen and 70 to 110 pounds each of phosphoric acid and potash. Planting is at a rate that provides 40,000 to 60,000 plants per acre. Insects are controlled effectively.

OATS.—At planting time the soils used for oats receive, per acre, 16 to 24 pounds of nitrogen and 48 to 72 pounds each of phosphoric acid and potash applied at time of planting. An additional 32 to 64 pounds of nitrogen is applied late in winter. Diseases are controlled effectively.

PIMENTO PEPPERS.—The soils used for pimento peppers receive, per acre, 96 to 120 pounds each of nitrogen, phosphoric acid, and potash. Planting is at a rate that provides 4,000 to 6,000 plants per acre. Insects and diseases are controlled effectively.

SERICEA LESPEDEZA.—At planting time the soils used for sericea lespedeza receive, per acre, 8 to 20 pounds of nitrogen, 36 to 60 pounds each of phosphoric acid and potash, and 1 ton of lime. After this an additional 48 to 72 pounds each of phosphoric acid and potash is applied annually. One ton of lime is applied in at least 1 year out of every 3, or according to the need indicated by soil tests. The planting rate is 30 to 35 pounds per acre.

COASTAL BERMUDAGRASS.—The soils used for Coastal bermudagrass must be in fields that are free of common bermudagrass. These soils receive, per acre, 60 pounds of nitrogen and 120 pounds each of phosphoric acid and potash. After each cutting, an additional 60 pounds of nitrogen is applied. Four times a year, or when grass is 12 to 15 inches high, the grass is mowed. The planting rate is 10,000 to 14,000 sprigs per acre. Lime is applied according to the need indicated by soil tests.

IMPROVED PASTURES.—These are pastures that contain one or a combination of plants that produces good forage. Soils used for improved pastures receive, per acre, 80 to 140 pounds of nitrogen and 60 pounds each of phosphoric acid and potash. One ton of lime is added every 3 years, or according to the need indicated by soil tests. The grass is mowed so that weeds and excessive growth are controlled.

Use of the Soils as Woodland

This section interprets the soils of Carroll and Haralson Counties in terms of growth of trees and lists limitations of soils used as woodland. This information will help the woodland owner who wishes to change his land use or to improve his woodland.

About 65 percent of the acreage in Carroll and Haralson Counties is wooded. Of this woodland, about 15 percent is owned by pulp and paper companies and the rest is privately owned. The survey area originally was forested with mixed stands of oak, hickory, dogwood, sourwood, yellow-poplar, sweetgum, blackgum, and pine. By 1900, however, most of the original timber had been cut.

Loblolly and shortleaf pines grow extensively on soils of the uplands and are commercially important. In some places the trees are scattered, but in other places stands are well stocked. Some longleaf pine grows in a few small stands. The trees on the bottom lands and higher up along streams are mostly low-grade hardwoods.

The soils of these two counties have good potential for the growth of trees. Many landowners have begun to improve their stands by practicing good forestry. Markets for lumber and pulpwood are available in this area, but markets for low-value hardwoods are needed. A major concern is improving the stands on the uplands.

TABLE 2.—*Estimated average acre yields of principal crops* [1]

[Yields listed are average yields expected under a high level of management]

Soil	Corn	Cotton (lint)	Oats	Pimento peppers	Sericea lespedeza hay	Coastal bermudagrass hay	Coastal bermudagrass pasture	Improved pastures [2]
	Bu.	*Lb.*	*Bu.*	*Hundredweight*	*Tons*	*Tons*	*Animal-unit-months* [3]	*Animal-unit-months* [3]
Augusta loam	65	----	55	----	----	4.0	6.5	5.5
Augusta sandy loam, 2 to 6 percent slopes	65	----	55	----	1.0	4.0	6.5	5.5
Buncombe loamy sand	40	----	45	----	1.7	4.2	7.0	----
Chewacla soils, frequently flooded	85	----	----	----	----	4.2	7.0	5.5
Congaree soils	80	----	75	65	3.1	4.8	8.0	6.5
Davidson gravelly loam, 2 to 6 percent slopes, eroded	70	500	65	65	3.0	5.5	9.0	6.1
Davidson gravelly loam, 6 to 10 percent slopes, eroded	60	500	60	50	2.7	5.4	8.5	5.5
Davidson gravelly loam, 10 to 15 percent slopes, eroded	55	425	60	40	2.5	4.8	8.0	5.0
Davidson gravelly clay loam, 2 to 6 percent slopes, severely eroded	50	400	58	50	2.6	5.4	8.5	5.3
Davidson gravelly clay loam, 6 to 10 percent slopes, severely eroded	45	350	40	25	2.5	4.8	8.0	5.0
Davidson gravelly clay loam, 10 to 15 percent slopes, severely eroded	40	350	40	----	2.2	4.3	7.0	4.5
Grover gravelly fine sandy loam, 2 to 6 percent slopes, eroded	65	600	70	65	2.8	5.4	8.5	5.3
Grover gravelly fine sandy loam, 6 to 10 percent slopes, eroded	50	500	60	50	2.6	4.8	8.0	5.0
Grover gravelly fine sandy loam, 10 to 15 percent slopes	45	450	50	40	2.4	4.6	7.6	4.0

See footnotes at end of table.

TABLE 2.—*Estimated average acre yields of principal crops* [1]—Continued

Soil	Corn	Cotton (lint)	Oats	Pimento peppers	Sericea lespedeza hay	Coastal bermudagrass hay	Coastal bermudagrass pasture	Improved pastures [2]
	Bu.	*Lb.*	*Bu.*	*Hundredweight*	*Tons*	*Tons*	*Animal-unit-months* [3]	*Animal-unit-months* [3]
Hulett gravelly sandy loam, 2 to 6 percent slopes	73	700	75	65	3.0	5.4	9.0	6.0
Hulett gravelly sandy loam, 2 to 6 percent slopes, eroded	68	625	70	65	3.0	5.4	9.0	6.0
Hulett gravelly sandy loam, 6 to 10 percent slopes, eroded	60	525	60	50	2.6	4.8	8.0	5.0
Hulett gravelly sandy loam, 10 to 15 percent slopes, eroded	50	450	55	40	2.5	4.3	7.0	4.5
Hulett gravelly sandy clay loam, 6 to 15 percent slopes, severely eroded					2.0	3.9	6.0	4.0
Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded	40	450	50		2.0			5.0
Louisa gravelly fine sandy loam, 6 to 10 percent slopes	30	300	40	25	1.4	3.0	5.0	3.0
Louisa gravelly fine sandy loam, 10 to 15 percent slopes					1.4	2.7	4.5	2.5
Louisburg stony loamy sand, 6 to 15 percent slopes					1.4	2.4	4.0	2.0
Madison gravelly fine sandy loam, 2 to 6 percent slopes, eroded	65	625	65	65	3.0	5.4	8.5	5.3
Madison gravelly fine sandy loam, 6 to 10 percent slopes, eroded	60	500	60	50	2.6	4.8	8.0	5.0
Madison gravelly fine sandy loam, 10 to 15 percent slopes, eroded	45	450	55	40	2.5	4.5	7.5	4.7
Madison gravelly fine sandy loam, 15 to 25 percent slopes					1.5	4.3	7.0	4.3
Madison gravelly clay loam, 2 to 6 percent slopes, severely eroded	50	400	60	50	2.4	4.8	8.0	4.7
Madison gravelly clay loam, 6 to 10 percent slopes, severely eroded	45	400	40		2.0	4.3	7.0	4.3
Madison gravelly clay loam, 10 to 15 percent slopes, severely eroded					2.0	3.6	6.0	4.0
Masada fine sandy loam, 2 to 6 percent slopes	74	630	65	75	3.0	6.0	10.0	6.0
Masada gravelly sandy loam, 2 to 6 percent slopes	74	630	65	75	3.0	6.0	10.0	6.0
Masada gravelly sandy loam, 6 to 10 percent slopes, eroded	68	500	53	50	3.0	5.4	9.0	5.5
Musella gravelly clay loam, 6 to 15 percent slopes, eroded	40	350	40	20	1.8	4.3	7.0	4.8
Tallapoosa gravelly fine sandy loam, 6 to 10 percent slopes, eroded	45	400	45	35	2.0	4.0	6.5	4.0
Tallapoosa gravelly fine sandy loam, 10 to 15 percent slopes, eroded					1.8	3.5	5.0	3.4
Wilkes stony loam, 6 to 15 percent slopes					1.7	3.0	5.0	3.0
Worsham silt loam								5.0

[1] Prepared by T. N. CRABB, soil scientist, Soil Conservation Service.

[2] Improved pastures are in tall fescue and white clover, or common bermudagrass and crimson clover.

[3] Animal-unit-months is the number of months during the year that 1 acre will provide grazing for 1 animal (1,000 pounds of live weight). It is the number of months the pasture can be grazed multiplied by the number of animal units an acre will support. For example, 1 acre of Davidson gravelly loam, 2 to 6 percent slopes, eroded, in Coastal bermudagrass pasture will provide grazing for 3 animals for 3 months, so it has a rating of 9 animal-unit-months.

Woodland suitability groups

Management of woodland can be planned more easily if the soils are grouped according to those characteristics that affect the growth of trees and management of the stands. For this reason, the soils of Carroll and Haralson Counties have been placed in six woodland suitability groups. Each group consists of soils that have about the same suitability for trees, that require about the same management, and that have about the same potential productivity. Gullied land was not placed in a woodland suitability group, because trees suitable for commercial use normally do not grow on this land.

The description of each woodland suitability group gives the potential productivity, or average site index, for species suited to the soils in the group. Also given are the average rate of yearly growth of these trees, in board feet per acre, and the hazards and limitations that affect management. Some of the terms used in the descriptions require explanation.

Potential productivity of a soil under specified management is indicated by site index. Site index is the average height, in feet, that the dominant and codominant trees of a given species, growing on the specified soil, will reach in 50 years. The average site indexes given in this survey are based on measurements of trees. Average yearly growth for southern pines is interpolated from tables 56, 88, and 152, in "Volume, Yield, and Stand Tables for Second-Growth Southern Pines" (*4*). Yearly growth is

shown to age 50, for trees 8 inches in diameter and larger in even-aged, fully stocked stands. Average yearly growth for hardwoods is adapted from table 7 in "Management and Inventory of Southern Hardwoods" (7). Used in this adaptation were data on growth of trees 12 inches in diameter and larger. These data, gathered in connection with soil-site evaluations by the Soil Conservation Service and cooperating agencies, are on yearly growth, to age 50, for even-aged well-stocked stands. Average yearly growth is given in board feet per acre (Scribner rule).

Each woodland suitability group, in varying degrees, has limitations that affect its management. In the description of the woodland groups, some of these limitations are expressed in the relative terms *slight*, *moderate*, or *severe*, which are explained in the following paragraphs as they relate to plant competition, equipment limitation, seedling mortality, and erosion hazard.

Plant competition refers to the rate of invasion by unwanted trees, shrubs, and vines when openings are made in the canopy. Competition is *slight* if it does not prevent adequate natural regeneration and early growth, or interfere with the normal development of planted seedlings. Competition is *moderate* if it delays the establishment and slows the growth of naturally occurring or planted seedlings, but it does not prevent the eventual development of a fully stocked, normal stand. Competition is *severe* if it prevents adequate restocking, either natural or artificial, without intensive preparation of the site and without special maintenance practices, including weeding.

Equipment limitations that are caused by unfavorable soil characteristics and topographic features may restrict or prevent the use of conventional equipment for planting and harvesting trees, for constructing roads, for controlling unwanted vegetation, and for controlling fires. The limitation is *slight* if there is little or no restriction on the type of equipment or on the time of year that the equipment can be used. The limitation is *moderate* if the use of equipment is restricted by one or more unfavorable characteristics, such as slope, stones or other obstructions, seasonal wetness, instability, or risk of injury to roots of trees. The limitation is *severe* if special equipment is needed to perform normal management.

Seedling mortality refers to the degree of expected loss of planted seedlings that is a result of unfavorable soil characteristics or topographic features, but not as a result of plant competition. Normal rainfall, a good planting stock, and proper planting are assumed. A rating of *slight* indicates an expected mortality of less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

The erosion hazard refers to susceptibility to erosion where management and harvesting practices are normal. A rating of *slight* indicates that problems of erosion control are unimportant; *moderate* indicates that some precautions are necessary to prevent erosion; *severe* indicates that special treatment or methods of operation are necessary to minimize deterioration of the soils.

Following are the descriptions of the woodland suitability groups. In a description the mention of a soil series does not necessarily mean that all soils in a series are in the group. To identify the soils in each group, refer to the "Guide to Mapping Units" at the back of this survey. More detailed information about the soils is given in the section "Descriptions of the Soils."

WOODLAND SUITABILITY GROUP 1

This woodland group consists of well-drained to excessively drained soils on first bottoms. These soils are in the Buncombe and Congaree series. The available water capacity is medium, except in the Buncombe soil, where it is low. Water and roots penetrate easily to great depths.

The soils in this group are used mostly for cultivated crops and pasture but are well suited to loblolly pine, yellow-poplar, and red oak.

For loblolly pine, the average site index is 91 and the average yearly growth is 620 board feet per acre. For yellow-poplar, the average site index is 105 and the average yearly growth is 560 board feet per acre. For red oak, the average site index is 82 and the average yearly growth is 280 board feet per acre.

Competition from underbrush and other unwanted plants is usually severe after removal of the canopy. Some of the special management practices that are needed for well-stocked stands are clearing, harrowing, furrowing, burning, poisoning, and planting.

Equipment limitations are moderate because periods of excessive wetness are short in winter.

Seedling mortality and the hazard of erosion are slight.

WOODLAND SUITABILITY GROUP 2

This woodland group consists of well-drained soils on uplands and stream terraces. These soils are in the Davidson, Grover, Hulett, Madison, and Masada series. Permeability is moderate, and the hazard of erosion is slight to moderate. Slopes range from 2 to 25 percent. The root zone is moderately thick to thick, and the available water capacity is medium. Figure 14 shows an area in native trees.

For loblolly pine, the average site index is 80 and the average yearly growth is 470 board feet per acre. For shortleaf pine, the average site index is 67 and the average yearly growth is 380 board feet per acre. For red oak, the average site index is 73 and the average yearly growth is 200 board feet per acre.

Competition from plants is moderate on gently sloping soils, but it is severe near the base of strongly sloping soils where seepage collects. Although the removal or treatment of this competition is not always necessary, better growing conditions are obtained if control practices are used.

On slopes of 10 to 15 percent, equipment limitations and the hazard of erosion are moderate, and on slopes of 15 to 25 percent, they are severe.

The rate of seedling mortality is slight.

WOODLAND SUITABILITY GROUP 3

This woodland group consists of well-drained soils on uplands. These soils are in the Davidson, Hulett, Madison, and Musella series. Except for the Musella soils, which are moderately eroded, these soils are severely eroded. The soils in this group have a moderately permeable subsoil that ranges from moderately thick to thick. Slopes range from 2 to 25 percent. The available water capacity ranges from medium to low.

For loblolly pine, the average site index is 70 and the average yearly growth is 360 board feet per acre. For shortleaf pine, the average site index is 62 and the average yearly growth is 330 board feet per acre.

Equipment limitations and the hazard of erosion are moderate for soils on slopes of 10 to 15 percent and are severe for soils on slopes of more than 15 percent.

The expected rate of seedling mortality is moderate.

Figure 14.—**Native vegetation consisting of oak, hickory, and a few pine trees on soils in woodland suitability group 2. The soil is a Madison gravelly fine sandy loam.**

WOODLAND SUITABILITY GROUP 4

Only Iredell gravelly fine sandy loam, 2 to 6 percent slopes, eroded, is in this woodland group. This soil is on low-lying uplands where slopes range from 2 to 6 percent. It has a sticky, plastic, slowly permeable subsoil. The available water capacity is moderately high. The root zone is moderately thick.

For loblolly pine, the site index is 73 and the expected yearly growth is 390 board feet per acre. For shortleaf pine, the site index is 58 and the expected yearly growth is 310 board feet per acre.

Competition from plants is moderate. Trees grow better where there is some control of this competition, but control is not always necessary.

The hazard of erosion is moderate, and the rate of seedling mortality is slight.

WOODLAND SUITABILITY GROUP 5

This woodland group consists of well-drained to somewhat excessively drained, slightly eroded to severely eroded soils on uplands. These soils are in the Louisburg, Louisa, Tallapoosa, and Wilkes series (fig. 15). Slopes range from 6 to 40 percent. Permeability of the subsoil is rapid. The root zone is thin, and available water capacity is moderate to moderately low.

For loblolly pine, the site index is 76 and the average yearly growth is 425 board feet per acre. For shortleaf pine, the average site index is 68 and the average yearly growth is 390 board feet per acre.

Competition from plants is moderate. The removal or treatment of this competition is not always needed, but usually better growing conditions can be obtained if some control is practiced.

Figure 15.—Scrubby growth of native vegetation on Louisa gravelly fine sandy loam, 10 to 15 percent slopes, in woodland suitability group 5.

Equipment limitations are moderate on slopes of 15 to 25 percent and severe on slopes steeper than 25 percent.

The rate of seedling mortality is moderate, and the hazard of erosion is moderate on the gently sloping soils but severe on the more steeply sloping soils.

WOODLAND SUITABILITY GROUP 6

In this woodland group are somewhat poorly drained and poorly drained, nearly level soils on first bottoms and low stream terraces. These soils are in the Augusta, Chewacla, and Worsham series. Available water capacity is medium to high.

For loblolly pine, the average site index is 93 and the average yearly growth is 660 board feet per acre. For yellow-poplar, the average site index is 102 and the average yearly growth is 535 board feet per acre. For red oak, the average site index is 85 and the average yearly growth is 300 board feet per acre. For sweetgum, the average site index is 97 and the average yearly growth is 470 board feet per acre.

Competition from plants is severe because the excess moisture promotes the invasion and growth of many undesirable kinds of plants. Control of this competition is needed before a desired stand can become established and grow normally. Generally needed to insure well-stocked stands are clearing, harrowing, furrowing, burning, poisoning, planting, or other special practices of management or site preparation.

Equipment limitations are severe. Flooding and a seasonal high water table limit the use of any kind of logging equipment to the drier periods.

The rate of seedling mortality is moderate as a result of flooding, a seasonal high water table, and poor drainage. The erosion hazard is slight.

Use of Soils for Wildlife [3]

The soils of Carroll and Haralson Counties produce food and cover for many kinds of wildlife. Bobwhite, mourning dove, rabbit, squirrel, and many nongame birds are common throughout the survey area. Most farms have sites suitable for fish ponds. Good habitat for deer and wild turkey is in the northern and western parts of Haralson County and on the wooded bottom lands and adjacent uplands along the larger streams. Deer and wild turkey required extensive areas of well-watered woodland. Well-suited habitat for wild duck and beaver is that along streams on long, narrow bottom lands. Such areas are well distributed throughout the two counties. Dams built by beavers are common on many of these streams.

Food and cover needed by wildlife

The feeding habits of wildlife differ. Some animals and birds eat insects and other animal foods, some eat only vegetation, and others eat a combination of the two.

In most of the survey area the soils support one or more species of wildlife. Some species spend most or all of their time in wooded areas, and others thrive on open farmlands. Fish live in water, and beavers require water in

[3] PAUL D. SCHUMACHER, biologist, Soil Conservation Service, assisted in writing this subsection.

their habitat. Ducks and other waterfowl also require areas of water.

Following is a summary of the food and habitat needed by the more important kinds of wildlife in the two counties.

BEAVER.—Beavers eat only vegetation, mainly bark, roots, and green plants. Their principal tree foods are from alder, oaks, birch, cottonwood, maple, pine, sweetgum, and willow. Beavers also eat honeysuckle, grass, weeds, and the tender shoots of elder. Acorns and corn are choice foods. The chief feeding areas are within 150 feet of water.

BOBWHITE.—Choice foods for bobwhite are acorns, beechnuts, blackberries, browntop millet, wild black cherries, corn, cowpeas, dewberries, annual and bicolor lespedezas, mulberries, pecans, poorjoe, common ragweed, beggarlice, and the seeds of dogwood, pine, and sweetgum. Bobwhites also eat many insects. The food must be close to vegetation that provides protection from sun, predators, and adverse weather.

DEER.—Choice foods are acorns, bahiagrass, white clover, corn, cowpeas, greenbrier, honeysuckle, annual and bicolor lespedezas, ryegrass, oats, and wheat. For adequate cover, deer generally need wooded areas that are 500 acres or more in size.

DUCK.—Choice foods are acorns, beechnuts, browntop millet, corn, Japanese millet, and the seeds of smartweed. These foods must be covered with water to be readily available to ducks, though occasionally ducks feed on these foods where they are near water.

DOVE, MOURNING.—Choice foods for mourning doves are the seeds of browntop millet, Japanese millet, corn, common ragweed, pine, and sweetgum. Doves do not eat insects, green leaves, or fruit. They drink water daily.

RABBIT.—Suitable cover, such as a blackberry or plum thicket, is essential for the protection of rabbits. Choice foods are clovers, winter grasses, and other succulent plants. These foods are available in most places in the survey area and can be made available in other places.

SQUIRREL.—Choice foods are acorns, beechnuts, black cherries, corn, hickory nuts, magnolia, mulberries, pecans, and the seeds of blackgum, flowering dogwood, and pine.

TURKEY, WILD.—Turkeys survive only in large wooded areas that are generally 2,000 acres in size or larger. They need a daily supply of drinking water, and they often roost in large trees over or near water. Choice foods are insects, acorns, bahiagrass seed, beechnuts, blackberries, dewberries, browntop millet, clover leaves, corn, cowpeas, wild grapes, hackberries, mulberries, oats, pecans, wheat, and the seeds of flowering dogwood and pine.

NONGAME BIRDS.—The many species of nongame birds in these two counties differ greatly in their choice of food. Several species eat only insects, a few eat insects and fruits, and several others eat insects, fruits, nuts, and acorns. A few eat seeds of legumes, grasses, and weeds.

FISH.—The principal fish in the many farm ponds and streams in the survey area are bass, bluegill, and channel catfish. The choice foods of bluegills are aquatic worms, insects, and insect larvae. Bass and channel catfish feed chiefly on small fish. The channel catfish also eat worms and insects. The number of fish in a stream or pond is related to the quality of the water, the abundance of the food supply in the water, the fertility of the soils in the watershed, and to some extent, the fertility of the soils at the bottom of the pond or stream. Because most of the soils in Carroll and Haralson Counties are acid and low in natural fertility, fertilizer and lime are needed in most ponds so that enough microscopic algae is produced to feed worms that are food for fish.

Wildlife suitability groups

The soils in Carroll and Haralson Counties have been placed in seven wildlife suitability groups on the basis of their suitability as habitat for specified kinds of wildlife. The soils in each group are somewhat similar and generally produce about the same kinds of food plants and protective cover for wildlife. The wildlife suitability groups in these two counties are described in the following pages. To identify the soils in each group, refer to the "Guide to Mapping Units" at the back of this survey.

Additional information can be obtained from the local technicians of the Soil Conservation Service. These technicians maintain specific up-to-date technical guides for each important kind of wildlife and fish, and for each significant plant that provides food or cover for wildlife. A landowner will find this information valuable in establishing or improving suitable food plants and habitat for the kinds of wildlife and fish he wishes to favor.

WILDLIFE SUITABILITY GROUP 1

This wildlife group consists of well-drained soils on uplands and stream terraces. Slopes range from 2 to 10 percent. The surface layer of most of the soils is sandy loam, fine sandy loam, or loam and is gravelly. The subsoil is clay or clay loam and moderately permeable. The root zone is thick. These soils are easily worked and have medium available water capacity. The hazard of erosion is slight to moderate in most of the acreage.

The soils in this group are extensive and widely scattered in the survey area. They are used mostly for cultivated crops or pasture. These soils are well suited to plantings of browntop millet, grain sorghums, cowpeas, and annual and bicolor lespedezas, all of which provide choice foods for bobwhite. Other choice foods for bobwhite, and growing wild on these soils, are blackberries, dewberries, wild black cherries, common ragweed, partridgepeas, and beggarlice. Doves are attracted to plantings of corn, browntop millet, and Japanese millet. Rabbits thrive on clovers, winter grasses, and other plants that grow on these soils. Because of their position and slope, these soils generally are not suitable for flooding for duck fields, but the many drains provide favorable sites for small ponds.

WILDLIFE SUITABILITY GROUP 2

This wildlife group consists of well-drained soils on uplands. These soils are on side slopes that range from 10 to 25 percent. The surface layer is sandy loam, fine sandy loam, or loam and is gravelly. The subsoil is clay or clay loam and is moderately permeable. The root zone is thick

or moderately thick. Because the soils are strongly sloping to moderately steep, surface runoff is rapid and the hazard of erosion is severe to very severe. The available water capacity is medium.

These soils are extensive and widely distributed throughout the survey area. Most of the acreage is wooded, and much of this woodland is in native vegetation that provides good protective cover for most kinds of game, particularly deer and wild turkey. In the woodland are acorns, greenbrier, and honeysuckle, which are choice foods for deer. Choice foods for wild turkeys are beechnuts, hackberries, wild grapes, flowering dogwood fruit, and seeds of pine. Corn, cowpeas, annual and bicolor lespedezas, ryegrass, oats, wheat, grain sorghum, and browntop millet are among the crops that can be planted occasionally in open areas to supplement the food for deer, wild turkey, and bobwhite. Drains that provide sites for small fishponds are common. These soils are not suitable for flooding for duck fields.

WILDLIFE SUITABILITY GROUP 3

This wildlife group consists of well-drained, severely eroded soils on uplands. Slopes range from 2 to 15 percent. The surface layer is gravelly clay loam or gravelly sandy clay loam. The subsoil is clay or clay loam and is moderately permeable. The root zone is thick or moderately thick, but soil tilth is poor. Infiltration is slow, surface runoff is rapid, and available water capacity is medium.

The soils in this group are fairly extensive and widely distributed throughout the survey area. All of their acreage has been cultivated, but most areas of the more sloping soils have reverted to pine trees that provide only poor habitat and source of food for wildlife. Because tilth is poor and erosion is severe, plantings of choice foods are hard to establish and maintain. Annual and bicolor lespedezas, corn, small grains, and clovers are marginally suited to these soils. The many drains that occur provide favorable sites for small ponds, but in many places diversion ditches are needed to prevent silting and the discoloring of water. These soils are not suitable for flooding for duck fields.

WILDLIFE SUITABILITY GROUP 4

This wildlife group consists chiefly of well-drained to somewhat excessively drained, stony or gravelly soils on uplands. Slopes range from 6 to 40 percent. The surface layer is generally sandy or loamy, and the subsoil is loamy. Permeability is moderately slow to moderately rapid. Surface runoff is medium to rapid, the root zone is thin, and available water capacity is medium to low.

The soils in this group are fairly extensive and widely distributed. Most of the acreage remains in native vegetation. Much of this acreage is in large areas that provide good protective cover for deer and wild turkey. Choice foods for deer are acorns, greenbrier, and honeysuckle. For turkey, choice foods are beechnuts, hackberries, wild grapes, flowering dogwood fruit, and pine seeds.

Among the plants that can be grown in open areas to provide choice supplementary food for deer and wild turkey and to attract bobwhites and doves are corn, cowpeas, bicolor lespedeza, oats, wheat, ryegrass, grain sorghum, and browntop millet. These soils are not suitable for flooding for duck fields. Sites are marginally suitable for fishponds, but in many places the soil is too thin and too rocky to provide fill material for dams.

WILDLIFE SUITABILITY GROUP 5

This wildlife group consists of well-drained and somewhat excessively drained soils in the head of drainageways or on first bottoms along creeks and rivers. Slopes range from 0 to 4 percent. The surface layer generally is sandy loam or loamy sand, but the layers below vary in texture. The root zone is thick. These soils are easily worked, have a medium to low available water capacity, and are suited to several kinds of plants. The first bottoms have a seasonal high water table for 1 to 2 months each year. Flooding occurs frequently but lasts only for extremely brief periods.

The acreage of the soils in this group is small but widely distributed. It is mostly in crops or pasture. Most plants that provide choice foods for wildlife can be grown on these soils, and most areas can be flooded for duck fields. Favorable sites for ponds are common on these soils.

WILDLIFE SUITABILITY GROUP 6

This wildlife group consists of somewhat poorly drained soils on first bottoms, around the head of drainageways, or on low slopes. The surface layer generally is silt loam or sandy loam. Beneath the surface layer, the texture ranges from sandy loam to clay. The first bottoms are flooded mainly in spring or summer, and the floods last from 2 to 7 days. The water table is high late in winter or early in spring. If adequately drained, these soils are easily worked. The available water capacity is high to medium.

The acreage of the soils in this group is fairly extensive, and much of it is wooded or idle. Because of poor drainage, a seasonal high water table, and flooding, these soils are suited to only a few plants that provide choice foods for wildlife. Suitable plants are browntop millet, white clover, tall fescue, Japanese millet, and smartweed. Many areas can be flooded for duck fields. Beavers have built a few dams. On these soils sites are favorable for dug ponds or for impounding water for large ponds. In areas where water oaks are dominant, green tree reservoirs that are generally free of other plants may be developed for ducks.

WILDLIFE SUITABILITY GROUP 7

Worsham silt loam is the only soil in this wildlife group. This nearly level soil is poorly drained and is on first bottoms or very low stream terraces. The surface layer is mainly silt loam but ranges from fine sandy loam to loam and silty clay loam. Beneath the surface layer is gray material ranging from fine sandy clay loam to silty clay loam. The first bottoms are flooded more than once a year, and this flooding lasts from 2 to 7 days. This soil has a seasonal high water table, 0 to 15 inches below the surface, 2 to 6 months per year. Many of these areas cannot be drained, because they lack outlets. Most of the year this soil is too wet to be worked.

The acreage of this soil is small, and most of it is in water-tolerant hardwoods. Because of poor drainage, a high water table, and flooding, the soil is chiefly limited to Japanese millet and smartweed for ducks and woody plants

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for beavers. Most areas can be flooded for duck fields. Beavers have built many dams on this soil. Water can be impounded for lakes, or ponds can be dug.

Engineering Uses of the Soils [4]

Soil engineering is an important part of structural engineering. In a broad sense, it is a subdivision of structural engineering because it deals with soils as structural material or with soils as foundation material upon which structures rest. Soils are natural materials that occur in great variety, and their engineering properties may vary widely within the relatively small space of a single project. Soils generally are used in the location and condition in which they are found. A large part of soil engineering practice consists of locating the various soils, determining their engineering properties, correlating these properties with job requirements, and selecting the best soil material for the job.

This soil survey contains information about the soils that is helpful to engineers. Special emphasis has been placed on engineering properties of the soils as they relate to the construction of irrigation systems, farm ponds, terraces, waterways, agricultural drainage systems, and other structures that conserve soil and water.

This soil survey contains information that engineers can use to—

1. Make studies of soil and land use that will aid in selecting and developing sites for industries, business, residences, and recreational areas.
2. Make reconnaisance surveys of soil and ground conditions that will aid in selecting locations for highways, pipelines, airports, and telephone lines.
3. Locate probable sources of gravel and other construction material.
4. Correlate pavement performance with soil mapping units, and thus develop information that will be useful in designing and maintaining certain engineering structures and other engineering uses.
5. Supplement information obtained from other published maps and reports and from aerial photographs.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Engineers in the Soil Conservation Service collaborated with soil scientists in preparing this section. The information in the section was obtained by combining the knowledge of engineers and soil scientists with information obtained from laboratory tests and field experience so that interpretations of soil properties could be made in a way that helps engineers in the area.

With the use of the soil map for identification, the interpretations made in this soil survey can be useful for many purposes. It should be emphasized, however, that these interpretations are not a substitute for sampling and testing needed at a site chosen for a specific engineering work where heavy loads are involved or at a site where the excavations are to be deeper than the depth here reported. Also, engineers should not apply specific values to estimates of bearing capacity given in this survey. Nevertheless, by using this survey, an engineer can select and concentrate on those soil units most important for the proposed kind of construction, and in this way reduce the number of soil samples taken for laboratory testing and complete an adequate investigation at minimum cost.

Some of the terms used by the agricultural soil scientist may be unfamiliar to the engineer, and some terms may have special meanings in soil science. These and other special terms used in the soil survey are defined in the Glossary in the back of this survey.

Much of the information in this section is in tables 3, 4, and 5. Table 3 gives test data obtained from the testing of samples taken from representative soils in Carroll and Haralson Counties. These tests were performed by the State Highway Department of Georgia. Table 4 gives estimated engineering properties of soils. In table 5, the soils are rated as a source of materials used in road construction, and soil features that adversely affect engineering structures and practices are named.

In addition to the information in this section, other information valuable to engineers is included in this soil survey. The sections "How This Survey Was Made" and "Descriptions of the Soils" are particularly helpful. In the section "Nonfarm Uses of Soils" the degree of limitation for selected nonfarm uses is rated and the chief limiting properties are given.

Engineering classification systems

Two systems of classifying soils are in general use among engineers. Both are used in this survey.

The Unified system (*8*) was developed by the U.S. Army, Corps of Engineers. In this system soil materials are classified according to their texture and plasticity and are grouped according to their performance as construction material. Soil material is identified as coarse grained (eight classes), fine grained (six classes), and highly organic (one class). An approximate classification by this system can be made in the field.

Many highway engineers use the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified in seven principal groups. The groups range from A–1, consisting of gravelly soils of high bearing capacity, to A–7, consisting of clayey soils having low strength when wet. In each group the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from 0 for the best material to 20 for the poorest. The group index number is shown in table 3 in parentheses following the soil group symbol, for example, A–4(5).

Engineering test data

Table 3 gives the results of tests on selected soil samples. These tests were made by the State Highway Department of Georgia, in cooperation with the U.S. Department of Commerce, Bureau of Public Roads, according to

[4] D. L. PAYNE, JR., agricultural engineer, Soil Conservation Service, assisted in the preparation of this section.

standard procedures of the American Association of State Highway Officials (AASHO). Each soil series tested was sampled in two or more localities so that the range in characteristics would be closer to the true range than it would be if samples were taken from only one locality. The modal profiles are typical, and the nonmodal profiles represent significant variations. Nevertheless, the data probably do not show the maximum variation in the horizons of each soil series. All of the samples were taken at a depth of less than 8 feet. The test data, therefore, may not be adequate for estimating the characteristics of soil material where deep cuts are required in rolling or hilly terrain. The samples were tested for moisture-density relationships, volume change, grain-size distribution, liquid limit, and plasticity index.

In the moisture-density test, soil material was compacted in a mold several times with a constant compaction effort, each time at a successively higher moisture content. The density, or unit weight, of the soil material increases until the optimum moisture content is reached. After that the density decreases with increase in moisture content. The highest density obtained in the compaction test is termed maximum dry density. Data showing moisture density are important in earthwork, for as a rule, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum content.

The data on volume change indicate the amount of shrinking and swelling measured on samples prepared at optimum moisture content and then subjected to drying and wetting. The total change that can occur in a specified soil is the sum of the values given for shrinking and swelling.

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

Estimated engineering properties of soils

In table 4 soil characteristics that are significant to engineering are estimated. These estimates are for a typical profile, which is divided into layers significant to engineering. Estimates were based on test data for those soils tested in the two counties. For soils not tested in these counties, estimates were based on test data obtained from similar soils in other counties and on past experience in engineering construction.

In the column showing depth to hard rock, the number of feet listed is from the soil surface down to hard rock. This is the depth to be expected in most of the area. The rock is hard enough to require drilling and blasting before its removal.

The depth to the seasonal high water table refers to the approximate distance, in inches or feet, from the surface down to ground water during the wettest season of the year.

The frequency and duration of floods tell how often the soils are likely to be flooded by water from stream overflow, from runoff, or from seepage, and also how long this water stands on or flows over the soil surface.

Estimated under classification for each horizon are the dominant USDA texture and the two engineering classifications, Unified and AASHO.

The three columns under percentage passing sieve list for each of the major horizons the percentages of soil particles that pass the No. 4, No. 10, and No. 200 sieves. The No. 4 sieve removes the gravel but passes finer particles, the No. 10 sieve removes the coarse sand, and the No. 200 sieve removes medium and fine sand but passes the silt and clay particles.

Permeability of the soil layers, in inches of water percolation per hour, was estimated for the soil in place. These estimates were based on the texture, structure, and porosity of the soils and on field observation.

Available water capacity is the amount of water a soil can hold and make available to plants, in inches per inch of soil depth. It is the approximate amount of water in a soil that is wet to field capacity, minus the amount at the permanent wilting point of plants.

The ratings for shrink-swell potential indicate the volume change resulting from the shrinking of the soil when it dries and the swelling of the soil as it takes up moisture. It is estimated on the basis of the amount and type of clay in the soil layers. In general, soils classified as A–7 and CH have high shrink-swell potential, except for Iredell soil, which has a very high shrink-swell potential. Clean sands and gravels and those soils having a small amount of nonplastic to slightly plastic fines have low shrink-swell potential, as does most other nonplastic to slightly plastic soil material.

Engineering interpretations of soils

Engineering interpretations of the soils in Carroll and Haralson Counties are given in table 5. This table rates the suitability of the soils as sources for topsoil and road fill. It also lists features that adversely affect the location of highways and the construction of farm ponds, drainage systems, irrigation systems, terraces, and waterways. The interpretations were made on the basis of estimates given in table 4, of test data shown in table 3, and of observation of the soils in the field.

A rating of *good*, *fair*, or *poor* is given to show suitability of soil material as a source of topsoil and road fill. Topsoil is material that is suitable for topdressing slopes, road shoulders, and other earth structures that require a plant cover for protection. Severely eroded soils are not suitable sources for topsoil. The suitability of a soil for a source of road fill depends largely on texture, moisture content, and location. Material that will make a stable fill is required. In rating the soils in table 5 for road fill, some consideration was given to the presence of stones and boulders, to the depth to bedrock, and to the presence of excessive moisture.

TABLE 3.—*Engineering*

[Tests performed by State Highway Department of Georgia, in accordance with standard procedures

Soil name and location	Parent material	Report No.	Depth	Moisture-density [1]		Volume change		
				Maximum dry density	Optimum moisture	Shrinkage	Swelling	Total volume change
			Inches	*Lb. per cu. ft.*	*Percent*	*Percent*	*Percent*	*Percent*
Chewacla soils:								
Haralson County: 3 miles north of Buchanan, Ga. (modal).	Recent alluvium.	S63-Ga-						
		71-3-2	2-9	101	18	0.9	17.5	18.4
		3-3	9-30	97	21	2.2	22.1	24.3
Haralson County: 7 miles northeast of Buchanan, Ga. (modal).	Recent alluvium.	4-1	0-7	99	20	2.7	20.7	23.4
		4-4	22-42	98	22	4.1	12.8	16.9
Davidson gravelly loam:								
Carroll County: 3 miles southwest of Villa Rica, Ga. (modal).	Acidic and basic rock.	S63-Ga-						
		22-6-1	0-5	116	14	7.2	.2	7.4
		6-3	10-37	101	21	3.9	3.4	7.3
		6-5	57-72	93	24	11.6	6.5	18.1
Carroll County: 2 miles southwest of Carrollton, Ga. (thinner than in modal profile).	Acidic and basic rock.	4-1	0-3	107	16	8.2	.8	9.0
		4-4	21-45	96	23	12.7	5.5	18.2
		4-5	45-62	104	19	3.6	8.1	11.7
Carroll County: 2.5 miles northwest of Hulett, Ga. (intergrade to Madison).	Acidic and basic rock.	5-1	0-5	123	10	.1	5.6	5.7
		5-3	9-23	109	15	6.8	2.0	8.8
		5-5	37-52	104	17	.6	6.2	6.8
Hulett gravelly sandy loam:								
Carroll County: 2 miles northeast of Bowdon, Ga. (modal).	Granite and gneiss.	S63-Ga-						
		22-8-1	0-6	109	14	1.1	1.6	2.7
		8-3	9-27	91	27	16.2	5.3	21.5
		8-5	43-60	95	24	4.6	23.5	28.1
Carroll County: 1 mile east of Bowdon Junction, Ga. (thin solum intergrade).	Granite and gneiss.	7-1	0-7	120	11	.2	1.6	1.8
		7-4	20-37	92	26	6.3	4.8	11.1
		7-5	37-60	93	23	3.9	17.2	21.1
Haralson County: 3 miles northwest of Temple, Ga. (intergrade to Grover).	Granite and gneiss.	S63-Ga-						
		71-1-1	0-8	118	12	1.3	3.3	4.6
		1-3	13-28	85	31	6.4	13.2	19.6
		1-5	39-60	94	24	3.1	16.2	19.3
Louisa gravelly fine sandy loam:								
Carroll County: 6 miles north of Carrollton, Ga. (modal).	Gneiss and schist.	S63-Ga-						
		22-2-5	5-12	114	14	3.4	2.7	6.1
		2-6	12-36	107	16	1.4	4.6	6.0
Carroll County: 3 miles southeast of Lowell, Ga. (heavy).	Gneiss and schist.	1-3	0-5	111	15	1.4	3.8	5.2
		1-4	5-24	107	18	6.5	2.6	9.1
Carroll County: 2 miles southwest of Temple, Ga. intergrade to Grover).	Gneiss and schist.	3-2	5-12	117	14	3.1	1.6	4.7
		3-3	13-23	106	17	3.6	5.0	8.6

[1] Based on AASHO Designation T99-57, Methods A and C (*1*). (Method A was used for samples containing less than 5 percent of the particles retained by the No. 4 sieve, and method C was used for the other samples.)

[2] Mechanical analysis according to the AASHO Designation T88-57 (*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 mm. in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis used in this table are not suitable for use in naming textural classes for soils.

test data

of the American Association of State Highway Officials (AASHO) (1)]

Mechanical analysis [2]												Liquid limit	Plasticity index	Classification	
Percentage passing sieve—								Percentage smaller than—						AASHO [3]	Unified [4]
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.				
			100	99	98	93	50	47	33	15	10	[5] NP	[5] NP	A–4(3)	SM
					100	99	76	73	55	27	18	31	NP	A–4(8)	ML
				100	99	98	54	48	35	15	11	NP	NP	A–4(4)	ML
			100	99	97	95	63	61	47	23	16	27	NP	A–4(6)	ML
	100	99	98	97	93	89	51	49	44	30	26	21	10	A–4(3)	CL
100	99	99	98	96	90	88	61	60	55	47	42	38	15	A–6(7)	ML–CL
					100	99	62	62	56	40	30	NP	NP	A–4(5)	ML
100	99	98	96	94	90	81	50	47	38	23	20	35	19	A–6(6)	SC
				100	99	90	70	69	64	44	35	56	32	A–7–6(18)	CH
				100	98	76	57	57	51	34	26	35	11	A–6(5)	ML–CL
			100	99	97	73	34	32	27	17	13	NP	NP	A–2–4(0)	SM
100	99	98	96	95	94	76	54	54	47	37	33	34	18	A–6(7)	CL
					100	68	36	35	30	20	17	NP	NP	A–4(0)	SM
		100	99	97	93	96	32	32	24	15	12	NP	NP	A–2–4(0)	SM
				100	99	92	72	71	70	54	47	49	22	A–7–6(14)	ML–CL
			100	99	97	88	59	58	49	33	28	NP	NP	A–4(5)	ML
100	97	95	87	82	78	66	24	19	14	8	6	NP	NP	A–2–4(0)	SM
				100	99	94	64	56	51	44	42	49	18	A–7–5(10)	ML
		100	99	98	97	84	57	56	52	33	30	NP	NP	A–4(4)	ML
[6] 99	97	96	94	92	90	70	32	32	24	14	11	NP	NP	A–2–4(0)	SM
				100	99	95	77	76	71	61	53	60	32	A–7–6(20)	CH
100	99	98	96	94	91	79	44	42	37	19	16	NP	NP	A–4(2)	SM
	100	96	90	80	72	62	29	28	22	13	10	NP	NP	A–2–4(0)	SM
		100	92	83	77	56	12	11	7	6	5	NP	NP	A–2–4(0)	SW–SM
[6] 99	97	96	89	82	71	49	27	25	18	12	10	NP	NP	A–2–4(0)	SM
				98	92	54	31	30	23	16	14	NP	NP	A–2–4(0)	SM
		100	96	89	77	60	27	26	20	13	10	NP	NP	A–2–4(0)	SM
		100	99	94	85	57	18	17	15	12	12	NP	NP	A–2–4(0)	SM

[3] Based on AASHO Designation: M145–49 (*1*).

[4] Based on the Unified Soil Classification System, Technical Memorandum No. 3–357 (*8*). SCS and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within two points from A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are ML–CL and SW–SM.

[5] Nonplastic.

[6] 100 percent passes the 2-inch sieve.

TABLE 4.—*Estimated*

Soil series and map symbol	Depth to hard rock	Depth to seasonal high water table	Frequency and duration of floods	Depth from surface to major horizons
	Feet			*Inches*
Augusta (AsI, AwB)	10+	0 to 25 inches for 1 to 2 months each year.	Once in 1 to 5 years for 2 to 7 days.	0–9 9–72 72–96
Buncombe (Bfs)	15+	30 to 60 inches for 1 to 2 months each year.	Once in 1 to 5 years for less than 2 days.	0–54
Chewacla (Cfs)	8+	0 to 25 inches for 1 to 2 months each year.	More often than once each year for 2 to 7 days.	0–30 30–46
Congaree (Cng)	15+	20 to 36 inches for 1 to 2 months each year.	Once in 1 to 5 years for less than 2 days.	0–52
Davidson (DrB2, DrC2, DrD2, DsB3[1], DsC3[1], DsD3[1]).	6+	More than 5 feet	None.	0–4 4–36 36–60
Grover (GlB2, GlC2, GlD)	10+	More than 5 feet	None.	0–5 5–36 36–54
Hulett (HhB, HhB2, HhC2, HhD2, HgD3 [1]).	10+	More than 5 feet	None.	0–6 6–43 43–60
Iredell (IaB2)	2–5	15 to 30 inches for 1 to 2 months each year.	None.	0–4 4–38 38–48
Louisa (LkC, LkD, LkE)	10+	More than 5 feet	None.	0–12 12–34
Louisburg (LDD, LDE)	2–5	More than 5 feet	None.	0–7 7–42 42
Madison (MhB2, MhC2, MhD2, MhE, MDB3 [1], MDD3 [1], MDC3 [1]).	10+	More than 5 feet	None.	0–5 5–32 32–42
Masada (MoB, MpB, MpC2)	8–20	More than 3 feet	None.	0–7 7–72
Musella (MuD2, MwE2)	1–5	More than 5 feet	None.	0–18 18
Tallapoosa (TiC2, TiD2, TiE2, ThD3 [1], ThE3 [1]).	10+	More than 5 feet	None.	0–4 4–17 17–52
Wilkes (WjD, WjE)	2–5	More than 3 feet	None.	0–6 6–48
Worsham (Wsl)	10+	0 to 15 inches for 2 to 6 months each year.	More often than once every year for 2 to 7 days.	0–9 9–60

[1] Because of severe erosion, the surface layer of this mapping unit is more clayey than the surface layer given in this table for the soil series. In AASHO and Unified ratings, the surface layer of this mapping unit more nearly resembles the subsoil given for the series.

engineering properties of soils

Classification			Percentage passing sieve—			Permeability	Availabl water capacity	Shrink-swell potential
Dominant USDA texture	Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	*Inches per hour*	*Inches per inch of soil*	
Loam	SM, ML	A–4	100	95–100	36–55	>6. 3	0. 14	Low.
Sandy clay loam and clay loam.	ML, CL	A–6	100	90–100	60–80	0. 63–2. 0	. 17	Moderate.
Loam to sandy clay loam	ML, SM	A–4	100	90–100	45–75	0. 63–2. 0	. 15	Low.
Loamy sand	SM	A–2–4	95–100	95–100	10–30	>6. 3	. 07	Low.
Silt loam	SM, ML	A–4	95–100	95–100	45–65	0. 63–2. 0	. 18	Low.
Sandy clay loam	ML	A–4	95–100	95–100	55–75	0. 63–2. 0	. 15	Low to moderate.
Fine sandy loam and sandy loam.	SM, ML	A–2, A–4	95–100	95–100	20–52	0. 63–2. 0	. 15	Low.
Gravelly loam	ML, CL, SM	A–4, A–6, A–2	90–100	80–100	34–60	2. 0–6. 3	. 13	Moderate to low.
Clay	ML, MH, CL, CH	A–5, A–7, A–6	95–100	75–100	55–70	0. 63–2. 0	. 15	Moderate to high.
Clay loam	CL, ML	A–6, A–4	95–100	95–100	55–75	0. 63–2. 0	. 15	Moderate to low.
Gravelly fine sandy loam	SM	A–2	90–95	80–85	25–35	6. 3	. 12	Low.
Silty clay loam	ML, CL	A–6, A–7	95–100	95–100	65–85	0. 63–2. 0	. 15	Moderate.
Soft mica schist	ML, SM	A–4, A–5	55–75	55–65	36–55	2. 0–6. 3	. 12	Low.
Gravelly sandy loam	SM	A–2	80–100	80–95	25–35	6. 3	. 12	Low.
Clay to clay loam	CL, CH, ML	A–6, A–7	95–100	95–100	60–80	0. 63–2. 0	. 13	Moderate to high.
Soft mica schist	SM, ML	A–4	90–100	80–100	40–60	2. 0–6. 3	. 11	Low.
Gravelly fine sandy loam	ML, SC	A–4	95–100	80–85	36–55	6. 3–2. 0	. 15	Low.
Clay	CH	A–7	100	100	75–95	<0. 2	. 16	Very high.
Silt loam	CH, MH	A–7	80–100	70–90	50–65	<0. 2	. 15	Moderate.
Gravelly fine sandy loam	SM	A–2–4	80–90	70–80	20–35	2. 0–6. 3	. 12	Low.
Micaceous soil material	SM	A–2–4	80–100	70–85	15–30	2. 0–6. 3	. 08	Low.
Stony loamy sand	SM	A–2	70–90	80–90	15–35	>6. 3	. 06	Low.
Coarse sandy loam	SM, SC	A–2, A–4	80–90	70–90	25–45	2. 0–6. 3	. 08	Low.
Hard granitic rock (boulders).								
Gravelly fine sandy loam	SM	A–2, A–4	90–95	80–90	25–45	>6. 3	. 11	Low.
Clay to clay loam	CL, MH	A–7	95–100	95–100	60–80	0. 63–2. 0	. 14	Moderate to high.
Micaceous soil material	SM, ML	A–4, A–5	80–95	75–85	36–55	0. 63–2. 0	. 11	Low.
Gravelly sandy loam	SM	A–2, A–4	75–85	75–90	25–45	>6. 3	. 12	Low.
Sandy clay loam to silty clay loam.	CL, ML	A–6, A–7	95–100	95–100	50–60	0. 63–2. 0	. 13	Moderate.
Gravelly clay loam	SC, CL	A–6	70–85	65–75	40–65	0. 63–2. 0	. 11	Moderate.
Fractured rock						0. 63–2. 0		
Gravelly fine sandy loam	SM	A–2	80–90	80–85	20–35	>6. 3	. 11	Low.
Clay loam	ML, CL, SM	A–6, A–7	80–95	70–85	45–65	0. 63–2. 0	. 14	Moderate.
Micaceous soil material	SM	A–2	80–90	70–85	15–30	2. 0–6. 3	. 08	Low.
Stony loam	SM, ML	A–4	70–80	70–80	36–55	>6. 3	. 12	Low.
Silt loam to silty clay loam	SM, CL	A–4, A–6	60–70	60–70	45–65	0. 63–2. 0	. 15	Moderate to low.
Hard granitic rock.								
Silt loam	ML	A–4	95–100	90–100	50–65	0. 63–2. 0	. 16	Low.
Silty clay to clay	ML, MH	A–6, A–7	95–100	95–100	55–75	<0. 2	. 14	High to moderate.

TABLE 5.—*Engineering*

Soil series and map symbol	Suitability as source of—		Soil features adversely affecting—		
	Topsoil	Road fill	Highway location	Farm ponds	
				Reservoir area	Embankment
Augusta (Asl, AwB)	Poor	Poor	Susceptibility to frequent flooding; seasonal high water table.	No adverse features	Soil wet part of time; low stability.
Buncombe (Bfs)	Fair to poor.	Good	Susceptibility to frequent flooding.	Excessive seepage due to rapid permeability.	Excessive seepage due to rapid permeability.
Chewacla (Cfs)	Good	Fair	Susceptibility to very frequent flooding; seasonal high water table.	No adverse soil features but limited mainly to dug ponds.	Soil wet part of time; low stability; poorly graded material.
Congaree (Cng)	Good	Fair	Susceptibility to frequent flooding; seasonal high water table.	No adverse features but limited mainly to dug ponds.	Poorly graded material; moderate strength and stability.
Davidson (DrB2, DrC2, DrD2, DsB3, DsC3, DsD3).	Fair	Poor	No adverse features	No adverse features	Moderate shrink-swell potential; susceptible to moderate cracking.
Grover (GlB2, GlC2, GlD)	Fair	Fair	No adverse features	No adverse features	No adverse features
Hulett (HhB, HhB2, HhC2, HhD2, HgD3).	Fair	Fair	Seepage at toe slopes	No adverse features	No adverse features
Iredell (IaB2)	Fair	Poor	Seasonal high water table; high shrink-swell potential.	No adverse features	High shrink-swell potential; low stability; susceptible to cracking.
Louisa (LkC, LkD, LkE)	Fair	Fair	Shallow to soft, weathered rock.	Moderately rapid permeability; excessive seepage likely where cuts reach into soft weathered rock.	Low strength and poor stability; excessive seepage likely.
Louisburg (LDD, LDE)	Fair	Fair	Shallow to granitic boulders.	Moderately rapid permeability; excessive seepage likely.	Moderately rapid permeability; excessive seepage likely.
Madison (MhB2, MhC2, MhD2, MhE, MDB3, MDC3, MDD3).	Fair	Fair	No adverse features	No adverse features	No adverse features
Masada (MoB, MpB, MpC2).	Fair	Fair	No adverse features	No adverse features	No adverse features
Musella (MuD2, MwE2)	Poor	Fair	Shallow or moderately shallow to bedrock; moderate shrink-swell potential.	Excessive seepage likely where cuts reach weathered or fractured rock.	Poorly graded material; coarse fragments common.
Tallapoosa (TiC2, TiD2, TiE2, ThD3, ThE3).	Fair	Fair	Shallow to soft, weathered rock.	Excessive seepage likely where cuts reach into soft weathered rock.	Low strength and poor stability; excessive seepage likely.
Wilkes (WjD, WjE)	Fair	Poor	Shallow over stones and boulders; strong to steep slopes.	Shallow soil; excessive seepage likely where cuts reach weathered or fractured rock.	Poorly graded material; low strength and stability; excessive seepage.
Worsham (Wsl)	Poor	Poor	Seasonal high water table; very frequent flooding; high to moderate shrink-swell potential.	No adverse features	Soil wet during most of year; high to moderate shrink-swell potential.

interpretations of the soils

	Soil features adversely affecting—Continued		
Agricultural drainage	Irrigation	Terraces	Waterways
Frequent flooding; seasonal high water table.	Soil features favorable	Not needed	Not needed.
Not needed	Rapid permeability and low available water capacity.	Not needed	Not needed.
Susceptibility to very frequent flooding; seasonal high water table; outlets not available in all areas.	Generally not needed	Not needed	Not needed.
Susceptibility to frequent flooding; seasonal high water table.	Soil features favorable	Not needed	Not needed.
Not needed	Soil features favorable in less eroded areas that have slopes of less than 10 percent.	Soil features favorable on slopes of less than 10 percent.	Moderately erodible.
Not needed	Soil features favorable	Soil features favorable on slopes of less than 10 percent.	Highly erodible.
Not needed	Soil features favorable	Soil features favorable	Highly erodible.
Not needed	Slow permeability in subsoil and slow infiltration.	Difficult to shape with standard farm equipment.	Moderately erodible.
Not needed	Low available water capacity and productivity.	Terraces not recommended on slopes steeper than 10 percent.	Not recommended.
Not needed	Low available water capacity and productivity.	Stones and boulders on or near surface; steep slopes.	Stones and boulders on or near surface.
Not needed	No adverse features on soils with slopes of less than 6 percent.	Soil features favorable on slopes of less than 10 percent.	Moderately erodible.
Not needed	Soil features favorable	Soil features favorable	Moderately erodible.
Not needed	Slow infiltration; low productivity.	Shallow to rock; stones and boulders common.	Moderately erodible; difficult to establish and maintain vegetation in cuts.
Not needed	Low productivity	Terraces not recommended on slopes steeper than 10 percent.	Highly erodible.
Not needed	Low productivity	Stones and boulders within the soil profile.	Moderately erodible; difficult to establish and maintain vegetation in cuts.
Seasonal high water table; very frequent flooding; outlets not available in all areas.	Slow infiltration and permeability; high available water capacity.	Not needed	Not needed.

Figure 16.—**This rock quarry in an area of a Louisburg stony loamy sand is operated by the Carroll County Government to provide crushed stone for surfacing roads. Sources of stones in the two counties are widely distributed.**

Sources of sand, gravel, and stones are available in the two counties, but investigation at specified locations is needed to determine suitability of the sources (fig. 16). None of the soils in the county are suitable as coarse or fine aggregate for concrete.

The selection of highway locations is affected by a seasonal high water table, flooding, seepage, moderate to high shrink-swell potential, shallowness to bedrock, steep slopes, and stones and boulders.

Some soils have features that make them unfavorable for use as the reservoir areas of farm ponds and as sources of embankment material. The unfavorable features should be carefully evaluated in selecting reservoir and embankment sites (fig. 17). Greater than normal water loss can be expected in reservoir areas located on soils that have rapid permeability and rapid seepage. Soils that have slow permeability are generally suitable for reservoirs. Stable embankments generally can be constructed with earth material that has moderate strength and stability.

Agricultural drainage is required on some soils on first bottoms and low terraces. Soils that have moderate permeability can be drained satisfactorily if adequate outlets are available. Subsurface drainage is difficult on soils that have slow permeability.

Generally, only soils on which crop growth can be sustained are suitable for irrigation. Best results are obtained on well-drained soils that have moderate to moderately rapid infiltration and high available water capacity.

Terraces and waterways for control of erosion can be established in upland areas that are suitable for cultivation. Stones, boulders, shallowness to bedrock, and steep slopes are detrimental soil features. Where slopes are 10 percent or more, terraces are difficult to construct and maintain. Also, establishing waterways is made difficult by erodibility of the soil and the difficulty in establishing vegetation.

Nonfarm Uses of Soils

In table 6 the soils of Carroll and Haralson Counties are rated according to the degree of limitations for use as foundations for houses; filter fields; oxidation ponds; campsites; picnic areas; intensive play areas; golf fairways; light industries; and trafficways. The ratings are slight, moderate, and severe. If a rating is moderate or severe, the main limitation or limitations are given. For selecting sites and in planning nonfarm uses, these ratings are helpful if they are used with the soil map at the back

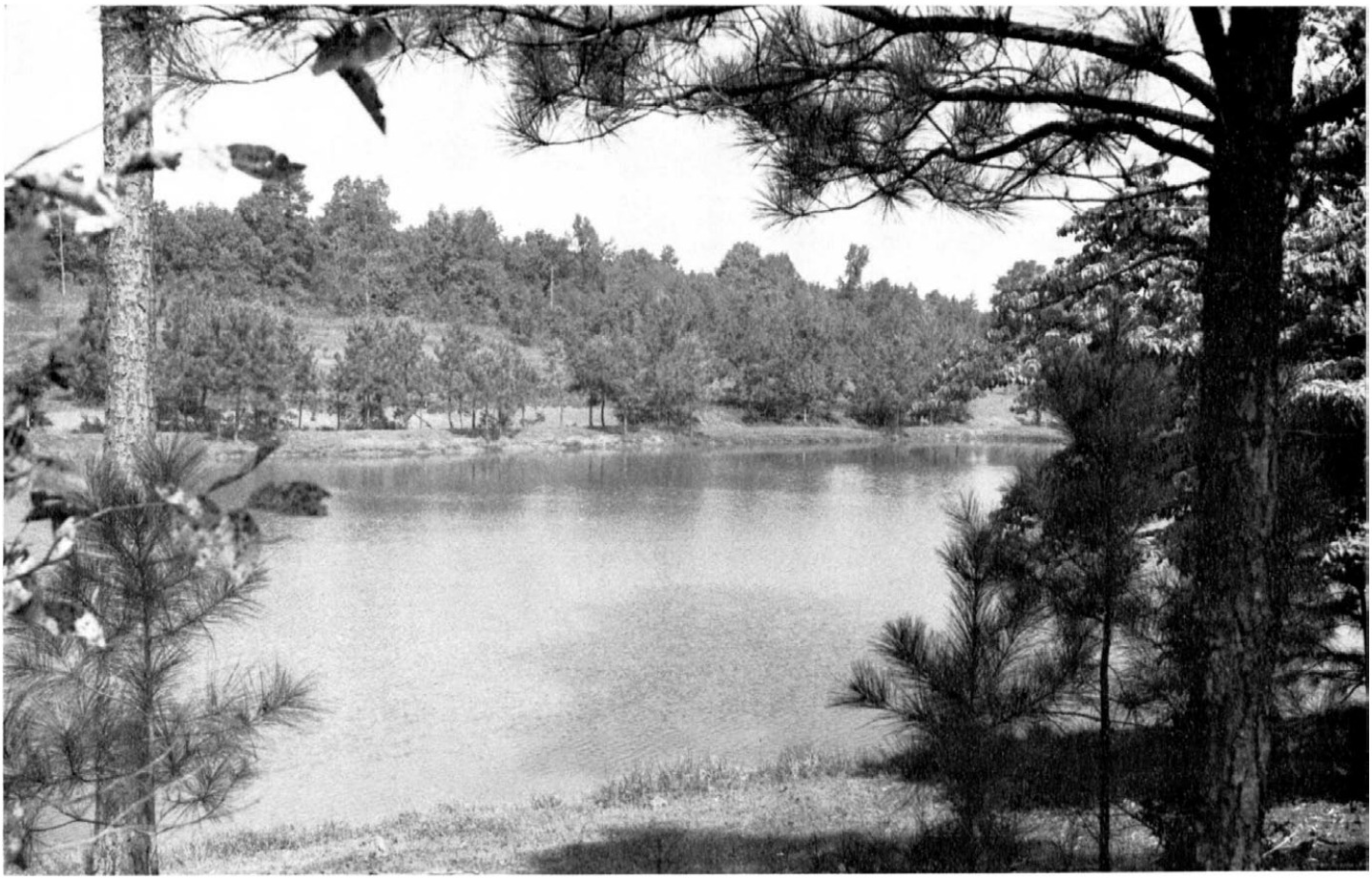

Figure 17.—**Well-managed fish pond reservoir on a Chewacla soil. The embankment on the far side of the pond is a Madison soil.**

of this survey. Also helpful are engineering tables 4 and 5. None of these tables or other information in this survey, however, eliminate the need for an investigation at the site of the planned development.

A rating of slight for a soil in table 6 means that, for the nonfarm use specified, the soil can be used much as it occurs naturally on the landscape. For a soil rated moderate or severe, modification of the soil is needed before it can be used for the purpose specified. Soils that have moderate limitations generally can be corrected by moderate adjustment, but extensive site preparation is needed on soils rated severe.

In the following paragraphs, the nonfarm uses listed in table 6 are defined and properties that cause limitations to use are discussed.

Foundations for houses refer to houses of three stories or less. The chief limiting factors considered in evaluating soils that may be used for this purpose are shrink-swell potential, flood hazard, slope, and depth to hard rock.

Filter fields are needed on homesites that are not serviced by a community or a public sewage system. These septic tanks dispose of sewage through absorption by the soil. Properties important in evaluating soils for septic tank filter fields are percolation rate, flood hazard, slope, depth to hard rock, and depth to seasonal high water table.

Where used as filter fields for septic tanks, soils generally function satisfactorily if the percolation rate is faster than 45 minutes per inch of soil. They have moderate limitations if the rate is between 45 and 75 minutes per inch. Limitations are severe if the rate is slower than 75 minutes per inch.

Oxidation ponds, sometimes called sewage lagoons, are shallow lakes that hold community sewage until it has been decomposed by bacteria. The soils are rated according to their limitations if used as a floor for the impounded area and as material for the dike. The requirements for the dike are the same as for other embankments that hold impounded water. Requirements for the floor of the pond are effective sealing against seepage, an even surface of low gradient and low relief, little or no organic matter, and a depth for the sewage of not less than 2 feet and not more than 5 feet. Properties important in evaluating soils for oxidation ponds are permeability, reservoir site material, depth to hard rock, slope, coarse fragments, and content of organic matter.

Campsites are areas suitable for tent sites and for activities related to outdoor living for periods of at least a week. Suitability for septic tanks is not required, and little site preparation is needed. Soil wetness, however, is a severe limitation. Properties important in evaluating soils for campsites are slope, trafficability, and inherent erodibility. Trafficability refers to the difficulty or ease

TABLE 6.—*Degree of soil limitation for selected*

Soils and map symbols	Foundations for houses	Sewage disposal		Recreation
		Filter fields	Oxidation ponds	Campsites
Augusta (Asl, AwB)	Severe: seasonal high water table.	Severe: seasonal high water table.	Slight	Severe: seasonal high water table; surface ponding.
Buncombe (Bfs)	Severe: flood hazard	Severe: flood hazard	Severe: rapid seepage; flood hazard.	Severe: flood hazard
Chewacla (Cfs)	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard[1]	Severe: flood hazard
Congaree (Cng)	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard[1]	Severe: flood hazard
Davidson:				
(DrB2)	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight
(DrC2)	Slight	Slight	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.
(DrD2, DsD3)	Moderate: 10 to 15 percent slopes.	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
(DsB3, DsC3)	Slight	Slight	Moderate to severe: 2 to 10 percent slopes.	Severe: clayey surface layer.
Grover:				
(GlB2)	Slight	Moderate: moderate percolation rate.	Moderate: 2 to 6 percent slopes.	Slight
(GlC2)	Slight	Moderate: moderate percolation rate.	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.
(GlD)	Moderate: 10 to 15 percent slopes.	Moderate: moderate percolation rate.	Severe: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
Gullied land (Gul)	Severe: inherent erodibility.	Severe: inherent erodibility.	Severe: inherent erodibility.	Severe: inherent erodibility.
Hulett:				
(HhB, HhB2)	Slight	Moderate: moderate percolation rate.	Moderate: 2 to 6 percent slopes.	Slight
(HhC2)	Slight	Moderate: moderate percolation rate.	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.
(HhD2, HgD3)	Moderate: 10 to 15 percent slopes.	Moderate: moderate percolation rate.	Severe: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
Iredell (IaB2)	Severe: high shrink-swell potential.	Severe: slow percolation rate.	Moderate: 2 to 6 percent slopes.	Moderate: surface ponding.
Louisa:				
(LkC)	Moderate: shallow depth to soft rock.	Severe: slow percolation rate in substratum.	Severe: shallow depth to soft rock.	Slight
(LkD, LkE)	Severe: shallow depth to soft rock: 10 to 40 percent slopes.	Severe: slow percolation rate in substratum.	Severe: shallow depth to soft rock; 10 to 40 percent slopes.	Severe: 10 to 40 percent slopes.
Louisburg (LDD, LDE)	Severe: 2 to 5 feet to hard rock; 10 to 25 percent slopes.	Severe: slow percolation rate in substratum.	Severe: 2 to 5 feet to hard rock; 10 to 25 percent slopes.	Severe: 10 to 25 percent slopes.
Madison:				
(MDB3, MDC3)	Slight	Moderate: moderate percolation rate.	Slight to moderate: 2 to 10 percent slopes.	Severe: clayey surface layer.
(MhD2, MDD3)	Moderate: 10 to 15 percent slopes.	Moderate: moderate percolation rate.	Severe: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
(MhB2)	Slight	Moderate: moderate percolation rate.	Moderate: 2 to 6 percent slopes.	Slight
(MhC2)	Slight	Moderate: moderate percolation rate.	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.
(MhE)	Moderate: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.
Masada:				
(MoB)	Moderate: brief flood hazard.	Moderate: brief flood hazard.	Moderate: 2 to 6 percent slopes.	Moderate: brief flood hazard.
(MpB)	Slight	Slight	Moderate: 2 to 6 percent slopes.	Slight
(MpC2)	Slight	Slight	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.

nonfarm uses and the chief limiting properties

Recreation—Continued			Light industries	Trafficways
Picnic areas	Intensive play areas	Golf fairways		
Severe: seasonal high water table.	Severe: seasonal high water table; surface ponding.	Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: seasonal high water table; moderate traffic-supporting capacity.
Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard	Severe: flood hazard.
Severe: flood hazard Severe: flood hazard	Severe: flood hazard Severe: flood hazard	Severe: flood hazard Severe: flood hazard	Severe: flood hazard Severe: flood hazard	Severe: flood hazard. Severe: flood hazard.
Slight	Slight	Slight	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity; inherent erodibility.
Slight	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: fair traffic-supporting capacity; inherent erodibility.
Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: fair traffic-supporting capacity; 10 to 15 percent slopes.
Severe: clayey surface layer.	Severe: clayey surface layer; 2 to 10 percent slopes.	Moderate: clayey surface layer.	Moderate: 2 to 10 percent slopes.	Moderate: fair traffic-supporting capacity; inherent erodibility.
Slight	Slight	Slight	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Slight	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Moderate: 10 to 15 percent slopes. Severe: inherent erodibility.	Severe: 10 to 15 percent slopes. Severe: inherent erodibility.	Moderate: 10 to 15 percent slopes. Severe: inherent erodibility.	Severe: 10 to 15 percent slopes. Severe: inherent erodibility.	Moderate: fair traffic-supporting capacity. Severe: inherent erodibility.
Slight	Slight	Slight	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Slight	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Moderate: 10 to 15 percent slopes. Moderate: surface ponding.	Severe: 10 to 15 percent slopes. Moderate: surface ponding.	Moderate: 10 to 15 percent slopes. Moderate: surface ponding.	Severe: 10 to 15 percent slopes. Severe: high shrink-swell potential.	Moderate: fair traffic-supporting capacity. Severe: high shrink-swell potential.
Slight	Severe: shallow depth to soft rock.	Severe: shallow depth to soft rock.	Moderate: shallow depth to soft rock.	Moderate: shallow depth to soft rock.
Moderate: 10 to 40 percent slopes.	Severe: shallow depth to soft rock; 10 to 40 percent slopes.	Severe: shallow depth to soft rock; 10 to 40 percent slopes.	Severe: shallow depth to soft rock; 10 to 40 percent slopes.	Moderate: shallow depth to soft rock; 10 to 40 percent slopes.
Moderate: 10 to 25 percent slopes.	Severe: 2 to 5 feet to hard rock; 10 to 25 percent slopes.	Severe: 2 to 5 feet to hard rock; 10 to 25 percent slopes.	Severe: 2 to 5 feet to hard rock; 10 to 25 percent slopes.	Moderate: 2 to 5 feet to hard rock; 10 to 25 percent slopes.
Severe: clayey surface layer. Moderate: 10 to 15 percent slopes.	Severe: clayey surface layer. Severe: 10 to 15 percent slopes.	Moderate: clayey surface layer. Moderate: 10 to 15 percent slopes.	Moderate: 2 to 10 percent slopes. Severe: 10 to 15 percent slopes.	Moderate: fair traffic-supporting capacity. Moderate: fair traffic-supporting capacity.
Slight	Slight	Slight	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Slight	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Moderate: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Moderate: 15 to 25 percent slopes.
Slight	Moderate: brief flood hazard.	Slight to moderate: brief flood hazard.	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Slight	Slight	Slight	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.
Slight	Moderate: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: moderate shrink-swell potential.	Moderate: fair traffic-supporting capacity.

TABLE 6.—*Degree of soil limitation for selected*

Soils and map symbols	Foundations for houses	Sewage disposal		Recreation
		Filter fields	Oxidation ponds	Campsites
Musella (MuD2, MwE2)	Moderate: 1 to 5 feet to hard rock; 10 to 25 percent slopes.	Severe: 1 to 5 feet to hard rock.	Severe: 10 to 25 percent slopes.	Severe: 10 to 25 percent slopes.
Tallapoosa: (TiC2)	Slight	Severe: shallow to soft rock.	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.
(TiD2, ThD3)	Moderate: 10 to 15 percent slopes.	Severe: shallow to soft rock.	Severe: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.
(TiE2, ThE3)	Severe: 15 to 25 percent slopes; shallow to soft rock.	Severe: shallow to soft rock.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.
Wilkes (WjD, WjE)	Severe: 10 to 25 percent slopes; 2 to 5 feet to hard rock.	Severe: slow percolation rate in substratum.	Severe: 2 to 5 feet to hard rock.	Moderate: coarse fragments.
Worsham (Wsl)	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Slight	Severe: seasonal high water table; flood hazard.

[1] Limitation is slight in areas adjacent to slopes where flood damage is likely to be slight.

with which people can move about on foot, on horseback, or in a small vehicle. It depends, to a large extent, on wetness.

Picnic areas are areas suitable for pleasure outings at which a meal is eaten outdoors. Little site preparation is needed other than that required for installing picnic tables and a fireplace. The chief requirements are an attractive landscape and good trafficability. Important properties limiting soils for picnic areas are steep slopes, poor trafficability, and inherent erodibility.

Intensive play areas are areas developed for playgrounds and for baseball diamonds, tennis or badminton courts, and other sites for organized games. These areas are subject to much foot traffic, and the soils generally should be nearly level and have good drainage and texture and consistence that give a firm surface. They should be free of coarse fragments and hard rock outcrops. These areas generally are not more than 2 acres. Properties important in rating soils for intensive play areas are slope, depth to hard rock, and trafficability.

Golf fairways are the mowed strips between the tees and putting greens. Properties important in evaluating soils for golf fairways are slope, trafficability, and inherent erodibility.

Light industries refer to buildings other than houses that are used for stores, offices, and small industries, none of which are more than three stories high. It is assumed they have public and community sewage disposal facilities. Properties important in evaluating soils for light industries are slope, depth to hard rock, flood hazard, and shrink-swell behavior.

Trafficways are low-cost roads and residential streets where only limited cut and fill and limited preparation of the subgrade are needed. Properties important in evaluating soils for trafficways are slope, depth to hard rock, flood hazard, inherent erodibility, and traffic-supporting capacity.

Formation and Classification of Soils

The first part of this section discusses the factors of soil formation as they relate to the formation of soils in Carroll and Haralson Counties. Then the processes that affect the development of soil horizons are explained. The third part describes the system of classification currently used and places the soils of the area in some of the categories of that system.

Formation of Soils

Soil is the product of parent material, relief, climate, plant and animal life, and time. The nature of the soil at any given place depends on the combination of these five major factors at that particular place. Each factor acts on the soil, and each modifies the effect of the other four. These factors have had an effect on the formation of every soil throughout the world.

Climate and vegetation are the active factors in soil formation. They act on and change parent material and gradually form soil. The effects of climate and vegetation on parent material are conditioned by relief. Time is needed for changing of the parent material into a soil profile. Some time, whether it is much or little, is needed for horizon differentiation. Distinct horizons usually require a long time.

The five factors that affect soil formation are discussed in the following paragraphs.

Parent material

Parent material is the unconsolidated mass from which a soil develops. It is largely responsible for the chemical and mineralogical composition of soils. The parent material of the soils in about 88 percent of the acreage in Carroll and Haralson Counties formed in place from resid-

nonfarm uses and the chief limiting properties—Continued

Recreation—Continued			Light industries	Trafficways
Picnic areas	Intensive play areas	Golf fairways		
Moderate: 10 to 25 percent slopes.	Severe: 10 to 25 percent slopes.	Moderate to severe: 10 to 25 percent slopes.	Severe: 10 to 25 percent slopes.	Moderate: 10 to 25 percent slopes.
Slight	Severe: 6 to 10 percent slopes.	Moderate: 6 to 10 percent slopes.	Moderate: shallow to soft rock.	Moderate: fair traffic-supporting capacity; shallow to soft rock.
Moderate: 10 to 15 percent slopes.	Severe: 10 to 15 percent slopes.	Moderate: 10 to 15 percent slopes.	Severe: shallow to soft rock; 10 to 15 percent slopes.	Moderate: fair traffic-supporting capacity; shallow to soft rock.
Moderate: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: 15 to 25 percent slopes.	Severe: shallow to soft rock; 15 to 25 percent slopes.	Moderate: fair traffic-supporting capacity; shallow to soft rock.
Moderate: coarse fragments.	Severe: 2 to 5 feet to hard rock; coarse fragments.	Severe: 2 to 5 feet to hard rock.	Severe: 2 to 5 feet to hard rock.	Severe: 2 to 5 feet to hard rock.
Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood hazard.	Severe: seasonal high water table; flood harzard.	Severe: flood hazard	Severe: flood hazard; poor traffic-supporting capacity.

ual material; that is, material weathered from the underlying rock.

According to a geologic map of Georgia (*2*), about 85 percent of the two counties is underlain by biotite gneiss and schist, phyllite, Ashland mica schist, and Wedowee schist. The main residual soils that were derived from these rocks are in the Madison, Grover, Louisa, Tallapoosa, and Hulett series. Most of these soils are highly micaceous.

The remaining 15 percent of the two counties is underlain by Augen gneiss, granite gneiss, and hornblende gneiss. The principal soils that were derived from these rocks are the Davidson and Musella. The clay in these soils is kaolinitic.

Soils that formed in alluvium occupy 12 percent of the two counties. These soils are mainly along larger streams. In about 3 percent of the survey area the soils formed in old alluvium, and in the remaining 9 percent they formed in recent alluvium. Much of the alluvium originated from rocks in the nearby uplands, but some of it was derived from the granitic and metamorphic rocks of the mountains to the northeast.

The soils on the flood plains are forming in recent alluvium and show little profile development. They are still receiving deposits. The principal soils that are forming in recent alluvium are the Buncombe, Congaree, and Chewacla.

The soils of the stream terraces formed in old alluvium and have distinct horizons. Some of the stream terraces are in the flood plain, but others are as high as 50 feet above the flood plain. The principal soils that formed in old alluvium are the Masada, Augusta, and Worsham.

Relief

Relief, or shape of the landscape, affects soil formation through its influence on drainage, erosion, plant cover, and soil temperature. In this area relief is largely determined by the kind of bedrock underlying the soils, by the geology of the area, and by the dissection by streams. The relief in these two counties is gently rolling to hilly and includes narrow stream valleys.

The soils of the survey area have slopes of 0 to 40 percent. Soils of the uplands that have slopes of less than 15 percent are generally thicker and have more distinct horizons than more strongly sloping soils. From soils that have slopes of 15 to 40 percent, geologic erosion removes soil material almost as fast as it is weathered. As a result, most strongly sloping to steep soils have a thin root zone. Louisa, Louisburg, Wilkes, and Musella soils are of this kind.

The uplands range from 1,000 to 1,600 feet above sea level, and the bottom lands range from 700 to 1,000 feet. Partly because of this range in elevation and the many branching drainageways, drainage is good in most upland areas. Excess water moves into the drainage channels rapidly and is removed quickly.

Climate

Climate, as a factor of soil formation, affects the physical, chemical, and biological relationships in the soil profile, primarily through the influence of precipitation and temperature.

Temperature and rainfall have much to do with the rates that rocks weather and minerals decompose. They also influence leaching and transporting of minerals and organic matter through the soil profile. The amount of water that percolates through the soil at a given point depends on rainfall, relative humidity, length of the frost-free period, soil permeability, and physiographic position. Climate, therefore, directly affects the accumulation of parent material and the differentiation of horizons. The effects of climate indirectly control the kinds of plants and animals that can thrive in a region.

The climate of Carroll and Haralson Counties is of the humid, warm-temperature, continental type that is characteristic of the southeastern part of the United States. In this type of climate, the soils are moist much of the time from December 1 through August 31. They are moderately dry much of the time from September 1 through November 30. The surface layer is frozen only a few days each year, and then only to a depth of 1 to 3 inches.

Because the climate is uniform throughout the two counties, it has not caused major local differences among the soils. It has tended to cause similarities, even among soils developed from different kinds of parent material. As expected in this type of climate, most of the soils in the area are highly weathered, leached, strongly acid, and low in natural fertility.

Plant and animal life

The kinds and number of plants and animals that live on and in the soil are, in large part, determined by the climate and, to varying degrees, by the parent material, relief, and time (age of the soil). Bacteria, fungi, and other microorganisms aid in weathering rock and decomposing organic matter. They are important chiefly in horizon differentiation, and to a lesser degree in the accumulation of soil parent materials. Among the changes caused by living organisms are gains in organic matter and nitrogen in the soil, gains or losses in plant nutrients, and changes in structure and porosity.

The larger plants furnish organic matter. They also transfer elements from the subsoil to the surface soil by assimilating those elements into their tissue and then depositing this tissue on the soil surface as fallen fruit, leaves, and stems. When trees are uprooted, soil material is carried to the surface by the upturned roots. Earthworms and other small invertebrates carry on a slow but continual cycle of soil mixing. The fungi and other microorganisms that live in the soil are most numerous in the upper few inches of the profile.

Before 1800, the uplands of the survey area were covered by forests. The forests consisted mainly of oak and hickory but included a few pines. The soils of the first bottoms were generally in yellow-poplar, gum, ash, oak, willow, and beech. Most of the area was cleared and cultivated at a later time, but much of it is now in pines.

Man is important to the future direction and rate of development of the soils because he clears the forests, cultivates the soils, and introduces new kinds of plants. Few results of these activities can yet be seen, except for a sharp reduction in the content of organic matter after a few months of cultivation and, in sloping, cultivated areas, a loss of the coarser textured surface because of accelerated erosion. Some results probably will not be evident for many centuries. Nevertheless, the complex of living organisms affecting soil formation in the survey area has been drastically changed as a result of man's activity.

Time

Generally a long time is required for a soil to form. The length of time that parent materials have been in place, therefore, is usually reflected in the character of the soil.

Where soil material has been in place for a long time, and has approached an equilibrium with its environment, the soil tends to have well-defined and related horizons. Examples of soils of this kind are the Madison, Grover, Hulett, and Davidson of the uplands and the Masada, Augusta, and Worsham of the stream terraces. On the flood plains, the soil material has not been in place long enough for a mature profile to develop. The Buncombe, Congaree, and Chewacla soils are of this kind.

Processes of Horizon Differentiation

Several processes affected the formation of soil horizons in the soils of Carroll and Haralson Counties. These processes are (1) accumulation of organic matter, (2) leaching of bases, (3) formation and translocation of silicate clay minerals, and (4) oxidation, or reduction, and transfer of iron. In most soils, more than one of these processes have been active in the development of horizons.

In most of the soils in these counties organic matter has accumulated in the upper part of the profile, and a thin A1 horizon has formed. This accumulation is greatest in undisturbed areas. After the soil is cleared and cultivated, the losses of organic matter are greater than the gains, and in most soils the organic-matter content reaches a low level.

Leaching of bases has occurred in nearly all of the soils in the survey area. Soil scientists have generally agreed that leaching of bases in soils keeps pace with their release in the breakdown of primary minerals of the rocks. Most of the soils are moderately to strongly leached, and this is reflected by the soils in the counties becoming acid. The Iredell and Wilkes soils formed in saprolite of diorites, diabase, chloritic schist, and the like, and are not so depleted of bases as are other soils in the two counties. Reaction in these soils is about neutral in the horizons below the surface horizon.

In most of the soils in the two counties, the translocation of clay minerals has contributed to horizon development. This is particularly true for the older soils of the uplands and stream terraces. The leached A2 horizons, which are above the B horizons, have a granular structure, contain more sand and less clay than the B horizons, and generally are grayish or brownish. In some places the B horizons have accumulations of clay, as indicated by coatings on the surfaces of blocky peds. These characteristics reflect losses of iron and clay and additions of organic matter. Where natural drainage is good, the red or reddish colors of the B horizons indicate the oxidation of iron to iron oxides.

Reduction and transfer of iron, a process called gleying, is evident in the more poorly drained soils of the survey area. The grayish color in the subsoil horizons indicates the reduction and loss of iron. In a few soils of this kind some of the horizons contain reddish-brown mottles and concretions, which indicate a segregation of iron.

To summarize the more important processes in horizon differentiation in the soils of this survey area are the leaching of bases, the translocation of silicate clay, and the oxidation or reduction of iron.

Classification of Soils

Classification consists of an orderly grouping of defined kinds of soils into classes in a system designed to make it easier to remember soils and their characteristics and interrelationships. Classification also helps to organize and apply results of experience and research to areas ranging from plots of several acres to tracts covering millions of

square miles. The defined kinds of soils are placed in narrow classes for use in detailed soil surveys and for application of knowledge within farms and fields. The large number of narrow classes are then grouped in progressively fewer and broader classes in higher categories so that information can be applied to larger areas, such as countries and continents.

The current system of classifying soils was adapted for general use by the National Cooperative Soil Survey in 1965. This system is under continual study. Readers interested in developments of this system should search the latest literature available (*3, 6*).

Under the current system of classifying soils (*6*), all soils are placed in six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria used as a basis for classification in this system are observable or measurable properties. The properties are chosen so that soils of similar mode of origin are grouped together.

In table 7 the soil series of Carroll and Haralson Counties are placed in some of the classes of the current system.

The classes in the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic grouping of soils. Two exceptions are Entisols and Histosols, which occur in many different climates.

Table 7 shows that the four orders recognized in Carroll and Haralson Counties are the Entisols, Inceptisols, Alfisols, and Ultisols. Entisols are recent mineral soils that do not have genetic horizons or have only the beginning of such horizons.

Inceptisols are mineral soils in which genetic horizons have started to develop. Their name is derived from the Latin word *inceptum*, which means beginning.

Alfisols are minerals soils that have an illuvial horizon in which significant amounts of clay minerals have accumulated and in which base saturation is more than 35 percent at a depth of 50 inches below the top of the clay-enriched horizon.

Ultisols are mineral soils that have a clay-enriched B horizon with a base saturation of less than 35 percent at a depth of 50 inches below the top of the clay-enriched horizon. Mineral soils are also Ultisols if they have a fragipan in a clay-enriched horizon that has a base saturation of less than 35 percent at a depth of 30 inches below the top of the pan. Most of the soils in this survey area are Ultisols.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes with the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of waterlogging, or soil differences resulting from the climate or vegetation. The names of suborders have two syllables. The last syllable indicates the order. An example is Udult (Ud, meaning of humid climates, and ult from Ultisol. Suborders are not given in table 7, because the last two syllables of the subgroup name the suborder.

GREAT GROUP. Soil suborders are separated into great groups according to the presence or absence of genetic horizons and the arrangement of these horizons. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans that interfere with the growth of roots or the movement of water. The features used are the self-mulching properties of clay, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The names of great groups have three or four syllables and are made by adding a prefix to the name of the suborder. An example is Hapludult (Hapl, meaning simple; ud, for humid; and ult, from Ultisol). The great group is not shown separately in table 7, because it is the last word of the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of a group and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups

TABLE 7.—*Classification of soil series in Carroll and Haralson Counties, Ga., according to the current system of classification*[1]

Series	Family	Subgroup	Order
Augusta	Fine-loamy, mixed, thermic	Aeric Ochraquults	Ultisols.
Buncombe	Mixed, thermic	Typic Udipsamments	Entisols.
Chewacla	Fine-loamy, mixed, thermic	Aquic Fluventic Dystrochrepts	Inceptisols.
Congaree	Fine-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Davidson	Clayey, kaolinitic, thermic	Rhodic Paleudults	Ultisols.
Grover	Fine-loamy, micaceous, thermic	Typic Hapludults	Ultisols.
Hulett	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Iredell	Fine, montmorillonitic, thermic	Vertic Hapludalfs	Alfisols.
Louisa	Loamy, micaceous, thermic, shallow	Ruptic Ultic Dystrochrepts	Inceptisols.
Louisburg	Coarse-loamy, mixed, thermic	Ruptic Ultic Dystrochrepts	Inceptisols.
Madison	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Masada	Fine-loamy, mixed, thermic	Typic Hapludults	Ultisols.
Musella	Fine-loamy, mixed, thermic	Typic Rhodudults	Ultisols.
Tallapoosa	Loamy, micaceous, thermic, shallow	Ochreptic Hapludults	Ultisols.
Wilkes	Loamy, mixed, thermic, shallow	Typic Hapludalfs	Alfisols.
Worsham	Clayey, mixed, thermic	Typic Ochraquults	Ultisols.

[1] Placement of some series in the current system of classification, particularly in families, may change as more precise information becomes available.

may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Typic Hapludult (a typical Hapludult).

FAMILY. Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils where used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. A family name consists of a series of adjectives preceding the subgroup name. The adjectives are the class names for texture, mineralogy, and so on that are used to designate the family. An example is the clayey, kaolinitic, thermic family of some Typic Hapludults.

SERIES: The series is a group of soils that have major horizons that, except for texture of surface layer, are similar in important characteristics and in arrangement in the profile. Soil series are named for a geographic location near the place where that series was first observed and mapped.

General Nature of the Area

Discussed in this section for Carroll and Haralson Counties are organization and settlement, transportation and markets, industries, climate, geology, physiography, and drainage,water supply, and farming. The figures for population and the statistics on farming are from reports of the U.S. Bureau of the Census.

Organization and Settlement

Carroll County was organized in 1826 and originally consisted of all the land between the Chattahoochee River on the east, the Alabama State line on the west, and the Cherokee Indian Nation on the north. This land was obtained from the Creek Indians by the Treaty of 1825 at Indian Springs. Parts of the land have been cut off from Carroll County at different times to form Heard, Troup, Douglas, and Haralson Counties.

Haralson County was organized in 1856 from a part of Carroll County and land ceded to the U.S. Government by the Cherokee Indians.

Early settlers in this area arrived in the 1820's from the eastern part of Georgia and from Virginia and the Carolinas. Early farming consisted of growing corn, wheat, and barley and raising cattle, hogs, chickens, and sheep for home use or for trading.

The population of the two counties was 48,775 in 1950 and 50,994 in 1960. About 60 percent of the population is rural.

Carrollton, the largest town and the county seat of Carroll County, had a population of 10,973 in 1960. Buchanan, the county seat of Haralson County, had a population of 753 in 1960. Other towns in the survey area are Bowdon, Villa Rica, Roopville, Temple, Mount Zion, and Whitesburg in Carroll County and Bremen and Tallapoosa in Haralson County.

Transportation and Markets

U.S. Highway No. 78 runs from east to west through the area, and U.S. Highway No. 27 runs from north to south. State Routes 5, 16, 61, 100, 101, 113, 120, and 166 also serve the two counties. All of these highways and many of the county roads are paved. Most of the other roads are surfaced with sandy or gravelly materials and are used throughout the year. In the future, Interstate Highway No. 20 will roughly parallel U.S. Highway No. 78 between Atlanta and Birmingham, Ala.

Two main railroads serve these two counties. The main line of one of these railroads runs between Atlanta and Birmingham, Ala., and the other runs from Chattanooga, Tenn., to Macon and Columbus, Ga. Bus service is available to and from the towns of Carrollton, Villa Rica, Temple, Bremen, and Tallapoosa. Trucklines serve all the towns.

Markets for grain, cotton, hay, pulpwood, and lumber are available in the area. The State Farmers Market in Atlanta is an outlet for vegetables, melons, fruits, and other produce. Livestock auction barns are located in Carrollton, La Grange, Atlanta, and Rome. Carrollton has a poultry processing plant, 3 meat processing plants, and a plant processing dairy products.

Industries

Manufacturing is diversified among 70 plants in the survey area. Products manufactured or processed in the two counties include copper and aluminum wire and cable, men's clothing, hosiery, shoes, auto parts, stainless steel tubing, latex, chemicals, concrete products, frozen foods, meat, dairy, and poultry products, lumber, printed cloth, and other textile products.

In 1964 approximately 9,670 people were employed in industry. Textile, garment, and heavy metal plants employed the most workers. Many of the jobs are filled by part-time farmers and people who live in rural areas and commute daily.

The Climate of Carroll and Haralson Counties [5]

In Carroll and Haralson Counties the climate is influenced by the elevation of the survey area, the higher mountains to the north, and the Gulf of Mexico to the south. These factors moderate both summer and winter temperatures and cause ample precipitation that is usually well distributed throughout the year. Table 8 provides data on the temperatures and precipitation in these two counties. The probabilities of the last freezing temperatures in spring and the first in fall are given in table 9.

Elevation within the two counties roughly ranges from 700 to 1,600 feet above sea level, but the higher mountains in the northern part of Georgia are a partial barrier to the cold air that flows southward during winter. Because of this barrier, the cold air is usually considerably modified when it reaches the survey area. Freezing occurs early in the morning on slightly more than half of the days from mid-November to mid-March, but the temperature is as low as 20° F. only 10 to 15 times during an average win-

[5] Prepared by HORACE S. CARTER, State climatologist, U.S. Weather Bureau, Athens, Ga.

ter. Temperatures below zero have been observed in the northern part of Haralson County but are very rare in the southern part of Carroll County. The hilly terrain often causes large differences in minimum temperatures within short distances. On clear, still nights, air cooled by radiation drains down the hills into valleys and other low areas and collects in pockets of cold air. The extreme minimum temperature in the valleys may be 10° to 15° lower than that on the surrounding slopes. Cold pockets of air are important in the selection of sites for certain crops and orchards and in scheduling spring planting.

The freeze-free growing period normally extends from early in April to late in October and averages slightly more than 200 days. The length of this period varies considerably between the northern part of Haralson County and the southern part of Carroll County. It also varies considerably according to local terrain and exposure.

In this survey area summer temperatures are more pleasant than those in lower areas to the south and east. Temperatures in the afternoon reach or exceed 90° on about half of the days in June, July, and August. A temperature of 100°, however, occurs in only about 1 year in 5. Because of elevation, temperatures are even more comfortable at night. Early in the morning the temperature is usually in the sixties throughout the summer. The average minimum temperature for the three months in summer is slightly higher than 65°.

Precipitation averages about 51 inches per year. Usually the wettest period is early in spring, and the driest is in fall. March is the only month that averages more than 6 inches, and only October averages less than 3 inches. Precipitation during the cool period is usually associated with large, low-pressure storm centers and weather fronts. Slow-moving air masses sometimes bring prolonged

TABLE 8.—*Temperature and precipitation data for Carroll and Haralson Counties, Ga.*

Month	Temperature				Precipitation		
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with—		Average monthly total	1 year in 10 will have—	
			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
January	54.2	32.4	71	15	5.08	1.9	7.9
February	58.2	34.3	73	18	5.29	2.0	8.1
March	64.0	39.7	80	25	6.08	2.6	9.7
April	74.6	48.6	86	33	5.38	1.6	8.1
May	82.5	55.9	91	43	3.33	1.0	6.6
June	87.9	64.0	96	54	3.97	2.0	7.2
July	89.2	66.7	96	60	5.09	2.3	8.6
August	89.2	65.4	96	58	3.87	1.8	7.4
September	83.6	60.1	93	50	3.28	.8	6.5
October	75.0	48.7	86	31	2.20	.8	6.5
November	64.0	37.9	77	23	3.25	1.1	5.8
December	55.4	33.1	70	17	4.51	1.9	8.9
Year	73.0	48.9	98	12	51.34	41.9	62.8

TABLE 9.—*Probabilities of last freezing temperature in spring and first freezing temperature in fall*

Probability	Dates for given probability at temperatures of—		
	24° F.	28° F.	32° F.
Spring:			
1 year in 10 later than	March 27	April 10	April 20
2 years in 10 later than	March 22	March 30	April 14
5 years in 10 later than	March 8	March 23	April 8
Fall:			
1 year in 10 earlier than	November 1	October 25	October 18
2 years in 10 earlier than	November 9	October 30	October 22
5 years in 10 earlier than	November 18	November 4	October 30

periods of steady rainfall to the area. In contrast, most precipitation during the warm period comes in afternoon showers that usually do not last long. But these summer showers are sometimes intense and cause considerable erosion. Although the amount of rainfall is generally adequate for farming and other uses, dry spells of two or more weeks occur during most years. Fortunately, these spells are more frequent late in summer and in fall after most major crops have been harvested. Light snow falls during most winters but seldom accumulates on the ground.

Thunderstorms usually occur on about 50 days a year. They may occur during any month but are more frequent in spring and summer. Hail and damaging winds occur occasionally with some of the more severe storms.

The average monthly relative humidity ranges from 80 to 90 percent early in the morning and from 50 to 60 percent early in the afternoon. Humidity is usually higher late in summer and in fall and is lower in spring.

The prevailing wind is usually from north to northwest from fall to spring and is variable to southerly in summer. Average velocity ranges from about 11 miles per hour from January through March to slightly more than 7 miles per hour in July and August.

Geology, Physiography, and Drainage

Carroll and Haralson Counties lie within the Piedmont Plateau. About 85 percent of the two counties is underlain by schist, phyllite, biotite gneiss, and other metamorphic rocks (*2*). The remaining 15 percent is underlain by Augen gneiss, granite gneiss, hornblende gneiss, and other igneous rocks.

The elevation of the survey area ranges from 700 to about 1,600 feet above sea level. One of the highest elevations is Blackjack Mountain, 1,550 feet. The lowest elevation is where the Chattahoochee River leaves Carroll County. The elevation ranges from 1,000 to 1,600 feet in the uplands and from 700 to 1,000 feet in the bottom lands. In the bottom lands the soils are nearly level and generally narrow. In most of the uplands the soils are gently sloping or rolling, but some soils along drainageways are strongly sloping.

The Chattahoochee River flows southwesterly along the southeastern edge of Carroll County and drains 25 percent of the survey area. The Little Tallapoosa River roughly parallels the Chattahoochee River and drains most of Carroll County and 40 percent of the total survey area. The Tallapoosa River flows southwesterly. It drains the largest part of Haralson County and about 35 percent of the two counties.

Water Supply

The rivers and streams of the survey area are excellent sources of water for towns, industries, and irrigation, but on most farms, shallow wells are dug to provide water for domestic use. These wells commonly yield 2 to 5 gallons of water per minute and are less than 60 feet deep. Drilled wells are replacing dug wells for many rural homes. These drilled wells are commonly 6 or 8 inches in diameter and 100 to 250 feet deep. They generally yield 6 to 10 gallons of water per minute.

About 700 farm ponds are in the two counties, and they are used for watering livestock and poultry, for irrigation, and for fishing and other recreation.

The water table is generally highest in April and May and lowest in October and November. Contrary to popular belief, it is not falling each successive year, except in a few small areas. Where the water table falls in a large area, this fall probably is caused by a decrease in the amount of rainfall in the area.

Farming

The total land area of Carroll and Haralson Counties is 499,200 acres, and of this area, 214,421 acres was in farms, according to the 1964 Census of Agriculture. The total number of farms was 1,993. The average-sized farm was about 115 acres. Farms averaging 50 acres or less numbered 1,161, and farms averaging from 50 to 200 acres per farm numbered 70.

In recent years a significant change in land use has been from crops to pasture, woodland, or homesites. Pulpwood companies have acquired 60,191 acres in the area and planted the open land to forest. In 1964, the Bureau of the Census reported 20,037 acres in crops, 22,831 in improved pasture, and 102,641 acres in woods.

According to the 1959 Census of Agriculture, there were 4,065 acres planted to cotton, but according to local sources, by 1968 the area in cotton had been reduced to 565 acres. The diverted acreage has ben planted largely to improved pasture. The principal crop in 1968 was corn, and its area was about 10,000 acres.

According to a count by the local county agents, on January 1, 1966, there were 25,700 cattle on farms in Carroll and Haralson Counties.

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Glossary

Acidity (see Reaction).

Aggregate, soil. Many fine particles held in a single mass or cluster, such as a clod, crumb, block, or prism.

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

Available water capacity. The capacity of a soil to hold water in a form available to plants. Amount of moisture held in soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

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

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of some soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

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; will 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.

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

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors, such as light, moisture, temperature, and the physical condition (or tilth) of the soil, are favorable.

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

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

Fragipan. A dense, brittle subsurface horizon that is very low in organic matter and clay but rich in silt or very fine sand. The layer seems to be cemented when it is dry, is hard or very hard, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottles caused by intermittent waterlogging.

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) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) 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, or substratum, 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.

Igneous rock. Rock that has been formed by the cooling of molten mineral material. Examples: Granite, syenite, diorite, and gabbro.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. It may be limited either by the infiltration capacity of the soil or by the rate at which water is applied to the surface soil.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Metamorphic rock. Rocks of any origin that have been completely changed physically by heat, pressure, and movement. Such rocks are nearly always crystalline.

Morphology, soil. The makeup of the soil, including the texture, structure, consistence, color, and other physical, mineralogical, and biological properties of the various horizons of the soil profile.

Mottled. 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. The horizon of weathered rock or partly weathered soil material from which soil has formed; horizon C in the soil profile.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow*, *slow*, *moderately slow*, *modcrate*, *moderately rapid*, *rapid*, and *very rapid.*

Plowed layer. The soil ordinarily moved in tillage; equivalent to surface soil.

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values and in words as follows:

	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		

Relief. The elevation or inequalities of a land surface, considered collectively.

Sand. As a soil separate, individual rock or mineral fragments 0.05 to 2.0 millimeters in diameter. Most sand grains consist of quartz but they may be of any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, 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). As a textural class, soil that 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 upon parent material, as conditioned by relief over periods of time.

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

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand), or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

Substratum. A layer below the solum, or true soil; the C horizon.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportions 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.

Topsoil. A presumed fertile soil or soil material, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

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

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