SOIL SURVEY OF

Cobb County, Georgia

United States Department of Agriculture
Soil Conservation Service
In cooperation with
University of Georgia, College of Agriculture
Agricultural Experiment Stations

Issued December 1973

Major fieldwork for this soil survey was done in the period 1960–68. Soil names and descriptions were approved in 1968. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1968. This survey was made cooperatively by the Soil Conservation Service and the University of Georgia, College of Agriculture, Agricultural Experiment Stations. It is part of the technical assistance furnished to the Atlanta Soil and Water Conservation District.

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

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

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

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

Finding and Using Information

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

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

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

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

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

Community planners and others can read about soil properties that affect the choice of sites for nonindustrial buildings and for recreation areas in the section "Town and Country Planning."

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

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

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

Cover picture: **Landscape in foreground is typical of the Madison-Gwinnett-Cecil association. Slopes are mainly 2 to 10 percent.**

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SOIL SURVEY OF COBB COUNTY, GEORGIA

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FIELDWORK BY R. J. TATE AND GROVER J. THOMAS, JR., SOIL CONSERVATION SERVICE

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

COBB COUNTY is in the northwestern part of Georgia (fig. 1) and is in the Piedmont section of the State. It is one of the five counties in the Atlanta metropolitan area and has a land area of 346 square miles or 221,440 acres. The county was established in 1832. Marietta is the county seat.

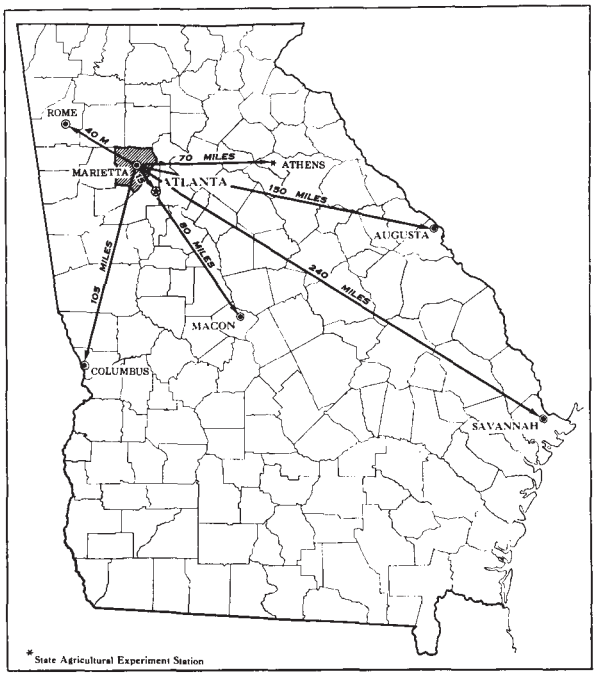

Figure 1.—**Location of Cobb County in Georgia.**

The population of Cobb County was 114,174 in 1960. Much of the recent increase in population has been distributed throughout the county.

The soils in Cobb County are mostly gently rolling to steep. They are suitable for many different crops, and the climate is favorable for their growth. Summers generally are warm, and winters are only moderately cold. Precipitation generally is ample for crops and is well distributed throughout the year.

Industries are increasing in number, and many people from adjoining counties find work in the manufacturing plants in Cobb County. The largest industry manufactures airplanes and employs more than 25,000 workers.

Excellent sources of water are available for industrial, residential, and farm uses.

How This Survey Was Made

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

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

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The soil series and the soil phase (*8*)[1] are the categories of soil classification most used in a local survey.

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

Soils of one series can differ in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man. On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects manage-

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

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

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

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

A soil complex consists of areas of two or more soils, so intermingled or so small in size that they cannot be shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. The name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Urban land-Cecil complex, 2 to 10 percent slopes, is an example.

An undifferential group is made up of two or more soils that could be delineated individually but are shown as one unit because, for the purpose of the soil survey, there is little value in separating them. The pattern and proportion of soils are not uniform. An area shown on the map may be made up of only one of the dominant soils, or of two or more. The name of an undifferentiated group consists of the names of the dominant soils, joined by "and." Madison and Pacolet soils, 10 to 15 percent slopes, severely eroded, is an example.

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

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

On the basis of yield and practice tables and other data, the soil scientists set up trial groups. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others, then 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 soil survey shows, in color, the soil associations in Cobb County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, 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 always agree fully with general soil maps of adjacent counties published at a different date. Differences are brought about by better knowledge of soils and modifications or refinements in soil series concepts. In addition, the uses of the general soil map have expanded in recent years, thus requiring a more precise and detailed map to accommodate the need. Still another difference is caused by the range in slope of the soils within an association.

The 13 soil associations in Cobb County are described in the pages that follow.

Alluvial Soils Along Flood Plains

Two associations in Cobb County consist of nearly level soils on flood plains along the Chattahoochee River and along major creeks. These soils are loamy and are generally mottled with brown and gray.

1. Cartecay-Toccoa association

Somewhat poorly drained and well-drained, nearly level soils that are subject to frequent flooding

This association consists of nearly level soils on broad to narrow flood plains. These soils formed in recent alluvium along streams that overflow more than once every 5 years. The stream channels are well defined. They cut into the bedrock in some places and are clogged and silted in many others. Depth to the water table is generally about 15 to 30 inches.

This association makes up about 8 percent of the county. Cartecay soils make up about 55 percent of the association; Toccoa soils, 35 percent; and minor soils, 10 percent.

Cartecay soils are somewhat poorly drained. The surface layer is dark yellowish-brown fine sandy loam about 5 inches thick. The subsurface layer is dark yellowish-brown silt loam about 6 inches thick. The underlying layer, to a depth of 45 inches, is mainly stratified sandy loam, loam, or loamy sand that is mottled with shades of red, gray, and brown. Depth to hard rock is more than 5 feet.

Toccoa soils generally have a surface layer that is dark-brown sandy loam 9 inches thick and has a few mottles of yellowish brown. The underlying layer is mainly stratified sandy loam, silty clay loam, loamy sand, and sand. The upper part is dark brown mottled with shades of brown and red, and the lower part is strong brown, yellowish

brown, and pale brown mottled with shades of brown, gray, and red. Depth to hard rock is more than 5 feet.

The less extensive soils in this association are mainly Chewacla soils, wet variants, on the bottom lands, and moderately well drained Altavista soils and poorly drained Roanoke soils on terraces. The soils on terraces developed in older alluvium and have more distinct horizons than the Cartecay and Toccoa soils.

Some areas of the better drained soils that have been cultivated are now used for pasture (fig. 2). The poorly drained soils support mixed stands of hardwoods.

Most of this association is wooded. About a third is too wet for cultivation. Without artificial drainage, only about 40 percent of the acreage is suited to cultivated crops. This acreage is mainly well-drained Toccoa soils. If adequately drained, the soils in this association are well suited to most of the pasture plants grown locally. The management, tenure, and size of farms vary. Limitations for most nonfarm uses are severe because of wetness or flooding.

2. *Toccoa-Cartecay association*

Well-drained and somewhat poorly drained, nearly level soils that are flooded once in 5 to 20 years

This association consists of nearly level soils on broad to narrow flood plains of recent alluvium. Overflow occurs once in 5 to 20 years. Depth to the water table ranges from less than 15 inches in a few places to more than 3 feet in others. In most of the association, the water table is at a depth of 15 to 30 inches.

This association makes up about 1 percent of the county. Toccoa soils make up about 65 percent of the association; Cartecay soils, 20 percent; and minor soils, 15 percent.

The well-drained Toccoa soils are stratified sandy loam, silty clay loam, sand, and loamy sand. The surface layer is mainly dark-brown sandy loam 9 inches thick and has a few mottles of yellowish brown. The underlying layer is mainly stratified sandy loam, silty clay loam, loamy sand, and sand. The upper part is dark brown mottled with

Figure 2.—Tall fescue pasture in a wooded area of the Cartecay-Toccoa association.

shades of brown and red, and the lower part is strong brown, yellowish brown, and pale brown mottled with shades of brown, gray, and red. Depth to hard rock is more than 5 feet.

Cartecay soils are somewhat poorly drained. The surface layer is mainly dark yellowish-brown fine sandy loam about 5 inches thick. The subsurface layer is dark yellowish-brown silt loam about 6 inches thick. The underlying layer, to a depth of 45 inches, is mainly stratified sandy loam, loam, or loamy sand that is mottled with shades of red, gray, and brown. Depth to hard rock is more than 5 feet.

The less extensive soils in this association are Chewacla soils, wet variants, moderately well drained Altavista soils, and poorly drained Roanoke soils.

Some areas of the better drained soils have been cultivated but are now used for improved pasture. A small acreage is used as sites for industries, recreational areas, and residential developments. Soil material has been removed from a large acreage for use in making brick. The rest of the association is in forests of mixed hardwoods and pines. About 60 percent of the acreage is suited to tilled crops, but the soils have severe to moderate limitations for most nonfarm uses. Protection from flooding is needed, although floods are less frequent and less severe than in the Cartecay-Toccoa association.

Gently Sloping to Sloping, Shallow Soils on Ridgetops

One association consists of gently sloping to sloping soils on narrow ridgetops. Slopes generally range from 6 to 15 percent. These soils have a dominantly yellowish-brown, friable to plastic, loamy and clayey subsoil. In most places they formed in diorite, hornblende gneiss, granite, gneiss, and other residual materials.

3. Wilkes association

Well-drained soils that have a thin, yellowish-brown, loamy and clayey subsoil

This association consists of soils on narrow ridgetops. Hard rock is less than 48 inches below the surface in 60 percent of the acreage. Slopes are 6 to 15 percent in most areas.

This association makes up less than 1 percent of the county. Wilkes soils make up about 90 percent of the association and minor soils about 10 percent.

Wilkes soils are well drained. In most of the acreage the surface layer is friable, dark grayish-brown sandy loam about 5 to 8 inches thick. In a small acreage the surface layer is stony. The subsoil is yellowish-brown, friable sandy clay loam in the upper part and mottled clay in the lower part. Soft rock is at a depth of about 18 inches.

The less extensive soils in this association are Appling, Helena, and Madison soils. Madison soils are well drained and are redder than the Wilkes soils. Appling and Helena soils are deeper than the Wilkes soils. Helena soils are less well drained than the Wilkes soils.

Approximately 90 percent of the acreage is in pine trees or mixed hardwoods. The rest is idle, in pasture, or cultivated or is used for residential sites. Farms are small. The soils are poorly suited to row crops and to most nonfarm uses, but are well suited to trees.

Sloping to Steep, Deep to Shallow Soils on Irregular Hillsides

Four associations consist of deep, moderately deep, or shallow soils mainly on side slopes. Slopes range from 10 to 60 percent. These soils are dominantly yellowish brown to dusky red and have a clayey or loamy subsoil. In most places they formed in mica schist, granite, gneiss, diorite, hornblende gneiss, and other residual materials.

4. Madison-Louisa-Pacolet association

Well-drained to somewhat excessively drained soils that have a dominantly red to yellowish-brown, clayey to loamy subsoil; mainly adjacent to drainageways on uplands

This association consists of soils on short slopes along drainageways. These drainageways form a dendritic pattern. Slopes are 15 to 25 percent in about half of the acreage, 25 to 60 percent in about a third, and 10 to 15 percent in the rest. In a few places dikes of hard rock are at a depth of less than 36 inches. The flood plains along the drainageways are narrow.

This association makes up about 13 percent of the county. Madison soils make up about 50 percent of the association; Louisa soils, 25 percent; Pacolet soils, 10 percent; and minor soils, 15 percent.

Madison soils are severely eroded in places. The surface layer is mainly yellowish-red clay loam and sandy clay loam 2 to 7 inches thick. The subsoil is red clay and sandy clay loam underlain by schist rock at a depth of about 36 inches.

Louisa soils are slightly eroded. The surface layer is dark-brown sandy loam about 6 inches thick. In some areas the surface layer is gravelly. The subsoil is yellowish-red gravelly loam and extends to a depth of about 14 inches. It is underlain by fragmented, strong-brown, weathered schist.

Pacolet soils are slightly eroded to severely eroded. In most places the surface layer is yellowish-brown sandy loam about 5 inches thick. In severely eroded areas the surface layer is reddish-brown to red sandy clay loam about 3 or 4 inches thick. The subsoil is red clay and sandy clay loam mottled in the lower part with yellowish brown.

The less extensive soils in this association are mainly well-drained Gwinnett and Musella soils.

This association is poorly suited to crops and pasture because the soils are steep, droughty, and erodible and have a shallow root zone. This association has a low potential for farming. Most farms are small and consist largely of cutover forest. Limitations for most nonfarm uses are moderate to severe.

5. Gwinnett-Pacolet-Musella association

Well-drained soils that have a dominantly dark-red, dusky-red, or red, clayey to loamy subsoil; mainly on hilly uplands

This association consists of soils on slopes that have well-defined drainageways. The slopes are short and range from 10 to 25 percent on about three-fourths of the acreage and 24 to 45 percent on the rest.

This association makes up about 10 percent of the county. Gwinnett soils make up about 50 percent of the association; Pacolet soils, about 28 percent; Musella soils, 7 percent; and minor soils, 15 percent.

Gwinnett soils have a dark reddish-brown loam surface layer about 6 to 9 inches thick. In eroded areas the surface layer is dark reddish-brown or dark-red clay loam about 5 inches thick. The subsoil is dark-red clay and clay loam. It is underlain by soft, weathered rock at a depth of about 36 inches.

Pacolet soils are slightly eroded to severely eroded. In less eroded areas the surface layer is yellowish-brown sandy loam about 5 inches thick. In severely eroded areas the surface layer is reddish-brown to red sandy clay loam. The subsoil is red clay and sandy clay loam mottled in the lower part with yellowish brown. It is underlain by red sandy loam at a depth of about 38 inches.

Musella soils have a dark reddish-brown loam or gravelly clay loam surface layer about 2 to 8 inches thick. In places the surface layer is stony. The subsoil is dark-red clay loam and gravelly clay that extends to a depth of about 19 inches. It is underlain at a depth of about 37 inches by soft consolidated rock. Depth to hard rock is commonly 22 to 60 inches or more.

The less extensive soils in this association are Toccoa, Hiwassee, Wilkes, Madison, and Appling soils. Toccoa soils are well drained and occur in small areas along narrow drainageways. The other soils formed in material weathered from acid rock and are mainly on the uplands.

Some areas of steep and stony soils have not been cleared. These areas support mixed stands of hardwoods and pines. Most areas that have been cultivated are now in pine trees or improved pasture or are used for residential sites. Most of this association is eroded, and in many areas the red subsoil is exposed.

Most farms in this association are small. The soils are not well suited to cultivated crops, but generally are well suited to pine trees. The soils have slight to severe limitations as sites for residences and light industry and for other nonfarm uses. Steep slopes, underlying rock, and the clayey subsoil are the main limitations.

6. *Louisburg-Appling-Wilkes association*

Excessively drained to well-drained soils that have a dominantly yellowish-brown and brownish-yellow, loamy to clayey subsoil and are stony in places; on hilly uplands

This association consists of soils on short side slopes that are disected by many narrow, well-defined drainageways. Rock crops out in many places, and in about a fourth of the association the surface is stony. Hard rock underlies two of the dominant soils. Slopes are 15 to 25 percent in slightly more than half the acreage, 10 to 15 percent in about a fourth, and 25 to 45 percent in the rest.

This association makes up about 3 percent of the county. Louisburg soils make up about 55 percent of the association; Appling soils, 20 percent; Wilkes soils, 10 percent; and minor soils, 15 percent.

Louisburg soils are well drained to excessively drained. The surface layer is very dark gray to dark yellowish-brown sandy loam or stony sandy loam. In most places the subsoil is brownish-yellow and yellowish-brown sandy loam, but in some places it is thin, discontinuous, and clayey. Depth to hard rock is 28 to 48 inches.

Appling soils are well drained. In less eroded areas the surface layer is brown to yellowish-brown sandy loam. In severely eroded areas it is yellowish-red to yellowish-brown sandy clay loam. The subsoil is clayey in the central part and is mottled yellowish brown, red, and yellowish red.

Wilkes soils have a surface layer of dark grayish-brown stony sandy loam and sandy loam about 5 inches thick. The subsoil is yellowish-brown sandy clay loam and clay. It is mottled in the lower part with shades of red and brown. This layer is underlain at a depth of 19 inches by olive-gray, yellowish-red, olive, and yellowish-brown saprolite. Depth to hard rock is about 34 inches.

The less extensive soils in this association are Madison, Pacolet, and Louisa soils on uplands and well-drained Toccoa soils along narrow drainageways.

Most areas that were formerly cultivated are now in pines. Some areas of steep and stony soils have not been cleared. These areas support mixed stands of hardwoods and pines. A small acreage is used as sites for private homes, manufacturing plants, and small businesses.

This association has a low potential for farming because the soils are steep, shallow, droughty, and stony. Many of the farms in this association are small and consist largely of cutover forest. They are operated part time by the owners. The soils in this association have moderate to severe limitations for nonfarm uses.

7. *Madison-Gwinnett-Pacolet association*

Well-drained soils that have a dominantly red and dark-red, clayey to loamy subsoil; mainly on short hillsides adjacent to drainageways

This association consists of well-drained soils on short slopes adjacent to drainageways. These drainageways form a dendritic pattern. The flood plains are narrow. Slopes are 10 to 15 percent in slightly more than half of the acreage and 15 to 25 percent in the rest.

This association makes up about 12 percent of the county. Madison soils make up about 60 percent of the association; Gwinnett soils, 15 percent; and Pacolet soils, 10 percent. The rest is minor soils.

In less eroded areas, Madison soils have a surface layer of yellowish-brown to dark-brown sandy loam about 5 inches thick. In severely eroded areas, the surface layer is mainly yellowish-red clay loam. The subsoil is mainly red clay and sandy clay loam. Soft schist rock underlies this layer at a depth of about 36 inches.

Gwinnett soils are eroded and severely eroded. The surface layer is dark reddish-brown clay loam or loam about 7 inches thick. The subsoil extends to a depth of about 36 inches and is dark-red clay loam and clay. It is underlain by soft, highly weathered rock.

Pacolet soils have a surface layer of yellowish-brown sandy loam about 5 inches thick. The subsoil is mainly red clay underlain by red sandy loam at a depth of about 38 inches.

The less extensive soils in this association are Appling, Hiwassee, Louisa, Musella, Toccoa, Cartecay, and Louisburg soils. The well-drained Toccoa soils and somewhat poorly drained Cartecay soils are along narrow drainageways. The other soils are on the uplands.

Most of this association is in cutover forest, but a large acreage is used for improved pasture and as sites for resi-

dential subdivisions, small manufacturing plants, and businesses. This association is not well suited to farming. Farms are small and are operated part time by the owners. The soils in this association have moderate to severe limitations for most nonfarm uses.

Very Gently Sloping to Sloping, Deep to Moderately Deep Soils on Broad and Narrow Ridgetops

Two associations consist of very gently sloping and gently sloping soils that are mainly on broad and narrow ridgetops and interstream divides. Slopes are 2 to 10 percent. These soils have a dominantly yellowish-brown to dusky-red clayey subsoil. In most places they formed in diorite, hornblende gneiss, granite, mica schist, gneiss, and other residual materials.

8. Appling-Cecil-Madison association

Well-drained soils that have a dominantly yellowish-brown and red to yellowish-red, clayey to loamy subsoil; on broad, uniform ridgetops

This association consists of soils on broad, uniform ridgetops. Slopes are 2 to 6 percent in approximately 60 percent of the acreage and 6 to 10 percent in the rest.

This association makes up about 14 percent of the county. Appling soils make up about 55 percent of the association; Cecil soils, 15 percent; Madison soils, 15 percent; and minor soils, 15 percent.

Appling soils have a mainly brown or yellowish-brown sandy loam surface layer about 6 inches thick. The subsoil is dominantly yellowish-brown clay and sandy clay. It is mottled with yellowish red and red below a depth of about 17 inches. The lower part of the subsoil is mottled with brownish yellow and pale brown.

Cecil soils have a strong-brown sandy loam surface layer about 6 inches thick. The subsoil is mostly red clay mottled with yellowish brown and strong brown.

Madison soils have a brown sandy loam surface layer. The subsoil extends to a depth of about 36 inches and is red and yellowish-red clay and sandy clay loam. It contains many mica flakes. Soft micaceous rock is at a depth of about 36 inches.

The less extensive soils are well-drained Durham soils, moderately well drained Altavista and Helena soils, well-drained Appling, Cecil, and Madison soils mainly on uplands, and well-drained Toccoa soils along small drainageways.

Slightly less than half the acreage of this association is cultivated or is in pasture; about an equal amount is forested or idle, and the rest is used as sites for residential subdivisions, small businesses, and small manufacturing plants. Many of the farms in this association are small, but a few are large. This association is well suited to general farming and is better suited to cultivated crops than any other association in the county. Common crops are tall fescue, white clover, Coastal bermudagrass, and corn. Limitations for nonfarm uses are slight to severe.

9. Madison-Gwinnett-Cecil association

Well-drained soils that have a dominantly red and dark-red, clayey subsoil; on fairly broad to narrow ridgetops

The soils in this association are on fairly broad to narrow ridgetops and interstream divides. Slopes are 6 to 10 percent in approximately 60 percent of the acreage and to 2 to 6 percent in the rest.

This association makes up about 20 percent of the county. Madison soils make up about 55 percent of the association; Gwinnett soils, 17 percent; Cecil soils, 12 percent; and minor soils, 16 percent.

Madison soils have a brown sandy loam surface layer about 5 inches thick. The subsoil is yellowish-red and red clay and sandy clay loam that extends to a depth of about 36 inches. It contains many mica flakes. Soft micaceous rock is at a depth of about 36 inches.

Gwinnett soils have a dark reddish-brown loam surface layer about 5 to 8 inches thick. The subsoil extends to a depth of about 36 inches and is mainly dark-red clay and clay loam. It is underlain by highly weathered, soft rock mixed with red clay loam.

Cecil soils have a strong-brown sandy loam surface layer about 6 inches thick. The subsoil is mostly red clay mottled with yellowish brown and strong brown.

Among the less extensive soils are well-drained Appling, Musella, Pacolet, Hiwassee, and Durham soils on uplands and well-drained Toccoa soils along the small drainageways.

Most of the acreage of this association was formerly cultivated or in pasture. Now only about 20 percent of the acreage is cultivated or in pasture. About 50 percent is wooded, and 30 percent is used as sites for residential subdivisions, small businesses, and industries. Most of the acreage is eroded, but tilth is good in most places. Tilth is poor in areas where erosion has removed all or nearly all the original surface layer and exposed the clayey subsoil. Most farms in this association are small; a few are large. This association is moderately well suited to cultivated crops and pasture. Limitations are slight to severe for nonfarm uses.

Very Gently Sloping to Sloping, Deep to Shallow Soils on Narrow to Fairly Broad Ridgetops

Two associations consist of very gently sloping to gently sloping soils on ridgetops. Slopes range from 2 to 15 percent. These soils generally have a yellowish-brown to dusky-red clay or sandy loam subsoil and are well drained to excessively drained. They formed in hornblende gneiss, diorite, granite, gneiss, and other residual materials.

10. Gwinnett-Hiwassee-Musella association

Well-drained soils that have a dominantly dark-red, dusky-red, or red, clayey to loamy subsoil

This association consists of soils on narrow to fairly broad ridgetops. Slopes are 6 to 10 percent in slightly more than half of the acreage and 2 to 6 percent in most of the rest.

This association makes up about 13 percent of the county. Gwinnett soils make up about 60 percent of the association; Hiwassee soils, 20 percent; Musella soils, 5 percent; and minor soils, 15 percent.

Gwinnett soils have a dark reddish-brown loam or clay loam surface layer about 5 to 8 inches thick. The subsoil extends to a depth of about 36 inches and is dark-red or

dusky-red clay and clay loam. It is underlain by highly weathered, soft rock mixed with red clay loam.

Hiwassee soils have a surface layer of dark reddish-brown to dusky-red loam or clay loam 3 to 8 inches thick. The subsoil extends to a depth of 60 inches or more and is mostly dark reddish-brown, dusky-red, and dark-red clay and clay loam.

Musella soils have a dark reddish-brown or dusky-red gravelly or stony surface layer 2 to 6 inches thick. The subsoil is dark-red clay loam and clay and extends to a depth of about 19 inches. It is underlain by broken, soft rock mixed with dark-red clay that extends to a depth of about 37 inches. Depth to hard rock is 22 to 60 inches or more.

The less extensive soils in this association are well-drained Madison, Cecil, Pacolet, and Appling soils.

Most of the acreage is in pine trees and improved pasture, but a large acreage is used as sites for residential subdivisions, small businesses, and small manufacturing plants. Most of this association is eroded, but tilth is good in most places. Tilth is poor in areas where erosion has removed all of the original surface layer and has exposed the clayey subsoil. This association has a moderate potential for both farm and nonfarm uses. Most of the farms in this association are small and are operated part time by the owners. Limitations are slight to severe for nonfarm uses.

11. Appling-Pacolet-Louisburg association

Well-drained to excessively drained soils that have a dominantly yellowish-brown, brownish-yellow, and red, clayey to loamy subsoil

This association consists of well-drained to excessively drained soils on ridgetops. In about a fourth of the acreage, a few rock outcrops occur and depth to hard rock is less than 36 inches. Slopes are 6 to 15 percent in about 70 percent of the acreage and 2 to 6 percent in the rest.

This association makes up about 2 percent of the county. Appling soils make up about 60 percent of the association; Pacolet soils, 15 percent; Louisburg soils, 10 percent; and minor soils, 15 percent.

Appling soils are on the smoother parts of the landscape. The surface layer is brown or yellowish-brown sandy loam about 6 inches thick. The subsoil is mainly yellowish-brown sandy clay mottled with yellowish red and red. It extends to a depth of about 53 inches.

Pacolet soils are in areas where slopes are steep. In the less eroded areas the surface layer is yellowish-brown sandy loam. The subsoil extends to a depth of about 40 inches. It is red clay and sandy clay loam mottled with yellowish brown.

Louisburg soils are on the steepest parts of the ridgetops. The surface layer is very dark gray sandy loam about 6 inches thick. The subsoil is mainly brownish-yellow or yellowish-brown sandy loam extending to a depth of about 23 inches. Hard rock generally is at a depth of 28 to 48 inches. A few rock outcrops are on the steeper slopes.

The less extensive soils in this association are moderately well drained Helena soils and well-drained Madison and Cecil soils.

Most of the acreage is in mixed stands of hardwoods and pines, but a large acreage is used as sites for small residential subdivisions, small businesses, and small manufacturing plants. Many areas are slightly eroded to eroded, and some are severely eroded.

This association does not have a high potential for farming because the soils are shallow and droughty, permeability is rapid, and hard rock is at a depth of less than 36 inches. Many of the farms are small and consist largely of cutover forest. They are operated part time by the owners. Limitations for nonfarm uses are slight to severe.

Dominantly Steep, Stony Soils on Mountains and Slopes Adjacent to Some Streams

One association consists of mainly steep soils on mountains and side slopes adjacent to streams. In most places the surface layer is stony and the subsoil is clayey to loamy. Slopes are 10 to 45 percent.

12. Pacolet-Musella-Louisburg association

Well-drained to excessively drained soils that have a dominantly red, dusky-red, and yellowish-brown to brownish-yellow, clayey to loamy subsoil

This association consists of stony soils on mountain slopes that rise about 100 feet to 600 feet above the surrounding area, and on slopes adjacent to streams (fig. 3). Approximately 80 percent of the acreage is stony. Depth to hard rock is 22 to more than 60 inches, but in a large acreage hard rock is at depths of 28 to 48 inches. In about 60 percent of the acreage hard rock is at a depth of less than 36 inches. Slopes are 25 to 45 percent in about half of the acreage and 10 to 25 percent in the rest.

This association makes up about 3 percent of the county. Pacolet soils make up about 40 percent of the association; Musella soils, 40 percent; Louisburg soils, 10 percent; and minor soils, 10 percent.

Pacolet soils are well drained. The subsoil is red clay and sandy clay loam.

Musella soils have a surface layer of dark reddish-brown stony loam. The subsoil is dark-red clay loam and clay about 13 inches thick.

Louisburg soils are mainly sandy loam throughout the profile, but in some areas they have a thin, discontinuous, clayey subsoil. The surface layer is very dark gray, and the subsoil is mainly brownish yellow and yellowish brown.

The less extensive soils are well-drained Madison and Gwinnett soils and somewhat excessively drained Louisa soils.

Most of the association is covered by mixed stands of hardwoods and pines that have been cut over. A large acreage on and around Kennesaw Mountain is in the Kennesaw Mountain National Battlefield Park. A few areas where the soils have been disturbed by road construction have no vegetation. Most of the farms in this association are small, but a few are large. Most farms are operated part time by the owners. This association does not have a high potential for farming, and the steep slopes, the stony surface, and shallow depth to hard rock limit most nonfarm uses.

Borrow and Fill Areas

One association consists of Urban land and Borrow pits. It is mostly cuts and fills that consist of mixed sand, silt, clay, and boulders.

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Figure 3.—**A typical landscape in the Pacolet-Musella-Louisburg association. Poor quality hardwoods on Louisburg stony sandy loam, 15 to 45 percent slopes.**

13. Urban land and Borrow pits association

Urban land and borrow areas that consist mostly of cuts and fills

This association is used for shopping centers, industrial sites, and residential sites. The soils have been disturbed or removed from many areas (fig. 4). In some places cuts expose weathered mica, schist, granite, gneiss, or diorite, and in others the soil material is sandy clay loam or clay loam. The filled areas generally are made up of material removed from new cuts. This material is mixed sand, silt, clay, and boulders, but in places it does not contain boulders. This association makes up about 1 percent of the county.

Descriptions of the Soils

This section describes the soil series and mapping units of Cobb County. The approximate acreage and proportion extent of each mapping unit are given in table 1. The location of each mapping unit is shown on the soil map at the back of this survey.

The procedure in this section is to describe the soil series first and then the mapping units in the series. Thus, to get complete information on any one mapping unit, it is necessary to read the description of that unit and the description of the series to which it belongs. The description of the soil series mentions features that apply to all of 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.

A profile representative 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.

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 and woodland suitability group in which the mapping unit has been placed. The "Guide to Mapping Units" at the back of this survey lists the page where each capability unit is described.

***Figure 4.*—A typical scene in the Urban land and Borrow pits association. This recently constructed area is being develop as an industrial park.**

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

Soils	Acres	Percent	Soils	Acres	Percent
Altavista sandy loam, 0 to 4 percent slopes	2, 570	1. 2	Madison sandy loam, 10 to 15 percent slopes, eroded	5, 545	2. 5
Alatvista silt loam, occasionally flooded	665	. 3	Madison clay loam, 6 to 10 percent slopes, severely eroded	12, 815	5. 8
Appling sandy loam, 2 to 6 percent slopes	6, 600	3. 0	Madison clay loam, 15 to 25 percent slopes, severely eroded	5, 955	2. 7
Appling sandy loam, 6 to 10 percent slopes	8, 865	4. 0	Madison and Pacolet soils, 10 to 15 percent slopes, severely eroded	14, 555	6. 6
Appling sandy loam, 10 to 15 percent slopes	3, 595	1. 6	Madison and Pacolet soils, 15 to 25 percent slopes, eroded	12, 510	5. 6
Appling sandy clay loam, 2 to 6 percent slopes, severely eroded	1, 355	. 6	Musella gravelly soils, 6 to 15 percent slopes, eroded	2, 295	1. 0
Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	2, 420	1. 1	Musella gravelly soils, 15 to 25 percent slopes, severely eroded	995	. 4
Cartecay silt loam, silty variant	1, 355	. 6	Musella and Pacolet stony soils, 10 to 45 percent slopes	7, 060	3. 2
Cartecay soils	8, 880	4. 0	Pacolet sandy loam, 10 to 15 percent slopes	4, 055	1. 8
Cecil sandy loam, 2 to 6 percent slopes, eroded	4, 165	1. 9	Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	4, 455	2. 0
Cecil sandy loam, 6 to 10 percent slopes, eroded	5, 920	2. 7	Roanoke silt loam	1, 165	. 5
Chewacla soils, wet variants	815	. 4	Toccoa sandy loam, local alluvium	1, 310	. 6
Durham sandy loam, 2 to 6 percent slopes	1, 050	. 5	Toccoa soils	7, 545	3. 4
Gwinnett loam, 2 to 6 percent slopes, eroded	2, 350	1. 1	Urban land	1, 720	. 8
Gwinnett loam, 6 to 10 percent slopes, eroded	2, 645	1. 2	Urban land and Borrow pits	2, 400	1. 1
Gwinnett loam, 10 to 15 percent slopes, eroded	2, 390	1. 1	Urban land-Appling complex, 2 to 10 percent slopes	855	. 4
Gwinnett clay loam, 2 to 6 percent slopes, severely eroded	6, 790	3. 1	Urban land-Cecil complex, 2 to 10 percent slopes	2, 265	1. 0
Gwinnett clay loam, 6 to 10 percent slopes, severely eroded	12, 805	5. 8	Urban land-Gwinnett complex, 2 to 10 percent slopes	995	. 4
Gwinnett clay loam, 10 to 15 percent slopes, severely eroded	8, 320	3. 7	Urban land-Madison complex, 2 to 10 percent slopes	2, 000	. 9
Gwinnett clay loam, 15 to 25 percent slopes, eroded	4, 620	2. 1	Urban land and Pacolet soils, 10 to 25 percent slopes	1, 650	. 7
Helena sandy loam, 2 to 10 percent slopes	1, 330	. 6	Wilkes stony sandy loam, 10 to 40 percent slopes	1, 260	. 6
Hiwassee loam, 2 to 6 percent slopes	3, 360	1. 5	Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes	1, 480	. 7
Hiwassee clay loam, 6 to 10 percent slopes, eroded	3, 050	1. 4	Rock quarry	130	. 1
Hiwassee clay loam, 10 to 15 percent slopes, eroded	1, 335	. 6	Total	221, 440	100. 00
Louisa gravelly sandy loam, 10 to 25 percent slopes	3, 870	1. 7			
Louisa soils, 25 to 60 percent slopes	3, 930	1. 8			
Louisburg sandy loam, 10 to 25 percent slopes	3, 860	1. 7			
Louisburg stony sandy loam, 15 to 45 percent slopes	1, 830	. 8			
Madison sandy loam, 2 to 6 percent slopes, eroded	9, 485	4. 3			
Madison sandy loam, 6 to 10 percent slopes, eroded	6, 200	2. 8			

Descriptions, names, and delineations of soils in this soil survey do not always agree fully with soils maps in adjacent counties published at a different date. Differences are brought about by better knowledge of soils, modifications in series concepts, intensity of mapping, and the extent of soils within the survey. Sometimes it is more feasible to combine under a single name small acreages of similar soils that respond to use and management in much the same way rather than to separate them under different names.

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" (*8*).

Altavista Series

The Altavista series consists of deep, moderately well drained soils that developed in old alluvium. These soils are on stream terraces, in depressions, around the heads of drainageways, and the bases of slopes. Slopes range from 0 to 4 percent.

In a representative profile, the surface layer is dark grayish-brown sandy loam 6 inches thick. The subsurface layer is light yellowish-brown sandy loam 8 inches thick. The subsoil is mainly yellowish-brown sandy clay loam to a depth of 57 inches; it is commonly mottled in the upper part with pale brown and light olive brown, and mottled in the middle and lower parts with gray, yellowish red, strong brown, red, and light yellowish brown. Depth to hard rock is more than 60 inches.

The natural fertility and organic-matter content are low. The available water capacity is medium, and permeability is moderate. Reaction is very strongly acid to strongly acid throughout the profile. Tilth is good.

Altavista soils that are not flooded annually are well suited to farming. About a fourth of the acreage is cultivated or used for pasture; the rest is idle or wooded. In natural wooded areas, the main trees are sweetgum, oaks, hickory, elm, and maple. Reforested areas are in loblolly and shortleaf pines.

Representative profile of Altavista sandy loam, 0 to 4 percent slopes, in a cultivated area 650 feet south of Georgia Highway No. 360, 400 feet west of Mud Creek:

Ap—0 to 6 inches, dark grayish-brown (2.5Y 4/2) sandy loam; few, fine, faint, pale-brown mottles; weak, fine, granular structure; very friable; many fine roots; strongly acid; abrupt, smooth boundary.

A2—6 to 14 inches, light yellowish-brown (2.5Y 6/4) sandy loam; few, fine, faint, very pale brown and yellowish-brown mottles; weak, coarse, subangular blocky structure; very friable; few fine roots; few wormholes filled with dark grayish-brown (10YR 4/2) sandy loam; very strongly acid; clear, smooth boundary.

B1t—14 to 21 inches, yellowish-brown (10YR 5/6) sandy clay loam; few, medium, distinct, light olive-brown (2.5Y 5/4) and pale-brown (10YR 6/3) mottles; weak, medium, subangular blocky structure; friable; few fine roots; few wormholes filled with dark grayish-brown (10YR 4/2) sandy loam; very strongly acid; clear, smooth boundary.

B2t—21 to 37 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, medium, prominent, gray (10YR 6/1), strong-brown (7.5YR 5/8), and yellowish-red (5YR 4/8) mottles; moderate, medium, subangular blocky structure; friable; few fine roots; few wormholes filled with dark grayish-brown (10YR 4/2) sandy loam; few fine mica flakes; clay films on ped surfaces; very strongly acid; clear, smooth boundary.

B31t—37 to 50 inches, mottled, yellowish-brown (10YR 5/6), light yellowish-brown (2.5Y 6/4), gray (10YR 6/1), red (2.5YR 4/8), yellowish-red (5YR 4/8), and strong-brown (7.5YR 5/8) sandy clay loam; weak, medium, subangular blocky structure; friable; few fine mica flakes; very strongly acid; gradual, wavy boundary.

B32t—50 to 57 inches, mottled, yellowish-brown (10YR 5/6), gray (10YR 6/1), red (2.5YR 4/8), and yellowish-red (5YR 4/8) sandy clay loam; weak, fine, subangular blocky structure; friable; many sand grains coated and bridged with clay; few fine mica flakes; very strongly acid.

The Ap horizon is dark yellowish-brown, yellowish-brown, or dark grayish-brown sandy loam 6 to 9 inches thick. The A2 horizon is light yellowish-brown or yellowish-brown sandy loam 4 to 8 inches thick. The Bt horizon is sandy clay loam to clay loam. Few to common fine mica flakes are in the B2t and B3t horizons. Depth to gray mottles ranges from 21 to 26 inches. The combined thickness of the A and B horizons ranges from 40 to about 60 inches. Angular pebbles range from none to few on the surface and in the B1t horizon, and from none to many in the B3t and C horizons. Depth to seasonal high water table is about 22 inches.

Because Altavista silt loam, occasionally flooded, is covered with about 10 to 15 inches of dark reddish-brown to brown silt loam alluvial material, it is outside the range defined for the Altavista series. This difference does not alter the usefulness and behavior of the soil.

Altavista soils commonly occur with Cartecay, Chewacla, wet variants, Toccoa, and Roanoke soils. Altavista soils are better drained and lack the clayey subsoil of the Roanoke soils. They have more distinct horizons than the Cartecay, Chewacla, wet variants, and Toccoa soils.

Altavista sandy loam, 0 to 4 percent slopes (AlB).—This soil has the profile described as representative for the series. The surface layer is sandy loam 6 to 9 inches thick. The seasonal high water table is at a depth of 22 inches.

Included in mapping are small areas of similar soils that have a gravelly sandy loam surface layer. In a few places are somewhat poorly drained Cartecay soils and poorly drained Roanoke soils.

Because of the deep rooting zone, good tilth, and medium available water capacity, this soil is well suited to moderately intensive use. Under good management it is well suited to cultivated crops. In cultivated areas the hazard of erosion is slight to moderate where slopes are more than 2 percent. Where slopes are less than 2 percent, this soil is subject to stream overflow. About a fourth of the acreage is cultivated or in pasture; the rest is wooded or idle. (Capability unit IIe–2; woodland suitability group 2w8)

Altavista silt loam, occasionally flooded (Al).—This soil on low stream terraces in areas 3 to 30 acres in size. The surface layer is reddish-brown, dark-brown, or brown silt loam about 10 to 15 inches thick. This material has been deposited as a result of flooding. The subsoil is sandy clay loam to clay loam that ranges in color from yellowish brown to light olive gray mottled with shades of brown, red, and gray. Slopes are 0 to about 2 percent.

Included in mapping are areas of similar soils that have a sandy loam surface layer and some small areas that have a clayey subsoil. A few areas of Toccoa, Roanoke, and Cartecay soils are also included.

The water table is at a depth of about 14 to 24 inches for 2 to 6 months each year, and most of the acreage is flooded annually for periods of 2 to 7 days. Along the Chattahoochee River, however, these soils are flooded once in 5 to 20 years, and the seasonal high water table is at a depth of 14 inches or more. Available water capacity is high.

This soil is suited to only a limited number of crops because of slow runoff, high water table, and occasional flooding. It can be farmed intensively if properly drained. About 70 percent of the acreage is wooded; the rest is idle, cultivated, or pastured. (Capability unit IIIw–3; woodland suitability group 2w8)

Appling Series

The Appling series consists of deep, well-drained soils that formed on uplands in material weathered from granite, gneiss, and schist. These soils are on narrow to broad ridgetops and hillsides. Slopes range from 2 to 15 percent. These soils occur throughout the county, but most of the acreage is in the southwestern part.

In a representative profile, the surface layer is sandy loam to a depth of 6 inches in the less eroded areas. It is brown in the upper 3 inches and yellowish brown in the lower part. The subsoil extends to a depth of about 53 inches. The subsoil is yellowish-brown sandy clay loam in the upper 11 inches, yellowish-brown clay in the middle part, and mottled sandy clay loam in the lower part. Prominent mottles of red and yellowish red begin at a depth of 17 inches. Mottles increase in size and number with increasing depth. Depth to hard rock is more than 72 inches.

Appling soils are low in natural fertility and are very strongly acid throughout. They contain a small amount of organic matter. Permeability is moderate. The available water capacity is medium. Tilth is good except in severely eroded soils.

These soils are suitable for a wide range of farm and nonfarm uses. Most of the acreage has been cultivated, but loblolly and shortleaf pines now grow in many areas that were formerly cultivated. The rest of the acreage is idle, cultivated, or in pasture or is used for residential sites.

Representative profile of Appling sandy loam, 2 to 6 percent slopes, in loblolly pines, 0.8 mile east of Powder Springs Creek, 1 mile west of Noses Creek, and 1.4 miles south of Georgia Highway No. 360:

Ap1—0 to 3 inches, brown (10YR 5/3) sandy loam; weak, fine, granular structure; very friable; many fine roots; few quartz pebbles; very strongly acid; clear, smooth boundary.

Ap2—3 to 6 inches, yellowish-brown (10YR 5/4) sandy loam; weak, fine, granular structure; very friable; common fine roots; few quartz pebbles; very strongly acid; clear, smooth boundary.

B1t—6 to 17 inches, yellowish-brown (10YR 5/6) sandy clay loam; weak, medium, subangular blocky structure; friable; few fine roots; few fine pores; few fine root channels; few quartz pebbles; few worm casts; very strongly acid; gradual, smooth boundary.

B2t—17 to 38 inches, yellowish-brown (10YR 5/6) clay; many, medium and coarse, prominent mottles of yellowish red (5YR 4/8) and red (2.5YR 4/6); moderate, medium, subangular blocky structure; firm; few fine roots; few pores; few worm casts; few fine mica flakes; few quartz gravel; clay films on some ped surfaces; very strongly acid; clear, smooth boundary.

B3t—38 to 53 inches, mottled yellowish-brown (10YR 5/6) yellowish-red (5YR 4/8), red (2.5YR 4/6), and brownish-yellow (10YR 6/8) sandy clay loam; few small pockets and lenses of clay; weak, medium, subangular blocky structure; friable; few fine roots; few clear quartz crystals; clay films on some ped surfaces; common fine mica flakes; few white feldspar crystals; very strongly acid; clear, wavy boundary.

IIC—53 to 60 inches, mottled yellowish-red (5YR 4/8), very pale brown (10YR 8/3), and brownish-yellow (10YR 6/8) clay loam; massive (structureless); friable; many fine mica flakes; few quartz pebbles; few thin bands of yellowish-brown and red clay; very strongly acid.

The Ap horizon is 2 to 9 inches thick and is dominantly sandy loam. It is brown, yellowish-brown, yellowish-red, or strong-brown sandy clay loam in severely eroded areas. The color is pale olive, brown, brownish yellow, dark grayish brown, light yellowish brown, or light olive brown in areas that have a sandy loam Ap or A1 horizon. In some places there is no B1t horizon. The B2t horizon ranges from yellowish red to yellowish brown and brownish yellow and from sandy clay to clay. The combined thickness of the A and B horizons ranges from 41 inches to about 60 inches.

Appling soils commonly occur with the Cecil, Helena, Pacolet, Madison, and Louisburg soils. Appling soils are less red in the subsoil than Cecil, Pacolet, and Madison soils. They are better drained than Helena soils and are deeper and have less sand in the subsoil than Louisburg soils.

Appling sandy loam, 2 to 6 percent slopes (AmB).—This soil is in small to large areas on narrow to broad ridge crests. The surface layer is brown, brownish yellow, or dark grayish brown. Depth to hard rock is more than 60 inches.

Included in mapping are small areas that have a gravelly sandy loam surface layer, and a few eroded spots where the surface layer is sandy clay loam. In a few places the combined thickness of the surface layer and subsoil is less than 40 inches and in some areas the surface layer is 18 inches thick. Also included are areas of Durham, Helena, and Cecil soils.

The tilth of the plow layer is good. Runoff is medium.

This Appling soil is suited to moderately intensive use. Crops respond well to good management, especially to fertilizer. This soil is well suited to most nonfarm uses. The hazard of erosion is slight to moderate where this soil is cultivated or left bare and not protected.

About 60 percent of the acreage is wooded; the rest is idle, cultivated, or in pasture or is used for residential sites. (Capability unit IIe–2; woodland suitability group 3o7)

Appling sandy loam, 6 to 10 percent slopes (AmC).—This soil is commonly on ridgetops and hillsides in areas as much as 60 acres in size. It has a profile similar to the one described as representative for the series, except that the surface layer is brownish yellow or light yellowish brown and is a mixture of the original surface layer and the upper part of the subsoil. Depth to hard rock is dominantly more than 60 inches.

Included in mapping are some areas of similar soils that have a gravelly sandy loam surface layer. In a few places, the combined thickness of the surface layer and subsoil is less than 40 inches, and hard rock is at a depth of 45 inches. Areas of Durham, Helena, and Cecil soils are also included.

The plow layer of this soil has good tilth. Runoff is medium.

This Appling soil is suited to a wide range of crops and responds to good management, especially to fertilizer. It is also suited to most nonfarm uses. The hazard of erosion is moderate to severe if this soil is cultivated or is left bare and unprotected.

Most of the acreage has been used for crops, chiefly cotton and corn. About 65 percent is in trees, and the rest is idle, cultivated, or in pasture or is used for residential

and industrial sites. (Capability unit IIIe–2; woodland suitability group 3o7)

Appling sandy loam, 10 to 15 percent slopes (AmD).—This soil is on hillsides in areas 25 acres or less in size. It has a pale-olive, light olive-brown, brown, or light yellowish-brown surface layer 6 to 9 inches thick. In other respects the profile is similar to the one described as representative for the series. Depth to hard rock is more than 60 inches.

Included in mapping are areas where the surface layer is gravelly sandy loam or sandy clay loam. In a few places the combined thickness of the surface layer and subsoil is less than 40 inches. In some areas of foot slopes, the subsoil is mottled with gray at a depth of about 40 inches. Also included are small areas of Pacolet, Madison, and Helena soils.

The soil has good tilth. Runoff is medium to moderately rapid.

This Appling soil is poorly suited to frequent cultivation, but it responds to good management and is suited to a number of locally grown crops. It also is suited to many nonfarm uses. The hazard of erosion is severe if this soil is cultivated or left bare and unprotected.

Most of the acreage is wooded, but a large acreage is pastured or cultivated or is used for homesites. (Capability unit IVe–1; woodland suitability group 3o7)

Appling sandy clay loam, 2 to 6 percent slopes, severely eroded (AnB3).—This soil is in areas 3 to 75 acres in size on narrow to broad ridgecrests. The surface layer is brown to yellowish-brown sandy clay loam 3 to 4 inches thick. The original surface layer and part of the subsoil have been removed by mechanical means and through erosion. In most places shallow gullies are common, and in a few places deep gullies have formed. The subsoil is mainly yellowish-brown clay or clay loam that has yellowish-red and red mottles. Depth to hard rock is more than 60 inches.

Included in mapping are some areas of similar soils that have a gravelly sandy loam or sandy loam surface layer and no gullies. In a few places the combined thickness of the surface layer and subsoil is less than 40 inches. Small areas of Cecil, Helena, and Durham soils are also included.

This soil has poor tilth because of the shallow gullies and because the sandy clay loam surface layer is sticky when wet and hard when dry. Runoff is medium to moderately rapid.

This Appling soil is suited to a fairly wide range of crops. It is also suited to many nonfarm uses. The hazard of erosion is moderate where this soil is cultivated or left bare and unprotected.

About 75 percent of the acreage is idle or in pines; the rest is pastured or cultivated or is used for residential sites. (Capability unit IIIe–2; woodland suitability group 4c2e)

Appling sandy clay loam, 6 to 10 percent slopes, severely eroded (AnC3).—This soil is on narrow ridgetops and hillsides. The largest mapped areas are about 40 acres in size. The surface layer of this soil is yellowish-brown to yellowish-red sandy clay loam 3 to 4 inches thick. The original surface layer and part of the subsoil have been removed by mechanical means and through erosion. In most places shallow gullies are common, and in a few places gullies are deep. The subsoil is mottled yellowish-brown, yellowish-red, brownish-yellow, or strong-brown clay. The combined thickness of the surface layer and subsoil ranges from about 41 to 60 inches. Depth to hard rock is more than 60 inches.

Included in mapping are small areas of Pacolet, Madison, and Helena soils, areas of soils that have a clay surface layer less than 3 inches thick, and areas on the lower part of some slopes where the soil has gray mottles at a depth of less than 30 inches.

This soil has poor tilth because of shallow gullies and because the sandy clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid.

This Appling soil is poorly suited to cultivated crops, but if well managed it can be cultivated occasionally. It is well suited to pine trees and to some nonfarm uses (fig. 5). The hazard of erosion is severe if this soil is cultivated or left bare and unprotected.

About 75 percent of the acreage is idle or in pines, and the rest is cultivated or pastured or is used for residential sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Cartecay Series

Cartecay series consists of deep, somewhat poorly drained soils on flood plains. Slopes are 0 to 2 percent. Once or twice each year these soils are subject to overflow that lasts 2 to 7 days. Along the Chattahoochee River overflow is less frequent.

In a representative profile, the surface layer is dark yellowish-brown fine sandy loam in the upper 5 inches and dark yellowish-brown silt loam in the lower 6 inches. The underlying layer, to a depth of 45 inches, is mainly stratified sandy loam, loam, or loamy sand that is mottled with shades of red, gray, and brown. Depth to hard rock is more than 60 inches.

Natural fertility is low, and the organic-matter content is moderate. Permeability is moderately rapid, and available water capacity is medium. Reaction is medium acid throughout the profile. Tilth is generally good. In a few wet places it is poor.

Cartecay soils are suited to a limited number of crops. About three-fourths of the acreage is wooded or idle, and the rest is cultivated or is in pasture. In natural wooded areas, the dominant trees are sweetgum, red maple, yellow-poplar, willows, alders, sycamore, blackgum, ash, and water oak.

Representative profile of Cartecay fine sandy loam, in an area of weed trees, 3.2 miles west of Georgia Highway No. 5, 2.3 miles north of U.S. Highway No. 41, and 1.7 miles east of railroad:

Ap—0 to 5 inches, dark yellowish-brown (10YR 3/4) fine sandy loam; many, fine, distinct, yellowish-red, strong-brown, and light brownish-gray mottles; weak, fine, granular structure; friable; many fine roots; many fine mica flakes; common, fine, soft, dark-brown and black concretions; medium acid; clear, smooth boundary.

A1—5 to 11 inches, dark yellowish-brown (10YR 3/4) silt loam; common, fine, distinct, yellowish-red, brown, and light brownish-gray mottles; weak, fine, granular structure; friable; many fine roots; many fine mica flakes; few, fine, soft, dark-brown and black concretions; medium acid; clear, smooth boundary.

C1—11 to 18 inches, mottled yellowish-red (5YR 5/8), red (2.5YR 4/8), pale-brown (10YR 6/3), yellowish-brown (10YR 5/4), and light brownish-gray (2.5Y 6/2) sandy loam; massive (structureless); friable; thin bedding planes; common fine roots; many fine

Figure 5.—**A stand of planted loblolly pines 6 years old on Appling sandy clay loam, 6 to 10 percent slopes, severely eroded. This soil is in woodland suitability group 4c2e.**

mica flakes; few quartz pebbles; common, soft, black, dark-brown, and yellowish-brown concretions; medium acid; clear, smooth boundary.

C2—18 to 26 inches, mottled light brownish-gray (2.5Y 6/2), yellowish-red (5YR 5/8), yellowish-brown (10YR 5/4), and dark-brown (7.5YR 4/4) fine sandy loam; massive (structureless); friable; thin bedding planes; few fine roots; many fine mica flakes; medium acid; abrupt, wavy boundary.

C3—26 to 36 inches, strong-brown (7.5YR 5/8) loamy sand; common, medium, distinct, yellowish-red (5YR 5/8), and dark yellowish-brown (10YR 4/4 to 10YR 3/4) mottles; massive (structureless); very friable; many fine mica flakes; thin lenses of sandy loam; medium acid; abrupt, smooth boundary.

C4—36 to 45 inches +, olive-brown (2.5Y 4/4) silt loam; many, medium, prominent, grayish-brown (2.5Y 5/2), light olive-brown (2.5Y 5/6), strong-brown (7.5YR 5/8), gray (10YR 6/1), and dark-brown (10YR 4/3) mottles; massive (structureless); friable; few fine roots; common fine mica flakes; few, soft, black concretions; medium acid.

The Ap horizon ranges from reddish brown to dark grayish brown in color and from fine sandy loam and loam to loamy sand in texture. Texture of the C3 and C4 horizons ranges from fine sandy loam or sandy clay loam to loamy sand within a short distance. Generally, the water table is at a depth of more than 18 inches, but during wet seasons it is 6 inches below the surface.

Cartecay soils occur with the Toccoa, Chewacla, wet variants, Altavista, and Roanoke soils. Cartecay soils contain less clay than the Chewacla, wet variants. They are wetter than the Toccoa soils and lack the well-defined horizons of the Altavista and Roanoke soils.

Cartecay soils (Cah).—These soils have slopes of 0 to 2 percent. The surface layer is loam or fine sandy loam 2 to 12 inches thick.

Included in mapping in a few places are similar soils that have sandy clay loam and clay layers at a depth of less than 40 inches. Also included are a few small areas of Toccoa, Altavista, and Roanoke soils.

The seasonal high water table is 6 inches below the surface for short periods. Runoff is slow.

Because they are wet and frequently flooded, these soils are poorly suited to many of the cultivated crops commonly grown in the county. If drained they can be used intensively. Pasture and hay crops respond well if fertilizer is applied and adequate drainage is provided.

About a fourth of the acreage is cultivated or pastured; the rest is idle or wooded. Reforested areas are mainly in willows, alders, or shortleaf and loblolly pines. (Capability unit IIIw–2; woodland suitability group 2w8)

Cartecay Series, Silty Variant

The Cartecay series, silty variant, consists of deep, somewhat poorly drained soils on flood plains. Slopes are 0 to 2 percent. Once or twice each year these soils are subject to stream overflow that lasts 2 to 7 days. Along the Chattahoochee River overflow is less frequent.

In a representative profile, the surface layer is dark-brown silt loam, 5 inches thick, that is mottled with brown and yellowish red. The next layer is silt loam, about 11 inches thick, that is mottled with shades of brown, yellow, and red. Between depths of 16 and 32 inches is silt loam mottled with gray, yellowish red, red, and shades of brown. This is underlain to a depth of 45 inches by dark grayish-brown silty clay loam that is mottled with gray, yellowish red, red, and shades of brown. Depth to hard rock is more than 60 inches.

Natural fertility is low, and organic-matter content is moderate. Permeability is moderate, and available water capacity is high. Reaction is medium acid to slightly acid throughout the profile. Tilth is generally good. In a few wet places it is poor.

This soil is suited to most pasture and hay crops commonly grown in the county. About three-fourths of the acreage is wooded or idle, and the rest is cultivated or is used for pasture. In natural wooded areas, the main trees are ash, willows, red maple, sweetgum, blackgum, and water oak.

Representative profile of Cartecay silt loam, silty variant, in hardwoods, 100 feet north of Sope Creek, 1.4 miles south of Georgia Highway No. 120, and 0.6 mile southeast of East Cobb Junior High School:

A—0 to 5 inches, dark-brown (7.5YR 4/4) silt loam; few, fine, distinct, yellowish-red and brown mottles; weak, fine, granular structure; friable; many fine roots; many worm casts; few fine mica flakes; medium acid; clear, smooth boundary.

C1—5 to 16 inches, mottled brown (10YR 5/3), yellowish-brown (10YR 5/4), brownish-yellow (10YR 6/6), strong-brown (7.5YR 5/6), and yellowish-red (5YR 4/6) silt loam; massive (structureless); friable; thin horizontal bedding planes; common fine roots; few, soft, black coatings; common fine mica flakes; few fine pores; few worm casts; medium acid; clear, smooth boundary.

C2—16 to 22 inches, mottled brown (10YR 5/3), yellowish-red (5YR 5/8), strong-brown (7.5YR 5/6), red (2.5YR 4/8), grayish-brown (10YR 5/2), and gray (10YR 6/1) silt loam; massive (structureless); friable; thin horizontal bedding planes; common fine roots; few, soft, black coatings; few fine pores; common fine mica flakes; slightly acid; clear, smooth boundary.

C3—22 to 32 inches, mottled yellowish-red (5YR 5/8), red (2.5YR 4/8), yellowish-brown (10YR 5/4), olive-brown (2.5Y 4/4), and gray (10YR 5/1) silt loam; massive (structureless); friable; few, fine, soft, black coatings; few fine pores; few fine mica flakes; medium acid; clear, wavy boundary.

C4—32 to 45 inches +, dark grayish-brown (2.5Y 4/2) silty clay loam; many, medium, prominent, red (2.5YR 4/8), yellowish-red (5YR 5/8), olive-brown (2.5Y 4/4), and gray (N 5/0) mottles; massive (structureless); friable; few fine roots; few, soft, black concretions; few fine mica flakes; medium acid.

The A horizon is 5 to 8 inches thick and ranges from dark brown to yellowish brown. Depth to gray mottles is commonly about 16 inches but ranges from 14 to 20 inches. The C4 horizon is silt loam, loam, silty clay loam, or sandy clay loam. The water table is normally at a depth of 15 to 30 inches, but the seasonal high water table is at a depth of 9 inches for 2 or 3 days in wet periods.

These soils are covered with water for periods of 2 to 7 days once every 5 to 20 years along the Chattahoochee River and once or twice annually along other streams in the county.

Cartecay, silty variant, occurs with Tocca, Chewacla, wet variants, Roanoke, Altavista, and normal Cartecay soils. It is better drained than the Chewacla, wet variants. It is more poorly drained than the Toccoa soils, more silty than the normal Cartecay soils, and has less distinct horizons than the Roanoke and Altavista soils.

Cartecay silt loam, silty variant (Cw).—This soil has 0 to 2 percent slopes, and runoff is slow.

Included in mapping are a few areas of soils that have a silty clay or sandy clay subsoil. In some areas the soil is free of gray mottles to a depth of 30 inches, and in other areas the surface layer has gray mottles.

If drained, this soil is suited to most of the pasture plants commonly grown in the county and to corn, soybeans, and a few other cultivated crops. It can be cultivated every year if adequately drained and otherwise well managed, but damage from flooding is a hazard.

About a fourth of the acreage is cultivated or pastured. The rest is wooded or idle. (Capability unit IIIw–2; woodland suitability group 2w8)

Cecil Series

The Cecil series consists of deep, well-drained soils that formed in material weathered from granite, gneiss, and mica schist. These soils are on broad to narrow ridgetops and moderately long hillsides throughout the county. Slopes range from 2 to 10 percent.

In a representative profile, the surface layer is chiefly strong-brown sandy loam to a depth of 6 inches. The subsoil extends to a depth of about 45 inches. It is red clay in the upper 12 inches, and red clay and sandy clay loam mottled with yellowish brown, yellowish red, and strong brown in the lower part. The underlying material is red sandy loam mottled with strong brown and yellowish red. Depth to hard rock is generally more than 60 inches.

These soils are low in natural fertility and strongly acid to very strongly acid throughout. The organic-matter content is low, permeability is moderate, and available water capacity is medium. Tilth is good except in eroded areas or galled spots.

Cecil soils are well suited to farming and to some nonfarm uses. A large acreage is pastured or cultivated or is used for residential sites. The native vegetation is mixed hardwoods and pine trees.

Representative profile of Cecil sandy loam, 2 to 6 percent slopes, eroded, in pine woods, 1 mile north of Shiloh

Methodist Church, 1 mile northeast of railroad, and 1.1 miles south of Cherokee County line:

Ap—0 to 6 inches, strong-brown (7.5YR 5/6) sandy loam; few, fine, distinct, red mottles; weak, fine, granular structure; very friable; many fine roots; few quartz pebbles; few worm casts; strongly acid; abrupt, smooth boundary.

B21t—6 to 18 inches, red (2.5YR 5/6) clay; moderate, medium, subangular blocky structure; firm; common fine roots; few quartz pebbles; few worm casts; few fine mica flakes; prominent red (2.5YR 4/6) clay films on ped surfaces; very strongly acid; clear, smooth boundary.

B22t—18 to 32 inches, red (2.5YR 4/8) clay; few, medium, prominent, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few fine roots; few, weak, red schist fragments; few fine mica flakes; few quartz pebbles; prominent red (2.5YR 4/6) clay films on ped surfaces; very strongly acid; clear, wavy boundary.

B3t—32 to 45 inches, interior of peds are red (2.5YR 4/6), and ped surfaces are yellowish-red (5YR 5/8) sandy clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/8); weak, medium, subangular blocky structure; friable; few fine roots; common fine mica flakes; few quartz pebbles and few, weak, red schist fragments; clay films on ped surfaces; very strongly acid; clear, wavy boundary.

C—45 to 60 inches +, red (2.5YR 4/6) sandy loam; common, medium, distinct, strong-brown (7.5YR 5/8) and yellowish-red (5YR 4/8) mottles; massive (structureless); friable; few fine roots; few, weak, red schist fragments; common fine mica flakes; very strongly acid.

The Ap horizon is brown, dark-brown, strong-brown, or yellowish-brown sandy loam 5 to 8 inches thick. The combined thickness of the A and B horizons ranges from 44 inches to more than 55 inches. The B1t horizon, where present, is yellowish-red sandy clay loam. The B2t horizons are red sandy clay to clay, and the B3t horizon is red or yellowish-red sandy clay loam. The B horizon ranges from 33 inches to about 50 inches in thickness. Depth to yellowish-brown, strong-brown, or reddish-yellow mottles ranges from 15 to 39 inches.

Cecil soils occur with Pacolet, Appling, Madison, Gwinnett, and Louisburg soils. They are deeper than the Pacolet soils and have a redder subsoil than the Appling soils. They contain less mica, especially in the surface layer and the upper part of the subsoil, than the Madison soils. They are deeper than the Gwinnett soils, and their subsoil is not as red. They are deeper, are more clayey in the subsoil, and have more distinct horizons than the Louisburg soils.

Cecil sandy loam, 2 to 6 percent slopes, eroded (CYB2).—This soil is on narrow to broad ridgetops. Erosion has removed most of the original surface layer of this soil, and the plow layer extends into the subsoil. Galled spots and rills occur in most areas. The present surface layer is strong-brown, yellowish-brown, dark-brown, or brown sandy loam 5 to 7 inches thick. In other respects, the profile is similar to the one described as representative for the series.

Included in mapping are some areas of similar soils that have a gravelly fine sandy loam and sandy clay loam surface layer and a sandy clay loam subsoil. Some small severely eroded areas are also included. In these areas the surface layer is yellowish-red or red sandy clay loam, and tilth is poor. Small areas of Madison, Pacolet, and Gwinnett soils are also included.

The plow layer of this soil has good tilth except in the galled spots. Runoff is medium. The effective rooting zone is more than 36 inches deep.

This Cecil soil is suited to moderately intensive farming. Crops respond well to good management, especially to fertilizer. This soil is also well suited to most nonfarm uses. The hazard of erosion is slight to moderate in cultivated fields and in unprotected bare areas.

About half the acreage is wooded; the rest is idle, cultivated, or pastured or is used for residential or industrial sites. (Capability unit IIe–1; woodland suitability group 3o7)

Cecil sandy loam, 6 to 10 percent slopes, eroded (CYC2).—This soil is on long, narrow ridgetops and moderately long hillsides. Mapped areas are less than 5 to more than 50 acres in size. The surface layer is yellowish-brown or dark-brown sandy loam 5 to 8 inches thick. It is a mixture of the original surface layer and the upper part of the subsoil. Galled spots, rills, and shallow gullies are in most areas. The subsoil ranges from about 33 inches to more than 45 inches in thickness. In other respects the profile is similar to the one described as representative for the series.

Included in mapping are some small areas where the soil is severely eroded, the plow layer is yellowish-red or red sandy clay loam, and tilth is poor. In a few places, the surface layer is gravelly fine sandy loam. Areas of Madison, Pacolet, and Gwinnett soils are also included.

The plow layer of this soil generally has good tilth except in severely eroded areas. Runoff is medium.

This soil is suited to a wide range of crops and to most nonfarm uses. It responds to good management, especially to fertilizer. The slopes and the runoff rate make the hazard of further erosion moderate to severe where this soil is cultivated and left unprotected.

About 65 percent of the acreage is wooded; the rest is idle, cultivated, or pastured or is used for residential or industrial sites. (Capability unit IIIe–1; woodland suitability group 3o7)

Chewacla Series, Wet Variants

The Chewacla series, wet variants, consists of deep, poorly drained soils that developed in recent alluvium on first bottoms. Slopes are 0 to 2 percent. These soils are in small to medium areas near the larger streams in the county.

In a representative profile, the surface layer is dark-brown to a depth of 12 inches. It is mottled silt loam in the upper 4 inches and silty clay loam mottled with gray in the lower part. The subsoil, to a depth of 48 inches, is grayish-brown or mottled gray silty clay loam. Depth to hard rock is more than 60 inches.

These soils are low in natural fertility and moderate in organic-matter content. Permeability is moderate, and the available water capacity is high. Reaction is strongly acid to medium acid throughout the profile. Tilth is generally good, but it is poor where the soils are wet.

Chewacla, wet variants, are suited to a limited range of crops. About 80 percent of the acreage is wooded; the rest is cultivated, pastured, or idle. In natural wooded areas, the trees are red maple, ash, willow, and water oak.

Representative profile of Chewacla heavy silt loam, wet variants, in woods, 110 yards east of Noses Creek, 1.5 miles south of Georgia Highway No. 360, and 0.8 mile northwest of Georgia Highway No. 5:

A11—0 to 4 inches, dark-brown (10YR 4/3) silt loam; many, fine, prominent, very pale brown, yellowish-red, and light brownish-gray mottles; weak, fine, granular structure; friable; many fine roots; few, fine, black and dark-brown concretions; strongly acid; abrupt, smooth boundary.

A12 —4 to 12 inches, dark-brown (10YR 4/3) silty clay loam; common, fine, prominent, gray, yellowish-red, pale-brown, and strong-brown mottles; weak, fine, granular structure; friable; many fine roots; few fine mica flakes; few, fine, soft, black and dark-brown concretions; medium acid; clear, smooth boundary.

B1g—12 to 24 inches, grayish-brown (10YR 5/2) silty clay loam; many, fine, prominent, gray, dark-brown, and strong-brown mottles; weak, fine, subangular blocky structure; friable; common fine roots; many fine mica flakes; few, fine, soft, black and dark-brown concretions; strongly acid; clear, smooth boundary.

B21g—24 to 36 inches, mottled gray (10YR 5/1), grayish-brown (10YR 5/2), yellowish-brown (10YR 5/6), and strong-brown (7.5YR 5/6) silty clay loam; weak, medium, subangular blocky structure; friable; few fine roots; many fine mica flakes; few, fine, soft, black and dark-brown concretions; medium acid; clear, wavy boundary.

B22g—36 to 48 inches, gray (10YR 5/1) silty clay loam; common, medium, prominent, strong-brown (7.5YR 5/6), and yellowish-red (5YR 5/8) mottles; weak, medium, subangular blocky structure; friable; few fine roots; common fine mica flakes; few, fine, soft, black and dark-brown concretions; strongly acid.

The Ap and A1 horizons are mottled dark yellowish-brown, dark-brown, or gray silt loam, fine sandy loam, silty clay loam, or sandy loam. The B horizon is silt loam, fine sandy loam, sandy loam, silty clay loam, or sandy clay loam. The combined thickness of the A and B horizons ranges from 36 to more than 48 inches.

The water table is commonly at a depth of less than 12 inches, but during dry periods is at a depth of as much as 24 inches. Depth to the seasonal high water table is 3 inches.

Chewacla, wet variants, occur with Toccoa, Cartecay, Roanoke, and Altavista soils. They have a grayish B horizon and are more poorly drained than the Altavista, Cartecay, and Toccoa soils. They are less clayey in the subsoil than the Roanoke soils.

Chewacla soils, wet variants (Csw).—These soils have slopes of 0 to 2 percent. The profile is similar to the one described as representative of Chewacla series, wet variants, but the surface layer is silt loam, silty clay loam, fine sandy loam, or sandy loam about 12 inches thick.

Included in mapping are some areas of similar soils that have a coarse sand or loamy sand surface layer, and other areas where thin layers of loamy sand and sand are in the profile at varying depths. Also included are small areas of Altavista, Cartecay, and Roanoke soils.

These soils are flooded once or twice each year for about 2 to 14 days. Along the Chattahoochee River, however, they are flooded only once every 5 to 20 years.

These soils are suited to a limited number of crops, but they can be cultivated intensively if drainage is provided. Crops on these soils respond fairly well to fertilizer. Most of the acreage is wooded, and except for a few small cultivated areas, the rest is idle or in pasture. Some areas provide good habitat for waterfowl. (Capability unit IVw–1; woodland suitability group 2w9)

Durham Series

The Durham series consists of deep, well-drained soils that formed in material weathered mainly from granite and gneiss, which is mixed with schist in places. These soils are in small areas on narrow to medium ridgetops on the uplands throughout the county. Slopes range from 2 to 6 percent.

In a representative profile, the surface layer is dark grayish-brown sandy loam about 7 inches thick. The subsurface layer is yellowish-brown sandy loam about 4 inches thick. The subsoil extends to a depth of about 54 inches; it is mainly yellowish-brown sandy clay loam. Mottles of yellowish red, brownish yellow, and strong brown are at depths ranging from 28 to 54 inches. Very pale brown and gray mottles are at depths below 44 inches. The layer below 54 inches and extending to 61 inches is mottled yellowish-brown, brownish-yellow, very pale brown, yellowish-red, and red sandy clay loam. Depth to hard rock is more than 60 inches.

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

Durham soils are well suited to farming and to many nonfarm uses. About a fourth of the acreage is cultivated or is used for pasture; the rest is idle or wooded or is used for residential sites. In reforested areas the main trees are loblolly and shortleaf pines.

Representative profile of Durham sandy loam, 2 to 6 percent slopes, in an idle field, 100 feet south of railroad, 650 yards east of Noses Creek, and 430 yards north of pipeline:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam; few, fine, faint mottles of yellowish brown; weak, fine granular structure; very friable; many fine roots; strongly acid; abrupt, smooth boundary.

A2—7 to 11 inches, yellowish-brown (10YR 5/4) sandy loam; few, fine, faint mottles of pale brown and brownish yellow; weak, fine, subangular blocky structure; friable; few fine roots; few root channels filled with dark grayish-brown sandy loam; very strongly acid; clear, smooth boundary.

B21t—11 to 28 inches, yellowish-brown (10YR 5/8) sandy clay loam; weak, medium, subangular blocky structure; friable; few clear quartz crystals and pebbles; few fine roots; few root channels filled with dark yellowish-brown (10YR 4/4) sandy loam; very strongly acid; clear, smooth boundary.

B22t—28 to 44 inches, yellowish-brown (10YR 5/8) sandy clay loam; common, medium, prominent mottles of yellowish red (5YR 4/8), brownish yellow (10YR 6/6), and strong brown (7.5YR 5/8); moderate, medium and fine, subangular blocky structure; friable; few clear quartz crystals and pebbles; few fine roots; clay films on ped surfaces; very strongly acid; gradual, smooth boundary.

B3t—44 to 54 inches, mottled yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/6), very pale brown (10YR 7/3), gray (10YR 6/1), yellowish-red (5YR 5/8), and red (2.5YR 4/6) sandy clay loam; weak, medium and fine, subangular blocky structure; friable; few clear quartz crystals; very strongly acid; gradual, wavy boundary.

IIC—54 to 61 inches, mottled yellowish-brown (10YR 5/6), brownish-yellow (10YR 6/6), very pale brown (10YR 7/3), yellowish-red (5YR 5/8), and red (2.5YR 4/6) sandy clay loam; small pockets or lenses of gray clay; massive (structureless); firm; few, fine, clear quartz crystals; very strongly acid.

The Ap horizon is very dark grayish brown, grayish brown, brown, or light yellowish brown and 7 to 12 inches thick. In places is a sandy loam or sandy clay loam B1t horizon, 5 to 7 inches thick, that ranges from light olive brown through brownish yellow and yellowish brown. The B2t horizon ranges from olive yellow through yellowish brown and brownish yellow. The combined thickness of the A and B horizons ranges from 40 to 60 inches. In places angular and subangular blocky gravel is common on the surface.

Durham soils occur with Appling, Helena, Altavista, and Cecil soils. They have more sand in the major part of the subsoil than the Appling and Cecil soils; they have less clay in the main part of the subsoil and are better drained than the Helena soils; and they are better drained than the Altavista soils.

Durham sandy loam, 2 to 6 percent slopes (DiB).—This soil has the profile described as representative for the series.

Included in mapping are small areas where slopes are less than 2 percent. Small areas of Appling, Altavista, and Helena soils are also included.

Runoff is medium in cultivated fields that are unprotected.

This soil is well suited to the cultivated crops commonly grown in the county and to many nonfarm uses. Crops respond well to fertilizer and good management. The hazard of erosion is slight to moderate in cultivated areas.

About a fourth of the acreage is cultivated or in pasture, the rest is wooded or idle or is used for residential sites. Reforested areas are mainly in loblolly and shortleaf pines. (Capability unit IIe–2; woodland suitability group 3o7)

Gwinnett Series

The Gwinnett series consists of moderately deep to deep, well-drained soils. These soils formed in material weathered from rocks that contain biotite, hornblende, pyrozene, and other dark-colored minerals. They occupy large areas on ridgetops and side slopes on uplands throughout the county. Slopes range from 2 to 25 percent.

In a representative profile of a severely eroded soil, the surface layer is dark reddish-brown clay loam 5 inches thick. The subsoil extends to a depth of about 36 inches. It is dark-red clay in the upper 19 inches and dark-red clay loam in the lower part. Small pieces of black, yellowish-red, strong-brown, and reddish-yellow weathered soft rock are between depths of 15 and 72 inches. As depth increases, the size and number of soft rocks increase. Depth to hard rock is 36 inches to more than 60 inches.

These soils are low in natural fertility and in organic-matter content. Reaction is very strongly acid throughout the profile. Permeability is moderate, and the available water capacity is medium. Tilth is good in the less eroded areas.

All but the steep Gwinnett soils are suited to farming and to nonfarm uses. Most of the acreage has been cultivated, but loblolly and shortleaf pines have been planted in many areas that were formerly cultivated. About 30 percent of the acreage is pasture or cultivated, or is used for residential and industrial sites; the rest is wooded.

Representative profile of Gwinnett clay loam, 6 to 10 percent slopes, severely eroded, in loblolly and shortleaf pines, 0.3 mile west of Rubes Creek, 0.9 mile east of railroad, and 0.9 mile north of Dawson Cemetery:

Ap—0 to 5 inches, dark reddish-brown (2.5YR 3/4) clay loam; weak, fine, granular structure; friable; many fine roots; few clear quartz crystals and pebbles; few black and brown concretions; few worm casts and wormholes; very strongly acid; abrupt, smooth boundary.

B21t—5 to 15 inches, dark-red (2.5YR 3/6) clay, red (2.5YR 4/6) when dry; moderate, medium, subangular blocky structure; firm; few fine and medium roots; few clear quartz crystals; few, soft, black concretions; few fine mica flakes; clay films on ped surfaces; very strongly acid; clear, smooth boundary.

B22t—15 to 24 inches, dark-red (2.5YR 3/6) clay; moderate, medium, subangular blocky structure; firm; few fine and medium roots; few clear quartz crystals; small soft rock fragments of yellowish red (5YR 4/8), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/8) are common; few fine mica flakes; few, soft, black minerals; clay films on ped surfaces; very strongly acid; gradual, wavy boundary.

B3t—24 to 36 inches, dark-red (2.5YR 3/6) clay loam; weak to moderate, medium, subangular blocky structure; friable; few fine mica flakes; few fine root channels; soft, weathered rock of black (10YR 2/1), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 6/8) makes up 30 percent of horizon by volume; very strongly acid; gradual, wavy boundary.

C—36 to 72 inches +, soft, highly weathered rock of strong brown (7.5YR 5/8), reddish yellow (7.5YR 6/8), yellowish red (5YR 4/8), and black (10YR 2/1), with thin discontinuous lenses of red clay loam; massive (structureless); friable; many fine mica flakes; very strongly acid.

The Ap horizon is dark reddish-brown, dusky-red, or dark-red loam or clay loam 3 to 9 inches thick. The A1 horizon, where present, is dark reddish-brown to dusky-red loam 5 to 6 inches thick.

The B1t horizon, where present, is dusky-red, dark-red, or dark reddish-brown clay loam or sandy clay loam 5 to 10 inches thick. The B2t horizon is dark-red, dusky-red, or dark reddish-brown clay 7 to 30 inches thick. The B3t horizon, where present, is as much as 17 inches thick. Where present, the B&C horizon is red or dark-red sandy clay loam, clay loam, or clay 6 to 12 inches thick. Soft, loose rock fragments make up 15 to 45 percent of the B&C horizon. The combined thickness of the A and B horizons ranges from 22 to 40 inches. Depth to soft, continuous rock ranges from 24 inches to more than 52 inches.

Gwinnett soils occur mainly with Cecil, Hiwassee, Madison, Musella, and Pacolet soils. They have a redder surface layer and a darker red subsoil than the Cecil, Madison, and Pacolet soils. They also have less mica throughout the profile than the Madison soils. They are thinner than the Hiwassee soils. They generally have fewer cobblestones in the surface layer, have a thicker subsoil, and are deeper over hard rock than the Musella soils.

Gwinnett loam, 2 to 6 percent slopes, eroded (GgB2).—This soil is on broad and narrow ridgetops and on hillsides. Mapped areas are less than 5 to more than 50 acres in size. In many places, erosion has removed much of the original surface layer, and the plow layer extends into the subsoil. The surface layer is dark reddish-brown loam 5 to 8 inches thick. The profile of this soil otherwise is similar to the one described as representative for the series. Depth to soft rock is 37 to more than 52 inches.

Included in mapping are areas of similar soils that have a clay loam and gravelly sandy loam surface layer. In some areas the combined thickness of the surface layer and subsoil is more than 50 inches. Also included are some small galled spots that have poor tilth and small areas of Madison, Hiwassee, and Musella soils.

The plow layer generally has good tilth. In the galled spots tilth is poor. Runoff is medium.

This Gwinnett soil is suited to moderately intensive cultivation. Crops respond well to good management, especially to fertilizer. This soil is also well suited to many nonfarm uses. The hazard of erosion is slight to moderate in cultivated areas and in areas that are bare and unprotected.

About 65 percent of the acreage is wooded; the rest is cultivated, pastured, or idle or is used for residential and industrial sites. (Capability unit IIe–1; woodland suitability group 3o7)

Gwinnett loam, 6 to 10 percent slopes, eroded (GgC2).—This soil is on narrow ridgetops and on the upper part of moderately long slopes. Mapped areas range from 3 to more than 25 acres in size.

The surface layer is dark reddish-brown loam 4 to 7 inches thick. The plow layer consists of the original surface layer mixed with material from the upper part of the subsoil. Galled spots are few to common in most areas. In other respects this soil has a profile similar to the one described as representative for the series. Depth to soft rock ranges from 26 to more than 48 inches.

Included in mapping are small areas of Madison, Hiwassee, and Musella soils.

This soil is suited to a wide range of crops and to many nonfarm uses. Crops respond well to good management, especially to fertilizer. The plow layer generally has good tilth. Runoff is medium, and the hazard of erosion is moderate to severe where this soil is cultivated or is bare and unprotected.

About 65 percent of the acreage is wooded; the rest is cultivated, pastured, or idle or is used for residential and industrial sites. (Capability unit IIIe–1; woodland suitability group 3o7)

Gwinnett loam, 10 to 15 percent slopes, eroded (GgD2).—This soil is on hillsides and short side slopes adjacent to drainageways. Mapped areas range from 3 to 45 acres in size.

The surface layer is dark reddish-brown or dusky-red loam 6 to 9 inches thick. The upper part of the subsoil is dark reddish-brown or dark-red clay loam 6 to 10 inches thick. The plow layer is a mixture of the original surface layer and the upper part of the subsoil. Some galled spots are in most areas that have been farmed. The profile otherwise is similar to the one described as representative for the series. Depth to soft rock ranges from 34 to 44 inches, and hard rock is at a depth of 47 inches in a few areas.

Included with this soil in mapping are areas of similar soils that have a cobbly sandy loam or clay loam surface layer, a few areas where the combined depth of surface layer and subsoil is less than 20 inches, and a few areas where the subsoil is loamy. Also included are small areas of Madison, Musella, and Hiwassee soils.

This soil generally has good tilth. Runoff is medium to moderately rapid, and the hazard of further erosion is severe where this soil is cultivated or left bare and unprotected. This soil is poorly suited to frequent cultivation, but it can be cropped occasionally if it is well managed.

Most of the acreage is wooded, but a large acreage is pastured or cultivated or is used for residential and industrial sites. (Capability unit IVe–1; woodland suitability group 3o7)

Gwinnett clay loam, 2 to 6 percent slopes, severely eroded (GeB3).—This soil is on broad ridgetops. Mapped areas range from less than 5 to more than 50 acres in size.

The surface layer is dark reddish-brown or dark-red clay loam 4 to 5 inches thick. It consists of remnants of the original surface layer and material from the subsoil. Shallow gullies are common in most areas, and some areas have a few deep gullies. The profile of this soil is otherwise similar to the one described as representative for the series. The combined thickness of the surface layer and subsoil is 33 to 38 inches. Depth to soft rock ranges from 33 to more than 42 inches.

Included in mapping are small areas of Madison, Hiwassee, and Musella soils.

This soil has poor tilth because of the clay loam surface layer and the shallow gullies. Runoff is medium.

This soil is suited to a wide range of crops and to many nonfarm uses. The hazard of further erosion is moderate where this soil is cultivated or is left bare and unprotected.

About 65 percent of the acreage is wooded or idle; the rest is cultivated or pastured or is used for residential and industrial sites. (Capability unit IIIe–1; woodland suitability group 4c2e)

Gwinnett clay loam, 6 to 10 percent slopes, severely eroded (GeC3).—This soil is on narrow ridgetops and on the upper part of moderately long hillsides. Mapped areas range from 3 to 110 acres in size.

This soil has the profile described as representative for the series. The surface layer is dark reddish-brown or dark-red clay loam 4 to 6 inches thick. It consists of material from the subsoil that has been mixed with remnants of the original surface layer. In most areas, small spots of dark-red or dusky-red clay is exposed. Shallow gullies are common, but in some areas there are a few deep gullies. Depth to soft rock ranges from 30 inches to more than 50 inches. The combined thickness of the surface layer and subsoil is 24 to 36 inches.

Included in mapping are small areas of Madison, Hiwassee, and Musella soils.

This soil has poor tilth because of the shallow gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid.

This soil is poorly suited to cultivated crops, but if well managed it can be cultivated occasionally. It is suited to pine trees and many nonfarm uses. Erosion is a hazard where this soil is cultivated or left bare and unprotected.

About 70 percent of the acreage is wooded; the rest is cultivated, pastured, or idle or is used for residential and industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Gwinnett clay loam, 10 to 15 percent slopes, severely eroded (GeD3).—This soil is on moderately long side slopes. Mapped areas range from 3 to 60 acres in size.

The surface layer is dark reddish-brown or dark-red clay loam 3 to 4 inches thick. It consists of material from the subsoil that has been mixed with remnants of the original surface layer. In most areas shallow gullies are few to common, and deep gullies occur in some places. Small spots of dark-red or dusky-red clay are exposed in many areas. The combined thickness of the surface layer and subsoil is 22 to 37 inches. Depth to soft rock ranges from 24 to more than 50 inches.

Included with this soil in mapping are a few areas of a similar soil that has a gravelly clay loam surface layer, and a few areas where the solum is less than 20 inches thick. Also included are small areas of Madison, Hiwassee, and Musella soils.

This soil has poor tilth because of the gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is rapid.

This soil is poorly suited to cultivated crops and to some nonfarm uses. It can be cultivated occasionally if good management practices are used. Pine trees grow moderately well on this soil. The hazard of erosion is severe where this soil is cultivated or is left bare and unprotected.

Most of the acreage is in pine trees, but a large acreage is pastured, cultivated, or idle or is used for residential and industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Gwinnett clay loam, 15 to 25 percent slopes, eroded (GeE2).—This soil is on short slopes generally adjacent to drainageways. Mapped areas range from 3 to 45 acres in size.

The surface layer is dusky-red or dark reddish-brown clay loam 3 to 7 inches thick. It consists of a mixture of material from the subsoil and the original surface layer. Shallow gullies are few to common, and dark-red or dusky-red clay is exposed in some places. In other respects, the profile is similar to the one described as representative for the series. Depth to soft rock ranges from 39 to 48 inches, and hard rock is at a depth of 36 inches in some areas.

Included in mapping are areas of similar soils that have a gravelly clay loam, gravelly sandy loam, or cobbly clay loam surface layer, and areas where the solum is less than 22 inches thick. Also included are small areas of Madison, Pacolet, and Musella soils.

This soil has poor tilth because of the gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid to rapid.

The moderately steep slopes and the hazard of further severe erosion make this soil unsuitable for cultivated crops and many nonfarm uses. This soil is suited to pine trees and can be used for permanent pasture.

About 80 percent of the acreage is wooded; the rest is pastured, cultivated, or idle or is used for residential and industrial sites. (Capability unit VIe–2; woodland suitability group 4c3e)

Helena Series

The Helena series consists of moderately deep to deep, moderately well drained soils. These soils formed in mixed materials weathered from granite, granite gneiss, gabbro, diorite, or hornblende gneiss. They are in small to medium-size areas on narrow to moderately wide ridgetops and short side slopes on the uplands. Slopes range from 2 to 10 percent.

In a representative profile, the surface layer is dark grayish-brown sandy loam about 5 inches thick. The upper part of the subsoil is yellowish-brown sandy clay loam commonly mottled with strong brown, yellowish red, and light yellowish brown. The middle and lower parts of the subsoil, to a depth of 37 inches, are clay mottled in shades of brown, red, yellow, and gray. Gray mottles are at a depth of 14 inches. Depth to hard rock is more than 60 inches.

These soils are low in natural fertility and organic-matter content. Permeability is slow, and the available water capacity is medium. Tilth is generally good. Reaction is strongly acid to very strongly acid throughout the profile.

Helena soils are suited to many cultivated crops grown locally. Less than 10 percent of the acreage is cultivated; the rest is wooded, pastured, or idle. Sweetgum, blackgum, white oak, red oak, and water oak are the main trees in natural wooded areas.

Representative profile of Helena sandy loam, 2 to 10 percent slopes, in an idle field, 700 yards east of Mud Creek, 1 mile north of Georgia Highway No. 360, and 25 feet west of paved road:

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) sandy loam; few, fine, faint, light yellowish-brown mottles; weak, fine, granular structure; friable; many fine roots; few fine pores; strongly acid; abrupt, smooth boundary.

B1t—5 to 14 inches, yellowish-brown (10YR 5/6) sandy clay loam; common, fine, distinct mottles of strong brown, yellowish red, and light yellowish brown; weak, medium, subangular blocky structure; friable; few fine roots; few quartz pebbles; common fine pores; very strongly acid; clear, smooth boundary.

B2t—14 to 24 inches, mottled yellowish-brown (10YR 5/6), light yellowish-brown (2.5Y 6/4), gray (10YR 6/1), yellowish-red (5YR 5/8), and red (2.5YR 4/8) clay; moderate, medium, angular blocky structure; firm; few fine pores; few fine mica flakes; few fine roots; few quartz pebbles; clay films on ped surfaces; very strongly acid; gradual, wavy boundary.

B3t—24 to 37 inches, mottled yellowish-brown (10YR 5/6), yellowish-red (5YR 5/8), red (2.5YR 4/8), pale-yellow (2.5Y 7/4), and gray (10YR 6/1) clay; many, medium, prominent mottles; weak, coarse, subangular blocky structure; firm; few fine mica flakes; few quartz pebbles; few fine pores; clay films on ped surfaces; very strongly acid; gradual, wavy boundary.

C—37 to 55 inches +, partially weathered granite; few veins of gray (N 5/0) clay in cracks and crevices; partially weathered granite crushes to sandy loam; very strongly acid.

The Ap horizon is dark grayish-brown, yellowish-brown, grayish-brown, or light olive-brown sandy loam 4 to 7 inches thick. The B1t horizon is brownish-yellow, olive-yellow, light yellowish-brown, or yellowish-brown sandy clay loam. The B2t horizon is firm, mottled sandy clay or clay. The B3t horizon is sandy clay loam to clay. Gray mottles are at a depth of 14 to 19 inches. The combined thickness of the A and B horizons is generally 24 to 37 inches, but in some areas it is more than 40 inches.

Helena soils occur chiefly with the Appling, Durham, and Cecil soils, but they are less well drained than those soils. In the subsoil, they are less red than the Cecil soils and more clayey than the Durham soils.

Helena sandy loam, 2 to 10 percent slopes (HYC).—Areas of this soil range from 2 to 3 acres in size. The surface layer is 4 to 7 inches thick.

Included in mapping are small areas of similar soils that have a surface layer of gravelly sandy loam. Also included are small areas of Appling, Durham, and Cecil soils, and small areas of eroded sandy clay loam.

The surface layer of this soil generally is in good tilth. The rooting zone, which is determined by depth to the underlying rock, is moderately deep. Depth to the seasonal high water table is about 27 inches.

This Helena soil is suited to most hay and pasture crops and to many cultivated crops grown locally. Crops respond well to good management, especially to fertilizer. The hazard of further erosion is moderate in cultivated and unprotected areas. This soil is moderately to severely limited for many nonfarm uses because of the seasonal high water table, slow permeability, and clayey subsoil.

Most of the acreage has been cultivated, but less than 10 percent of the acreage is now cultivated; the rest is wooded, is idle, or is in pasture. Reforested areas are mainly in shortleaf and loblolly pines. (Capability unit IIIe–4; woodland suitability group 3w8)

Hiwassee Series

The Hiwassee series consists of deep, well-drained soils that formed in material weathered mainly from diorite gneiss and hornblende gneiss, which are mixed with schist in places. These soils occur in small to medium-size areas on narrow to moderately wide ridgetops and hillsides on

uplands throughout the county. Slopes range from 2 to 15 percent.

In a representative profile, the surface layer is dark reddish-brown loam about 5 inches thick. The subsoil is dark reddish-brown, dusky-red, or dark-red clay to a depth of 54 inches. Below this is dark reddish-brown clay loam that extends to a depth of more than 70 inches in some places. Depth to hard rock is generally more than 60 inches.

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

Hiwassee soils are suited to a wide range of plants. Most of the acreage has been cultivated, but loblolly and shortleaf pines now grow in many areas that were formerly cultivated. About a fourth of the acreage is pastured, cultivated, or idle or is used for residential and industrial sites. The rest is wooded.

Representative profile of Hiwassee loam, 2 to 6 percent slopes, in an idle field, 0.8 mile south of Cherokee-Cobb County line, 0.75 mile southwest of fire tower on Sweat Mountain, and 0.5 mile northeast of Rubes Creek:

Ap—0 to 5 inches, dark reddish-brown (5YR 3/4) loam; weak, fine, granular structure; friable; many fine roots; few, hard, black concretions; few quartz pebbles; few red worm casts; common fine pores; strongly acid; abrupt, smooth boundary.

B21t—5 to 18 inches; dark reddish-brown (2.5YR 3/4) clay; moderate, medium and fine, subangular blocky structure; friable; common fine roots; few quartz pebbles; few, soft, black concretions; few, hard, yellowish-brown and dark-brown concretions; few fine pores; clay films on ped surfaces; very strongly acid; gradual, smooth boundary.

B22t—18 to 39 inches, dusky-red (10R 3/4) and dark-red (10R 3/6) clay; moderate to strong, medium and fine, subangular blocky structure; firm; few fine roots; few clear quartz pebbles; few, soft and hard, black concretions; few, small, soft, yellowish-brown rock fragments; few worm casts; few fine pores; clay films on ped surfaces; very strongly acid; gradual, smooth boundary.

B23t—39 to 54 inches, dark-red (10R 3/6) clay; moderate, medium, subangular blocky structure; firm; few quartz pebbles; few black and yellowish-brown, hard concretions; very strongly acid; gradual, smooth boundary.

B3t—54 to 70 inches +, dark reddish-brown (2.5YR 3/4) clay loam; weak, medium, subangular blocky structure; friable; few quartz pebbles; few, hard, yellowish-brown concretions; common, soft, black concretions; very strongly acid.

The Ap horizon is dark reddish-brown to dusky-red clay loam or loam 3 to 8 inches thick. The A1 horizon, where present, is chiefly dark reddish-brown loam about 4 inches thick. A few rounded pebbles are on the surface in some areas. The upper 20 inches of the Bt horizon is dark-red, dusky-red, or dark reddish-brown clay or clay loam; the clay content is 38 to 60 percent. The upper 40 inches of the Bt horizon is more than 10 percent mica, feldspar, manganese, and other weatherable minerals. In the B3t horizon, the clay content commonly decreases and the color is dark reddish brown to red. A stone line occurs in places, commonly below a depth of 62 inches. The solum is commonly more than 60 inches thick.

Hiwassee soils occur mainly with Cecil, Gwinnett, Madison, Pacolet, and Musella soils. They have a darker red surface layer and subsoil than the Cecil, Madison, and Pacolet soils. They are deeper over bedrock than the Pacolet, Madison, Gwinnett, and Musella soils.

Hiwassee loam, 2 to 6 percent slopes (HSB).—This soil occurs in small to medium-size areas on narrow to moderately wide ridgecrests. It has the profile described as representative for the Hiwassee series. The surface layer ranges from 5 to 8 inches in thickness, and in some areas the upper part of the subsoil is clay loam 4 to 10 inches thick.

Included in mapping are small areas of similar soils that have a gravelly clay loam, cobbly clay loam, or clay loam surface layer. In a few places the solum is more than 72 inches thick. Small areas of Gwinnett, Madison, and Musella soils are also included.

Tilth is good only within a narrow range of moisture content. Runoff is medium.

This Hiwassee soil is suited to moderately intensive use. Crops respond well to good management, especially to fertilizer. This soil is also well suited to many nonfarm uses. The hazard of erosion is slight to moderate where the soil is cultivated or is left bare and unprotected.

About 65 percent of the acreage is wooded; the rest is cultivated, pastured, or idle or is used for residential or industrial sites (fig. 6). (Capability unit IIe–1; woodland suitability group 3o7)

Hiwassee clay loam, 6 to 10 percent slopes, eroded (HTC2).—This soil is on long hillsides adjacent to narrow ridgetops. Mapped areas range from 5 to 50 acres in size. The surface layer is dusky-red or dark reddish-brown clay loam 4 to 7 inches thick. It is a mixture of remnants of the original surface layer and material from the upper part of the subsoil. Shallow gullies occur in most places. In a few places, deep gullies have formed, and the upper part of the subsoil is clay loam. The solum ranges from 44 to 104 inches in thickness. In other respects the profile is similar to the one described as representative for the series.

Included with this soil in mapping are areas of similar soils that have a loam surface layer, and a few areas where weak-red, strong-brown, very dark gray, or white mottles are in the lower part of the profile. Also included are small areas of Madison, Gwinnett, and Musella soils.

This soil has poor tilth because of shallow gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid.

This soil is poorly suited to cultivated crops. If well managed, it can be cultivated occasionally. It is suited to pine trees and many nonfarm uses. Erosion is a hazard where this soil is cultivated or is left bare and unprotected.

About 75 percent of the acreage is in trees; the rest is cultivated, pastured, or idle or is used for residential or industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Hiwassee clay loam, 10 to 15 percent slopes, eroded (HTD2).—This soil is on long side slopes. Mapped areas range from 5 to 35 acres in size. The surface layer is dusky-red or dark reddish-brown clay loam 3 to 6 inches thick. It is a mixture of remnants of the original surface layer and material from the upper part of the subsoil. Most areas have shallow gullies. The solum ranges from 52 to more than 87 inches in thickness. In other respects the profile is similar to the one described as representative for the series.

Included with this soil in mapping are areas of similar soils that have a cobbly loam, loam, cobbly clay loam, or gravelly loam surface layer 2 to 12 inches thick. In a few

Figure 6.—**Coastal bermudagrass grown for hay on Hiwassee loam, 2 to 6 percent slopes. A mixed stand of loblolly pines and hardwoods is in the background.**

places bedrock is at a depth of 38 inches. Also included are small areas of Madison, Gwinnett, and Musella soils.

Tilth is poor because of the gullies and because the clay loam surface layer is sticky when wet and hard when dry.

This soil is poorly suited to cultivated crops and to many nonfarm uses. It can be cultivated occasionally if well managed. Pine trees grow moderately well. Runoff is rapid, and the hazard of erosion is severe where this soil is cultivated or is left bare and unprotected.

Most of the acreage is in pine trees, but a large acreage is pastured, cultivated, or idle or is used for residential and industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Louisa Series

The Louisa series consists of somewhat excessively drained soils that formed in material weathered from mica schist, quartz mica schist, and gneiss. These soils are shallow over weathered rock. They are in small areas on narrow ridgetops and side slopes on uplands throughout the county. Slopes range from 10 to 60 percent.

The surface layer is chiefly dark-brown gravelly sandy loam about 6 inches thick. The subsoil is yellowish-red gravelly loam about 8 inches thick that overlies strong-brown weathered schist at a depth of about 14 inches. The surface layer and subsoil have a high content of fine mica flakes. The underlying schist, at a depth of 26 inches, is soft and can be excavated without drilling and blasting.

In these soils, natural fertility and organic-matter content are low. Permeability is moderately rapid, and available water capacity is low. Reaction is strongly acid throughout the profile.

Louisa soils are not suited to cultivated crops, and nearly all of the acreage is wooded. In natural wooded areas, the main trees are oaks, hickory, and dogwood. Reforested areas are generally in shortleaf and loblolly pines.

Representative profile of a Louisa gravelly sandy loam in an area of Louisa soils, 25 to 60 percent slopes, under a mixed stand of hardwoods, 0.3 mile south of Interstate Highway No. 20, and 1.2 miles north of the Chattahoochee River:

O1—2 inches to 1 inch, relatively fresh hardwood litter.
O2—1 inch to 0, very dark grayish-brown (10YR 3/2) partially decomposed forest litter mixed with a small amount of mineral matter.
A11—0 to 3 inches, dark-brown (10YR 4/3) gravelly sandy loam; weak, fine, granular structure; friable; many fine roots; many fine mica flakes; fine quartz pebbles and schist fragments make up 20 to 25 percent of horizon; strongly acid; clear, smooth boundary.
A12—3 to 6 inches, dark-brown (7.5YR 4/4) gravelly sandy loam; weak, fine, granular structure; very friable; many fine roots; many fine mica flakes; quartz pebbles

and schist fragments make up 15 to 20 percent of horizon; few worm casts; few, soft, black concretions; strongly acid; clear, smooth boundary.

B—6 to 14 inches, yellowish-red (5YR 4/8) gravelly loam; weak, coarse and medium, subangular blocky structure; friable; many fine roots; many fine mica flakes; quartz pebbles and schist fragments make up 20 percent of horizon; strongly acid; clear, wavy boundary.

C—14 to 26 inches, strong-brown (7.5YR 5/6) weathered schist; massive (structureless); friable; thin lenses of red clay in seams and cracks between rock strata is about 1 percent (by volume) of horizon, and loose small and medium schist fragments make up about 30 percent of horizon; many fine mica flakes; few quartz pebbles; strongly acid; abrupt, smooth boundary.

R—26 to 30 inches +, rock of black, gray, yellowish-red, and yellowish-brown mica schist that can be cut with spade.

The A1 horizon is yellowish-brown, grayish-brown, dark-brown, or dark grayish-brown sandy loam and gravelly sandy loam 2 to 7 inches thick. The Ap horizon is dark brown, yellowish brown, or dark yellowish brown and 5 to 7 inches thick. The A horizon is 3 to 11 inches thick. The B horizon is yellowish-red, yellowish-brown, brownish-yellow, strong-brown, or red sandy loam, gravelly sandy loam, gravelly loam, sandy clay loam, or clay loam. The solum is 8 to 20 inches thick. Depth to soft rock ranges from 15 to more than 36 inches, but generally is 26 to 34 inches. The Bt horizon is sandy clay loam or clay loam, discontinuous, and 8 to 14 inches thick; it makes up about 35 to 45 percent of the profile. Depth to hard rock is generally more than 60 inches.

Louisa soils occur mostly with Madison, Pacolet, Louisburg, and Gwinnett soils. They are shallower and have less distinct horizons than the Madison, Pacolet, and Gwinnett soils and are not so clayey in the subsoil. They contain more mica and have a finer textured subsoil than the Louisburg soils.

Louisa gravelly sandy loam, 10 to 25 percent slopes (lkE).—This soil is on narrow ridgetops and side slopes. The surface layer is yellowish-brown, dark grayish-brown, or dark-brown gravelly sandy loam. The subsoil is yellowish-brown, strong-brown, yellowish-red, or red gravelly sandy loam, sandy loam, or sandy clay loam 5 to 14 inches thick. Depth to soft rock ranges from 27 to more than 36 inches but is 27 to 34 inches in most places.

Included in mapping is a similar soil that has a loam or fine sandy loam surface layer, is stony, and has a few rock outcrops. In some areas hard rock is at a depth of 30 inches. Small areas of Pacolet and Louisburg soils are also included.

Tilth is generally good. Runoff is moderately rapid. This soil is not suited to cultivated crops because slopes are steep, the hazard of erosion is severe, and the available water capacity is low. It has moderate to severe limitations for nonfarm uses.

About 90 percent of the acreage is wooded; the rest is idle or pastured or is used for residential sites. (Capability unit VIIe–2; woodland suitability group 4r2)

Louisa soils, 25 to 60 percent slopes (lNF).—These are mainly steep soils on side slopes. The surface layer is gravelly sandy loam and sandy loam 3 to 7 inches thick. The profile is similar to the one described as representative for the series, but texture of the surface layer is more variable. Depth to soft schist rock ranges from 15 to more than 36 inches.

Included in mapping are areas of similar soils where the surface is stony. Also included are small areas of Pacolet, Madison, and Gwinnett soils. Hard rock is at a depth of about 36 inches in a few places.

These soils are not suited to cultivated crops because slopes are steep, the erosion hazard is severe, tilth is poor, and the available water capacity is low. They have severe limitations for many nonfarm uses.

Most of the acreage is wooded, but part is idle or pastured or is used for residential sites. (Capability unit VIIe–2; woodland suitability group 4r2)

Louisburg Series

The Louisburg series consists of moderately deep, well-drained to excessively drained soils that formed in material weathered mainly from granite and gneiss. These soils occur in small to medium-size areas on ridge crests and hillsides mostly in the southeastern part of the county. Slopes range from 10 to 45 percent.

In a representative profile, the surface layer, to a depth of 6 inches, is sandy loam; it is very dark gray in the upper 2 inches and light olive brown below. The subsoil is sandy loam and extends to a depth of 23 inches; the upper 4 inches is yellow, the middle is brownish yellow, the lower 7 inches is yellowish brown. The underlying layer, about 8 inches thick, is partially weathered rock and sandy loam material. Hard rock underlies this soil at a depth of about 31 inches.

The Louisburg soils are low in natural fertility and organic-matter content. Reaction is strongly acid to very strongly acid throughout the profile. Permeability is rapid, and available water capacity is low. Tilth is good where the soils do not contain stones.

These soils are not suited to cultivated crops or to many nonfarm uses. Most of the acreage is wooded, but a small acreage is idle, pastured, or cultivated or is used for residential sites. In natural wooded areas, the trees are white oak, red oak, hickory, blackjack oak, post oak, and dogwood. Reforested areas are in loblolly and shortleaf pines.

Representative profile of Louisburg sandy loam, 10 to 25 percent slopes, in hardwoods, 0.5 mile west of Nickajack Creek, 0.9 mile south of U.S. Highway No. 78, and 0.9 mile northeast of Georgia Highway No. 139:

A1—0 to 2 inches, very dark gray (5Y 3/1) sandy loam; weak, fine, granular structure; very friable; many fine roots; few quartz pebbles; common worm casts of olive yellow, olive brown, and light olive brown; strongly acid; clear, smooth boundary.

A2—2 to 6 inches, light olive-brown (2.5Y 5/4) sandy loam; weak, fine, granular structure; friable; many fine roots; few quartz pebbles; many worm casts of grayish brown, olive yellow, and pale olive; few wormholes or root channels filled with black and dark grayish-brown sandy loam; very strongly acid; clear, smooth boundary.

B1—6 to 10 inches, yellow (2.5Y 7/6) sandy loam; weak, coarse and medium, subangular blocky structure; friable; common fine roots; few quartz pebbles; common worm casts of yellowish brown; few wormholes or root channels filled with black and dark grayish-brown sandy loam; few fine mica flakes; very strongly acid; clear, smooth boundary.

B21—10 to 16 inches, brownish-yellow (10YR 6/6) sandy loam; weak, coarse and medium, subangular blocky structure; friable; common fine roots; few quartz pebbles; few worm casts of yellowish brown; few fine mica flakes; very strongly acid; clear, smooth boundary.

B22—16 to 23 inches, yellowish-brown (10YR 5/6) sandy loam; weak, medium, subangular blocky structure; friable; few fine roots; few fine mica flakes; few quartz pebbles; few worm casts of yellow; few, fine, highly weathered rock fragments of strong brown; very strongly acid; clear, wavy boundary.

C—23 to 31 inches, partly weathered soft granite rock that is yellowish brown, strong brown, yellowish red, and

grayish brown containing few white streaks; few lenses of brown sandy loam between rock strata; soft granite crushes easily to sandy loam; very strongly acid; gradual, wavy boundary.

R—31 inches, hard granite rock.

The A1 horizon is very dark gray, very dark grayish-brown, or dark grayish-brown sandy loam 2 to 8 inches thick. In places the surface is stony. The Ap horizon, where present, is dark-brown or grayish-brown sandy loam about 8 inches thick. The B2 horizon is chiefly yellowish-brown or brownish-yellow sandy loam; in about 40 percent of the acreage, however, a thin discontinuous layer of sandy clay loam or sandy clay makes up part of the B2 horizon. This loamy or clayey horizon is generally mottled with red, yellowish red, and strong brown. Depth to soft rock is 20 to 34 inches. Depth to hard rock is 28 to 48 inches.

Louisburg soils commonly occur with Appling, Pacolet, Wilkes, Musella, and Louisa soils. They are shallower to hard rock and sandier in the subsoil than the Appling and Pacolet soils and lack the well-defined horizons of those soils. They are more sandy in the subsoil than the Wilkes and Musella soils and have less mica throughout the solum than the Louisa soils.

Louisburg sandy loam, 10 to 25 percent slopes (LnE).—This soil is on narrow ridge crests and hillsides. It has the profile described as representative for the series. The surface layer is sandy loam 6 to 8 inches thick. The subsoil is mainly yellow to yellowish-brown sandy loam, but in places it has a thin discontinuous layer of sandy clay loam or sandy clay less than 6 inches thick. The clayey part is mottled with red, yellowish red, and strong brown. Depth to soft rock generally ranges from 21 to 32 inches, and depth to hard rock, from 28 to 48 inches.

Included in mapping are areas of a similar soil that has a gravelly sandy loam or a stony sandy loam surface layer. In a few small areas hard rock is at a depth of 18 inches and the solum is less than 12 inches thick. Also included are a few areas of Pacolet and Appling soils. In a few places there are rock outcrops.

The surface layer of this soil has good tilth.

This Louisburg soil is not suited to cultivated crops because of steep slopes and the severe hazard of erosion. It has moderate to severe limitations for most nonfarm uses.

Most of the acreage is wooded. The rest is idle or pastured or is used for residential sites. (Capability unit VIIe–2; woodland suitability group 3r8)

Louisburg stony sandy loam, 15 to 45 percent slopes (LDF).—This soil is on hillsides. The surface layer is stony, dark grayish-brown to very dark grayish-brown sandy loam 3 to 7 inches thick. The subsoil is mostly yellowish-brown or brownish-yellow sandy loam, but in places there is a thin discontinuous layer of sandy clay loam to sandy clay 12 to 23 inches thick. The sandy clay loam or sandy clay is mottled with red, yellowish red, and strong brown. Depth to soft rock ranges from 20 to 34 inches. Depth to hard rock ranges from about 29 inches to more than 42 inches.

Included in mapping are some areas of a similar soil that has a sandy loam surface layer and other small areas where the solum is more than 48 inches thick. Also included are small areas of Pacolet and Appling soils. Rock outcrops are few to common.

This soil is not suited to cultivated crops because slopes are steep, erosion is a severe hazard, and the surface layer is stony (fig. 7). It has severe limitations for many nonfarm uses.

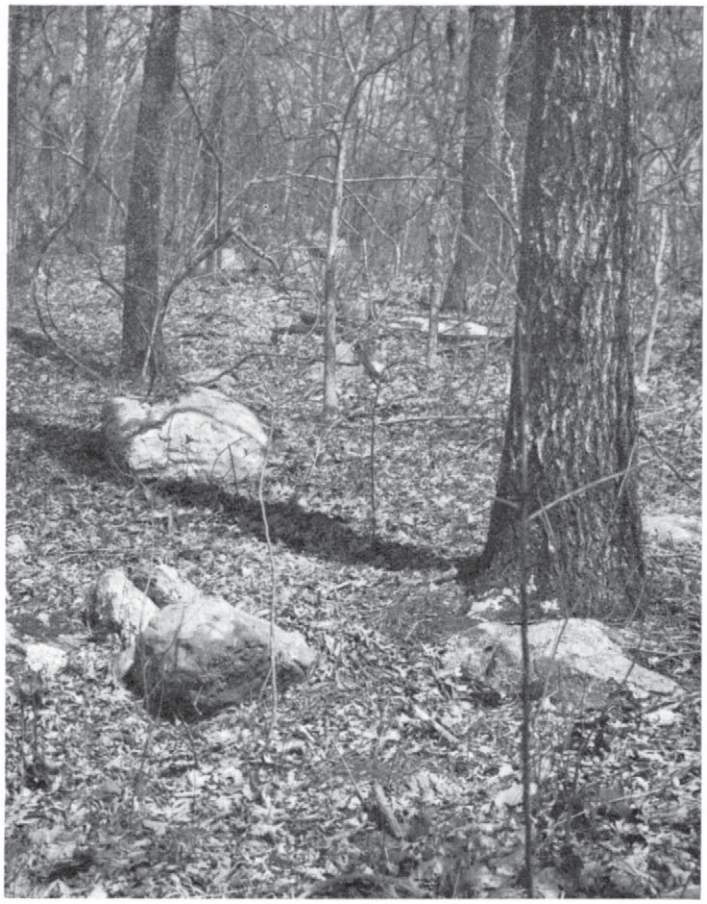

Figure 7.—**Poor quality hardwoods growing on Louisburg stony sandy loam, 15 to 45 percent slopes. The stony surface prohibits use of farm machinery.**

Most of the acreage of this soil is wooded. A small acreage is idle or pastured or is used for residential sites. (Capability unit VIIe–2; woodland suitability group 3x3)

Madison Series

The Madison series consists of moderately deep to deep, well-drained soils that formed in material weathered from quartz mica schist, granite gneiss, and mica schist. These soils are on somewhat broad to narrow ridgetops, on long hillsides, and on short slopes adjacent to drainageways in the uplands. Areas of these soils are scattered throughout the county. Slopes range from 2 to 25 percent.

In a representative profile, the surface layer is brown sandy loam about 5 inches thick. The subsoil extends to a depth of 36 inches; it is yellowish-red and red sandy clay loam in the upper 5 inches and red clay in the middle 15 inches. The lower 11 inches is red sandy clay loam that is approximately 20 percent yellowish-brown, soft rock fragments. Depth to hard rock is generally more than 60 inches.

Madison soils are low in natural fertility and organic-matter content. Reaction is very strongly acid throughout the profile. The available water capacity is medium, and permeability is moderate. Tilth is good except in galled spots and in severely eroded areas.

The less sloping soils that are not severely croded are suited to most crops grown locally. They have slight to

moderate limitations for many nonfarm uses. Most of the acreage is wooded, but a large acreage is pastured, cultivated, or idle or is used for residential and industrial sites. In some abandoned fields there are stands of loblolly and shortleaf pines; the less eroded soils are covered by a stand of mixed hardwoods.

Representative profile of Madison sandy loam, 2 to 6 percent slopes, eroded, in a pasture, 0.9 mile south of Willeo Creek, 0.6 mile northwest of Harmony Grove Baptist Church, and 1.25 miles east of Mountain View School:

Ap—0 to 5 inches, brown (7.5YR 5/4) sandy loam; few, fine, distinct mottles of yellowish red and yellowish brown; weak, fine, granular structure; very friable; many fine roots; few fine mica flakes; common quartz pebbles and schist fragments; very strongly acid; abrupt, smooth boundary.

B1t—5 to 10 inches, yellowish-red (5YR 4/8) and red (2.5YR 4/8) sandy clay loam; weak, medium, subangular blocky structure; friable; few fine roots; few quartz pebbles and schist fragments; common fine mica flakes; few root channels and wormholes filled with brown and yellowish-brown sandy loam; very strongly acid; clear, smooth boundary.

B2t—10 to 25 inches, red (2.5YR 4/6) clay; moderate, medium and fine, subangular blocky structure; firm; few fine roots; many fine mica flakes; few quartz pebbles and schist fragments; clay films on ped surfaces; very strongly acid; clear, wavy boundary.

B3t—25 to 36 inches, red (2.5YR 4/6) sandy clay loam; weak, medium and fine, subangular blocky structure; friable; few fine roots; clay films on ped surfaces; approximately 20 percent (by volume) of horizon is soft, yellowish-brown schist rock; many fine mica flakes; very strongly acid; clear, irregular boundary.

C—36 to 48 inches +, soft schist rock that is black, red, olive, olive yellow, and yellowish brown; thin bands of red clay approximately 1/16 to 1/5 inch thick between rock strata make up less than 5 percent (by volume) of horizon; very strongly acid.

The A1 horizon, where present, is very dark grayish-brown, dark grayish-brown, and strong-brown sandy loam 2 to 6 inches thick. The Ap horizon is yellowish-red, yellowish-brown, brown, strong-brown, reddish-brown, and dark-brown sandy loam or clay loam 2 to 7 inches thick.

The combined thickness of the A and B horizons ranges from 21 to 40 inches. The B1t horizon, where present, is red or yellowish-red sandy clay loam, clay loam, or gravelly sandy clay loam 3 to 6 inches thick. The B3t horizon is red or strong-brown clay loam or sandy clay loam 4 to 18 inches thick. The B3t horizon occurs in slightly more than 50 percent of the acreage. The B&C horizon, where present, is red sandy clay loam, clay loam, or clay 6 to 17 inches thick. This horizon is 20 to 40 percent, by volume, loose rock fragments. In some places, it is mottled with yellowish brown, strong brown, and yellowish red. Depth to soft schist rock ranges from 22 to more than 60 inches.

Madison soils occur mostly with Appling, Cecil, Louisa, Gwinnett, and Pacolet soils. They have more mica throughout the profile than the Appling, Cecil, Gwinnett, and Pacolet soils, especially in the surface layer and the upper part of the subsoil. They are deeper and have more distinct horizons than the Louisa soils. They are less red in the surface layer and subsoil than the Gwinnett soils.

Madison sandy loam, 2 to 6 percent slopes, eroded (MgB2).—This soil occurs as small to large areas on narrow to moderately broad ridgetops. It has the profile described as representative for the series. In many places the surface layer is eroded and the plow layer extends into the subsoil. Small galled spots are common in most areas. Depth to soft schist rock ranges from 28 to more than 36 inches.

Included in mapping are some areas of similar soils that have a gravelly sandy loam and gravelly clay loam surface layer. Also included are small areas of Cecil, Gwinnett, and Appling soils.

This soil generally has good tilth. In the galled spots tilth is poor. Runoff is medium in cultivated fields that are unprotected.

This soil is suited to a wide range of crops and can be farmed somewhat intensively. Crops respond well to fertilizer and good management. This soil is also suited to most nonfarm uses. The hazard of erosion is slight to moderate where this soil is cultivated or is left bare and unprotected.

Most of the acreage at one time was planted to cotton and corn, but about 70 percent is now wooded; the rest is idle, cultivated, or pastured or is used for residential or industrial sites. (Capability unit IIe–1; woodland suitability group 3o7)

Madison sandy loam, 6 to 10 percent slopes, eroded (MgC2).—This soil is on long, narrow ridgetops and moderately long hillsides. Mapped areas range from 3 to 55 acres in size. The plow layer is a mixture of the original surface layer and the upper part of the subsoil. It is yellowish-brown, dark brown, or brown sandy loam 4 to 5 inches thick. There are a few shallow gullies in some places. Depth to soft schist rock ranges from 30 inches to more than 60 inches.

Included in mapping are some small areas of a severely eroded soil and areas of similar soils that have a cobbly or gravelly surface layer. Also included are areas of Cecil, Gwinnett, and Appling soils.

The plow layer of this soil has good tilth except in the severely eroded areas. Runoff is medium where this Madison soil is cultivated or left bare and unprotected, and the hazard of further erosion is moderate to severe.

If well managed, this soil can be cultivated. The generally good tilth and the moderately thick to thick rooting zone make this soil suitable for a wide range of crops. It is also suited to many nonfarm uses.

About 70 percent of the acreage is wooded. The rest is idle, cultivated, or pastured or is used for residential or industrial sites. (Capability unit IIIe–1; woodland suitability group 3o7)

Madison sandy loam, 10 to 15 percent slopes, eroded (MgD2).—This soil is on moderately long side slopes. Mapped areas are 3 acres to 60 acres in size. In many places erosion has removed so much of the surface layer that the plow layer now extends into the subsoil. Galled spots are common in most areas, and shallow gullies have formed in a few places. The surface layer is brown, dark-brown, or reddish-brown sandy loam 4 to 5 inches thick. The solum ranges from 31 to 38 inches in thickness. Depth to soft rock ranges from 27 inches to more than 60 inches.

Included in mapping are areas of similar soils that have a cobbly and gravelly surface layer and severely eroded areas where the surface layer is gravelly clay loam. Also included are small areas of Pacolet, Gwinnett, and Louisa soils.

This soil has good tilth except in areas that are severely eroded. Runoff is medium to moderately rapid, and the hazard of further erosion is severe where this soil is cultivated or is left bare and unprotected.

This soil is poorly suited to frequent cultivation, but it can be cropped occasionally if well managed. It has moderate to severe limitations for most nonfarm uses.

Most of the acreage is wooded, but a large acreage is pastured or cultivated or is used for residential and in-

dustrial sites. (Capability unit IVe–1; woodland suitability group 3o7)

Madison clay loam, 6 to 10 percent slopes, severely eroded (MDC3).—This soil is on long, narrow ridgetops and moderately long hillsides. Mapped areas are 5 to 130 acres in size. The surface layer is strong-brown or yellowish-red clay loam 2 to 6 inches thick. It is a mixture of remnants of the original surface layer and material from the upper part of the subsoil. In most places shallow gullies are common, and in a few places deep gullies have formed. The subsoil is red clay in the upper 12 to 26 inches. This is underlain by a layer of red clay loam 6 to 8 inches thick or a layer of red clay loam and loose rock fragments about 17 inches thick. The combined thickness of the surface layer and the subsoil ranges from 26 to 36 inches. Depth to soft schist rock ranges from 35 to 45 inches.

Included in mapping are small areas of a similar soil that has a fine sandy loam, sandy loam, and gravelly sandy loam surface layer, and small areas where the combined thickness of the surface layer and subsoil is less than 20 inches. Also included are small areas of Pacolet, Gwinnett, and Appling soils.

This soil has poor tilth because of the shallow gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid because of the slope.

This Madison soil is poorly suited to cultivated crops, but if well managed it can be cultivated occasionally. It is suited to pine trees and many nonfarm uses. The hazard of erosion is severe where this soil is cultivated or is left bare and unprotected.

About 70 percent of the acreage is in trees or is idle; the rest is cultivated or pastured or is used for residential and industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Madison clay loam, 15 to 25 percent slopes, severely eroded (MDE3).—This soil is on short side slopes mainly adjacent to drainageways. Mapped areas are 5 to 40 acres in size. The surface layer is yellowish-red, reddish-brown, or yellowish-brown clay loam 4 to 5 inches thick. It consists of material from the upper part of the subsoil that has been mixed with remnants of the original surface layer by plowing. Shallow gullies are common in most areas and a few deep gullies have formed. The subsoil is red clay in the upper 12 to 15 inches. This is underlain by either red clay loam or sandy clay loam 7 to 10 inches thick or a layer of red clay mixed with loose rock fragments. The combined thickness of the surface layer and subsoil ranges from 23 to 30 inches. Depth to soft rock ranges from 25 inches to more than 52 inches.

Included in mapping are areas of a similar soil that has a sandy loam, fine sandy loam, or cobbly or gravelly sandy loam surface layer. The solum is less than 20 inches in some places. Small areas of Pacolet, Gwinnett, and Louisa soils are also included.

This soil has poor tilth because of the shallow gullies and because the clay loam surface layer is sticky when wet and hard when dry. Runoff is rapid, and the hazard of erosion is severe.

This soil is not suited to cultivated crops. It is suited to pine trees. Limitations are severe to moderate for most nonfarm uses.

About 80 percent of the acreage is wooded; the rest is idle, cultivated, or pastured or is used for residential and industrial sites. (Capability unit VIIe–1; woodland suitability group 4c3e)

Madison and Pacolet soils, 10 to 15 percent slopes, severely eroded (MsD3).—These soils occur on moderately long hillsides. Mapped areas are 3 to 55 acres in size. These soils occur in no regular pattern; however, most mapped areas contain both major soils. The mapping unit is about 70 percent Madison soils and 20 percent Pacolet soils. The rest is mostly mottled strong-brown to yellowish-red clayey soils less than 40 inches deep. These soils are similar enough to permit common interpretations for most expected uses. The surface layer of these soils consists largely of material from the subsoil. Shallow and deep gullies are common.

The Madison soils have a reddish-brown to yellowish-red clay loam or sandy clay loam surface layer 2 to 7 inches thick. The subsoil is mainly yellowish-red and red sandy clay loam and clay which extends to a depth of about 30 inches. Soft schist rock underlies this layer.

The Pacolet soils have mainly a reddish-brown sandy clay loam surface layer 3 to 4 inches thick. The subsoil is chiefly red clay and sandy clay loam that extends to a depth of about 35 inches. Depth to soft rock ranges from about 22 to more than 48 inches. Hard rock is generally at a depth of more than 60 inches.

Included in mapping are some areas of similar soils that have a gravelly or cobbly surface layer. Also included are small areas of Gwinnett, Hiwassee, and Louisa soils.

These soils have poor tilth because of the clay loam surface layer and the gullies. They are not suited to cultivated crops because of poor tilth and the severe erosion hazard. They are suited to permanent pasture and pine trees. Limitations are moderate or severe for many nonfarm uses.

Most of the acreage is wooded, but a large acreage is pastured or cultivated or is used for residential and industrial sites. (Capability unit VIe–2; woodland suitability group 4c2e)

Madison and Pacolet soils, 15 to 25 percent slopes, eroded (MsE2).—These soils are on short slopes adjacent to drainageways. Mapped areas range from about 3 to 100 acres in size. These soils occur in no regular pattern, but most mapped areas contain both major soils. This mapping unit is about 70 percent Madison soils and 28 percent Pacolet soils. These soils are similar enough to permit common interpretations for most expected uses.

The Madison soils have a dark-brown to reddish-brown sandy loam surface layer about 5 inches thick. The subsoil is yellowish-red and red clay and sandy clay loam that extends to a depth of about 36 inches. The underlying material is soft schist rock.

The Pacolet soils generally have a very dark grayish-brown to strong-brown sandy loam surface layer 5 to 6 inches thick. The subsoil is red clay and sandy clay loam that extends to a depth of about 38 inches. The underlying material is red sandy loam. These soils range from about 24 to 38 inches in depth.

Included in mapping are areas where the surface layer is gravelly, stony, or cobbly sandy loam and areas where the solum is 40 to 60 inches thick. Also included are small areas of Louisburg, Gwinnett, and Louisa soils.

These soils have good tilth except in the severely eroded spots and in areas that are stony or cobbly. Runoff is moderately rapid to rapid.

Steep slopes and the severe hazard of erosion make these soils poorly suited to cultivated crops. They are suited to pasture and pine trees. These soils have moderate to severe limitations for most nonfarm uses.

Most of the acreage is wooded or idle. The rest is used for residential and industrial sites or is pastured or cultivated. (Capability unit VIe–2; woodland suitability group 3r8)

Musella Series

The Musella series consists of well-drained soils that are shallow to moderately deep over broken and fractured soft rock. These soils formed in material weathered from diorite and other similar rocks. They are on narrow ridgetops and short sloping areas adjacent to drainageways and stony mountain sides on the uplands. The mapped areas are 3 to 60 acres in size. Slopes are 6 to 45 percent.

In a representative profile, the surface layer extends to a depth of 6 inches and is dark reddish brown. The upper 2 inches is stony loam, and the lower 4 inches is gravelly loam. The subsoil extends to a depth of 19 inches; it is dark-red clay loam in the upper 7 inches and dark-red clay intermingled with loose, weathered, soft rock fragments below. Soft consolidated rock is at a depth of 37 inches.

Musella soils are low in natural fertility and organic-matter content. Reaction is very strongly acid throughout the profile. The available water capacity is medium, and permeability is moderate. Tilth is generally poor.

Musella soils are not suited to cultivated crops, and they have moderate to severe limitations for many nonfarm uses. About 90 percent of the acreage is wooded. The rest is pastured, cultivated, or idle or is used for residential and industrial sites. In a few areas, soil material that contains cobblestones has been removed and used in road construction. The trees in wooded areas are mostly loblolly and shortleaf pines and mixed hardwoods.

Representative profile of a Musella loam, in an area of Musella and Pacolet stony soils, 10 to 45 percent slopes, in hardwoods, 0.25 mile north of railroad, 0.5 mile southwest of U.S. Highway No. 41, and 0.6 mile northwest of Kennesaw Mountain National Battlefield Park headquarters:

A11—0 to 2 inches, dark reddish-brown (5YR 3/3) loam; weak, fine, granular structure; friable; common stones; many fine roots; common fine pores; many pebbles and hard concretions; few, fine, distinct, black, dark-brown, and dark-red worm casts; very strongly acid; clear, smooth boundary.

A12—2 to 6 inches, dark reddish-brown (5YR 3/4) gravelly loam; weak, fine, granular structure; friable; many pebbles and hard concretions; many fine roots; common fine pores; few, fine, distinct, dark-brown and dark-red worm casts; very strongly acid; clear, smooth boundary.

B2t—6 to 13 inches, dark-red (2.5YR 3/6) clay loam; moderate, medium, subangular blocky structure; friable; common fine roots; common pebbles; few fine pores; very strongly acid; clear, wavy boundary.

B3t—13 to 19 inches, dark-red (10R 3/6) gravelly clay; moderate, medium, subangular blocky structure; friable; few fine roots; loose, weathered, soft, yellowish-brown and strong-brown rock fragments that contain fine black and white spots make up about 50 percent (by volume) of this horizon; very strongly acid; gradual, wavy boundary.

C—19 to 37 inches, black, yellowish-brown, and strong-brown broken and fractured soft rock that contains few narrow tongues or pockets of dark-red clay. About 10 percent of the horizon is red clay; few fine roots extend into upper part of horizon; very strongly acid; clear, irregular boundary.

R—37 to 40 inches +, soft, yellowish-brown and strong-brown consolidated rock that contains few black and white streaks.

The surface layer is dark reddish-brown or dusky-red gravelly clay loam, gravelly sandy loam, or loam 2 to 6 inches thick. The A horizon in slightly eroded areas is dark reddish brown and is 3 to 8 inches thick. Stones are on the surface in places. The B1t horizon, where present, is dark-red or dark reddish-brown clay loam or gravelly clay loam 3 to 4 inches thick. The B2t horizon is dusky-red to dark-red clay loam or gravelly clay loam 6 to 17 inches thick. The B3t horizon is chiefly dark-red or dusky-red gravelly clay 6 to 10 inches thick; 40 to 50 percent, by volume, is soft loose rock fragments. The combined thickness of the A and B horizons is 13 to 26 inches. Depth to soft rock is 20 to more than 50 inches; depth to hard rock is generally 22 to more than 60 inches.

Musella soils occur with Hiwassee, Gwinnett, Madison, Cecil, Pacolet, and Louisburg soils. They have a redder surface layer and a darker red subsoil than the Pacolet, Madison, and Louisburg soils. They are generally shallower to bedrock and have a thinner solum than the Hiwassee and Gwinnett soils.

Musella gravelly soils, 6 to 15 percent slopes, eroded (MlD2).—These soils are on narrow ridgetops and short sloping hillsides. Mapped areas are 3 to 30 acres in size.

The surface layer is dark reddish-brown gravelly clay loam and gravelly sandy loam 3 to 6 inches thick. It consists of remnants of the original surface layer and the upper part of the subsoil that have been mixed by plowing. In most areas, shallow gullies are few to common and one or two deep gullies have formed. Depth to consolidated weathered rock ranges from 20 to more than 50 inches.

Included in mapping are a few small areas of a soil that has a solum 50 inches thick. Also included is a soil that has a yellowish-red gravelly clay loam subsoil. In some areas is a similar soil that has a clay loam, cobbly clay loam, stony loam, or sandy loam surface layer. Small areas of Gwinnett and Madison soils are also included.

These soils have moderately rapid to rapid runoff. Tilth is poor.

These soils are not suited to cultivated crops because of the slopes, poor tilth, and the severe hazard of erosion. Limitations are slight to severe for many nonfarm uses.

About 80 percent of the acreage is wooded. The rest is used for residential and industrial sites or is pastured, cultivated, or idle. (Capability VIIe–2; woodland suitability group 4f3)

Musella gravelly soils, 15 to 25 percent slopes, severely eroded (MlE3).—These soils are on short side slopes adjacent to drainageways and on hillsides that are moderately long. Mapped areas are 3 to 20 acres in size.

The surface layer is dark reddish-brown or dusky-red gravelly clay loam to gravelly sandy loam 3 to 5 inches thick. It consists of remnants of the original surface layer and the upper part of the subsoil. In most areas, shallow gullies are few to common and one or two deep gullies have formed. The combined thickness of the surface layer and subsoil is 12 to 26 inches.

Included in the mapping are a few small areas of a soil that has a solum 40 inches thick and areas of soils that have a solum about 14 inches thick. Also included are areas where the surface layer is cobbly. Small areas of Pacolet, Gwinnett, and Madison soils are also included.

Runoff is rapid on these Musella soils. Tilth is poor.

These soils are not suited to cultivated crops or to permanent pasture because of slope, poor tilth, and the severe hazard of erosion. These soils are severely limited for nonfarm uses in most places.

About 85 percent of the acreage is wooded. The rest is idle, cultivated, or pastured or is used for residential and industrial sites. (Capability unit VIIe–2; woodland suitability group 4f3)

Musella and Pacolet stony soils, 10 to 45 percent slopes (MJF).—These soils occur on narrow ridgetops and short slopes adjacent to drainageways and on mountainsides. Mapped areas are 3 to 60 acres in size. The surface layer is loam, sandy loam, or cobbly sandy loam. Stones are on 5 to 20 percent of the surface.

The Musella soil has the profile described as representative for the Musella series. The profile of this Pacolet soil is similar to the one described for the Pacolet series, but the surface layer is stony. The Musella soils make up about 63 percent of this unit, and the Pacolet soils make up about 27 percent. These soils are similar enough to permit common interpretations for most expected uses.

Included in mapping are small areas of Cecil, Gwinnett, and Madison soils. A few rock outcrops are in most mapped areas.

Because they are steep and stony and the hazard of erosion is severe, these soils are better suited to pine trees than to cultivated crops. Limitations for nonfarm uses generally are severe.

All of the acreage is wooded, except a few small areas that have been excavated or used for residential or industrial sites. (Capability unit VIIe–2; woodland suitability group 3x3)

Pacolet Series

The Pacolet series consists of moderately deep to deep, well-drained soils that formed in material weathered from gneiss, mica schist, and granite. These soils are on broad to narrow ridgetops, on hillsides, and on short side slopes of the uplands throughout the county. Slopes range from 6 to 45 percent.

In a representative profile of a less eroded soil, the surface layer is yellowish-brown sandy loam 5 inches thick. The subsoil extends to a depth of 38 inches; it is red clay in the upper 25 inches and red sandy clay loam in the lower 8 inches. Distinct yellowish-brown mottles begin at a depth of 18 inches. At a depth of 38 to 48 inches is mottled red sandy clay loam. Depth to hard rock is generally more than 60 inches.

Pacolet soils are low in natural fertility and organic-matter content. Reaction is very strongly acid throughout the profile. Permeability is moderate, and the available water capacity is medium. Tilth is generally good except in areas that are cobbly, stony, or severely eroded.

Pacolet soils are poorly suited to row crops, but are suited to permanent pasture, pine trees, and perennial hay crops. They are moderately to severely limited for many nonfarm uses. Most of the acreage is wooded, but a large acreage is pastured or cultivated or used for residential and industrial sites. Mainly loblolly and shortleaf pines grow in formerly cultivated areas, and mixed stands of hardwoods grow in slightly eroded areas on uplands.

Representative profile of Pacolet sandy loam, 10 to 15 percent slopes, in loblolly pine, 0.6 mile west of Tate Creek, 0.25 mile south of Cherokee-Cobb County line:

Ap—0 to 5 inches, yellowish-brown (10YR 5/4) sandy loam; weak, fine, granular structure; friable; many fine roots; few quartz pebbles; few wormholes filled with yellowish-red (5YR 4/8) material; very strongly acid; clear, smooth boundary.

B21t—5 to 18 inches, red (2.5YR 4/8) clay; moderate, medium, subangular blocky structure; firm; few fine and medium roots; few quartz pebbles; clay films on ped surfaces; very strongly acid; clear, smooth boundary.

B22t—18 to 30 inches, red (2.5YR 4/8) clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; few medium roots; few quartz pebbles; clay films on ped surfaces; very strongly acid; clear, smooth boundary.

Bt—30 to 38 inches, red (2.5YR 4/8) sandy clay loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few medium roots; few quartz pebbles; few fine mica flakes; clay films on most ped surfaces; very strongly acid; clear, wavy boundary.

C—38 to 48 inches +, red (2.5YR 4/8) sandy loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; massive (structureless); friable; few medium roots; many fine mica flakes; very strongly acid.

In less eroded areas the Ap horizon is yellowish-brown, reddish-brown, or dark-brown sandy loam 4 to 6 inches thick. In severely eroded areas it is yellowish-red or reddish-brown sandy clay loam 3 to 4 inches thick. In some areas there is an A1 horizon of stony sandy loam.

The combined thickness of the A and B horizons ranges from 20 to 39 inches. The B1t horizon, where present, is red or yellowish-red sandy clay loamy or clay loam 4 to 5 inches thick. The B2t horizon is clay or sandy clay 10 to 25 inches thick. The B3t horizon is clay loam or sandy clay loam 4 to 13 inches thick. Depth to mottles of strong brown, yellowish brown, or yellowish red ranges from 14 inches in some severely eroded soils to 32 inches in some slightly eroded soils. In about 50 percent of the acreage the subsoil is not mottled. Depth to weathered, consolidated rock ranges from 34 to more than 50 inches; hard rock is generally below a depth of 60 inches.

Pacolet soils occur mainly with Cecil, Appling, Madison, Gwinnett, and Louisburg soils. They are shallower than the Cecil soils and have a redder subsoil than the Appling soils. They contain less mica, especially in the surface and upper part of the subsoil, than the Madison soils. Their surface layer and subsoil are less red than Gwinnett soils. They have a thicker solum and more clay in the subsoil than the Louisburg soils.

Pacolet sandy loam, 10 to 15 percent slopes (PfD).—This soil is on hillsides and short side slopes. Mapped areas are 3 to more than 35 acres in size. The surface layer is reddish-brown, yellowish-brown, or dark-brown sandy loam 4 to 6 inches thick. This soil has the profile described as representative for the series.

Included in mapping are small areas of Cecil, Madison, and Gwinnett soils and areas of soils that have a cobbly sandy loam, gravelly fine sandy loam, or sandy clay loam surface layer. Included also are some areas of a soil that has a yellowish-red or red sandy clay loam or clay loam subsoil.

This soil has good tilth except in areas where the surface layer is cobbly sandy loam or sandy clay loam. The combined thickness of the surface layer and subsoil ranges from 26 to 39 inches.

Runoff is medium to moderately rapid, and the hazard of erosion is severe where this soil is cultivated or is left bare and unprotected. The soil is poorly suited to frequent cultivation, but it can be cropped occasionally if well managed. It is moderately to severely limited for many nonfarm uses.

Most of the acreage is wooded, but a large acreage is pastured or cultivated or is used for residential and industrial sites (fig. 8). (Capability unit IVe–1; woodland suitability group 3o7)

Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded (PgC3).—This soil is on narrow to broad ridgetops and hillsides. Mapped areas are 3 to 30 acres in size.

The surface layer of this soil is reddish-brown or yellowish-red sandy clay loam 3 to 4 inches thick. In places the original surface layer has been removed through erosion or by mechanical means and the red subsoil is exposed. In most places shallow gullies are common, and in a few places deep gullies have formed. The subsoil is red sandy clay or clay in the upper 10 to 18 inches and red clay loam or sandy clay loam in the lower 4 to 9 inches. The combined thickness of the surface layer and subsoil is 20 to 31 inches. Mottles of yellowish red or yellowish brown are at a depth of about 17 inches in most places; some areas are free of mottles. Depth to weathered rock ranges from 36 to more than 48 inches.

Included in mapping are areas of a similar soil that has a loam or sandy loam surface layer. Also included are small areas of Cecil, Madison, and Gwinnett soils.

This soil has poor tilth because of the shallow gullies and because the sandy clay loam surface layer is sticky when wet and hard when dry. Runoff is moderately rapid.

This soil is poorly suited to cultivated crops, but if well managed it can be cultivated occasionally. It is well suited to pine trees and moderately suited to many nonfarm uses. The hazard of erosion is severe where this soil is cultivated or is left bare and unprotected.

About 75 percent of the acreage is in trees or is idle; the rest is cultivated or pastured or is used for residential or industrial sites. (Capability unit IVe–1; woodland suitability group 4c2e)

Figure 8.—**Low-quality oaks on Pacolet sandy loam, 10 to 15 percent slopes. Widely scattered pines are in right background**

Roanoke Series

The Roanoke series consists of deep, poorly drained soils that formed in old alluvium. These soils occur as small areas on stream terraces near the larger streams in the county. They are susceptible to flooding. Slopes range from 0 to 2 percent.

In a representative profile, the surface layer is mottled dark grayish-brown silt loam over silty clay loam about 7 inches thick. The subsurface layer is mottled dark grayish-brown silty clay loam about 6 inches thick. The subsoil is mostly gray mottled with shades of brown and red; it extends to a depth of 62 inches. It is silty clay loam in the upper part and clay in the middle and lower parts. Depth to hard rock is more than 60 inches.

These soils are low in natural fertility and low to moderate in organic-matter content. Permeability is slow. Reaction is very strongly acid to strongly acid throughout the profile. Tilth is generally good, but in many places it is poor because the soil is wet. The available water capacity is medium.

These soils are poorly suited to cultivated crops and have severe limitations for residential and industrial sites. About three-fourths of the acreage is wooded; the rest is idle, cultivated, or pastured. In natural wooded areas, the main trees are sweetgum, water oak, ash, red maple, and blackgum.

Representative profile of Roanoke silt loam, in a wooded area 650 feet west of Olley Creek, 0.8 mile east of Georgia Highway No. 5, and 1.1 miles north of railroad:

A11—0 to 3 inches, dark grayish-brown (2.5Y 4/2) silt loam; common, fine, prominent, black, grayish-brown, strong-brown, and yellowish-red mottles; weak, fine, granular structure; friable; many fine roots; few wormholes; few small pieces of partly decomposed leaves and bark; strongly acid; abrupt, smooth boundary.

A12—3 to 7 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, fine and medium, prominent, gray (10YR 6/1), strong-brown (7.5YR 5/8), and yellowish-red (5YR 4/8) mottles; weak, fine, granular structure; friable; common fine roots; few small pieces of partly decomposed leaves and bark; very strongly acid; clear, smooth boundary.

A3—7 to 13 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, medium, prominent mottles of yellowish red (5YR 4/6), strong brown (7.5YR 5/6), and gray (N 6/0); weak, fine, granular structure; friable; few fine roots; very strongly acid; clear, smooth boundary.

B1g—13 to 18 inches, gray (N 6/0) silty clay loam; common, fine and medium, prominent, yellowish-red (5YR 4/6), strong-brown (7.5YR 5/6), and yellowish-brown (10YR 5/6) mottles; weak, medium, subangular blocky structure; friable; few fine and medium roots; few fine mica flakes; few small pieces of charcoal; few quartz pebbles; very strongly acid; clear, smooth boundary.

B21tg—18 to 32 inches, gray (N 6/0) clay; many, medium, prominent, yellowish-red (5YR 4/6), light yellowish-brown (2.5Y 6/4), and yellowish-brown (10YR 5/8) mottles; moderate, medium, subangular blocky structure; firm; few fine roots; few fine mica flakes; few quartz pebbles; thin patchy clay films on ped surfaces; very strongly acid; clear, smooth boundary.

B22tg—32 to 42 inches, gray (N 6/0) clay; many, medium, prominent, yellowish-brown (10YR 5/6) mottles, and few, fine and medium, yellowish-red (5YR 5/8) and strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; firm; few fine roots; few quartz pebbles; few, fine, soft, black concretions; few fine mica flakes; clay films on some ped surfaces; very strongly acid; gradual, wavy boundary.

B23tg—42 to 52 inches, mottled gray (N 6/0), yellowish-red (5YR 5/8), strong-brown (7.5YR 5/6), and yellowish-brown (10YR 5/6) clay; weak, medium, subangular blocky structure; firm; few fine roots; many, fine, soft, black and dark-brown concretions; few fine mica flakes; very strongly acid; gradual, wavy boundary.

B3tg—52 to 62 inches, brownish-yellow (10YR 6/8) clay; many, medium and coarse, prominent, gray (N 6/0), yellowish-red (5YR 5/8), strong-brown (7.5YR 5/6), red (2.5YR 4/8), and yellowish-brown (10YR 5/6) mottles; massive; firm; few fine roots; few fine mica flakes; few, fine, soft, black and dark-brown concretions; very strongly acid.

The A1 horizon ranges from very dark grayish-brown to very dark gray silt loam mottled with strong brown, yellowish red, and gray. The A horizon ranges from 10 to 13 inches in thickness. The B2tg horizon is silty clay or clay. The combined thickness of the A and B horizons ranges from 42 inches to about 60 inches.

The water table is commonly at a depth of less than 24 inches for more than 6 months each year, but it may be at a depth of 36 inches or more during dry periods. The seasonal high water table is at a depth of 6 inches.

Roanoke soils occur with Altavista soils on stream terraces and with the Cartecay, Chewacla, and Toccoa soils on first bottoms. They are grayer and more poorly drained than the Altavista soils. They contain more clay than the Cartecay, Chewacla, wet variants, and Toccoa soils.

Roanoke silt loam (Ron).—This soil is on low stream terraces. It has the profile described as representative for the series.

Included in mapping are areas of similar soils that have a yellowish-brown fine sandy loam surface layer 6 to 10 inches thick. Other areas contain a soil that has a sandy clay subsoil. Also included in a few places are small areas of Altavista, Toccoa, and Cartecay soils.

Because of very frequent flooding, the shallow water table, and poor drainage, this soil is poorly suited to cultivated crops, and the range of suitable crops is limited. This soil can be used for pasture if properly drained. It has severe limitations for residential and industrial sites. About 75 percent of the acreage is wooded; the rest is idle, cultivated, or pastured. (Capability unit IVw–2; woodland suitability group 2w9)

Toccoa Series

The Toccoa series consists of deep, well-drained soils on narrow to broad first bottoms of streams, in depressions near heads of drainageways, and at the base of slopes on uplands. Mapped areas are as much as 140 acres in size. Most areas of these soils are subject to flooding. Slopes range from 0 to 4 percent.

In a representative profile, the surface layer is dark-brown sandy loam 9 inches thick. It has a few mottles of yellowish brown. The underlying layer is mainly stratified sandy loam, silty clay loam, loamy sand, and sand; the upper part is dark brown mottled with shades of brown and red and the lower part is strong brown, yellowish brown, and pale brown mottled with shades of brown, gray, and red. Depth to hard rock is more than 60 inches.

Toccoa soils are low in natural fertility and moderate to low in organic-matter content. Permeability is moderately rapid, and the available water capacity is medium. Reaction is slightly acid to medium acid throughout the profile. Tilth is good.

Toccoa soils are suited to a wide range of crops. About 75 percent of the acreage is in forest or is idle, and the rest is cultivated or pastured, or is used for residential or

industrial sites. In natural wooded areas the main trees are red maple, willow, ash, and beech.

Representative profile of Toccoa sandy loam in a cultivated field 75 feet west of Olley Creek, and 0.6 mile south of pipeline:

Ap—0 to 9 inches, dark-brown (10YR 4/3) sandy loam; few, fine, faint, yellowish-brown mottles; weak, fine, granular structure; very friable; many fine roots; few fine mica flakes; medium acid; clear, smooth boundary.

C1—9 to 13 inches, dark-brown (7.5YR 4/4) silty clay loam; common, medium, distinct, pale-brown (10YR 6/3), brown (10YR 5/3), and yellowish-red (5YR 5/8) mottles; massive (structureless); friable; few fine roots; common fine mica flakes; thin lenses of fine sandy loam about 1/16 inch thick; medium acid; clear, broken boundary.

C2—13 to 22 inches, dark-brown (7.5YR 4/4) fine sandy loam; common, medium, distinct, pale-brown (10YR 6/3), brown (10YR 5/3), and yellowish-red (5YR 5/8) mottles; massive (structureless); friable; few fine pieces of charcoal; many fine mica flakes; medium acid; clear, wavy boundary.

C3—22 to 26 inches, yellowish-brown (10YR 5/4) fine sandy loam; common, fine, distinct, gray, yellowish-red, and strong-brown mottles; massive (structureless); friable; few fine roots; common fine mica flakes; few, fine, soft, dark reddish-brown and black concretions; few small pieces of charcoal; slightly acid; clear, wavy boundary.

C4—26 to 35 inches, strong-brown (7.5YR 5/8) coarse sand; single grain (structureless); very friable; few pockets of sandy loam mottled with dark brown (7.5YR 4/4), grayish brown (10YR 5/2), and dark yellowish brown (10YR 4/4); few quartz pebbles; few fine mica flakes; slightly acid; clear, broken boundary.

C5—35 to 41 inches, mottled pale-brown (10YR 6/3), grayish-brown (10YR 5/2), gray (10YR 5/1), strong-brown (7.5YR 5/8), and yellowish-red (5YR 5/8) sandy loam; massive (structureless); very friable; few fine mica flakes; slightly acid; clear, smooth boundary.

C6—41 to 50 inches +, pale-brown (10YR 6/3) loamy sand; few, fine, distinct, yellowish-brown, brown, and strong-brown mottles; single grain (structureless); very friable; few fine mica flakes; medium acid.

The Ap horizon is grayish-brown, dark-brown, or reddish-brown sandy loam, fine sandy loam, loamy sand, or loam 5 to 12 inches thick. The A1 horizon is yellowish brown, dark brown, or reddish brown and is 4 to 12 inches thick. The dominant texture within depths of 10 to 40 inches is sandy loam. Within these depths are layers of silty clay loam, coarse sand, sandy loam, loamy sand, loam, and silt loam. The water table is generally at a depth of 24 to 36 inches for 6 months each year, but in dry periods it is below 48 inches in some places. The seasonal high water table is at a depth of about 24 inches. Depth to gray mottles ranges from 20 to more than 48 inches; mottles are most commonly between depths of 20 and 30 inches.

Toccoa soils occur mainly with Cartecay, Chewacla, wet variants, Altavista, and Roanoke soils. They are better drained than those soils and are sandier than the Roanoke, Chewacla, wet variants, and Altavista soils.

Toccoa sandy loam, local alluvium (Tod).—This soil is in depressions, near heads of drainageways, and at the base of slopes on uplands. Mapped areas are 1 to 10 acres in size. Slopes are 2 to 4 percent. This soil is not subject to flooding.

The surface layer is predominantly grayish-brown to reddish-brown sandy loam 8 to 12 inches thick. In most places the underlying layers are brown, dark-brown, yellowish-red, red, and dark reddish-brown sandy loam, loamy sand, sand, and silt loam. The thickness of the alluvial material over the sandy clay loam ranges from 30 to more than 48 inches.

Included in mapping are some areas that have a dark-red or dark reddish-brown clay loam subsoil. Also included are small areas of Appling, Cecil, and Cartecay soils.

This soil is suited to truck crops and to many other crops grown locally. It can be farmed intensively if well managed. Most of the acreage has been cropped mainly to cotton and corn. Crops may be damaged in areas where runoff is slow. About a fourth of the acreage is cultivated or pastured; the rest is idle or wooded or is used for residential or industrial sites. Reforested areas are mainly in shortleaf and loblolly pines. (Capability unit IIw–2; woodland suitability group 1o7)

Toccoa soils (Toc).—These soils are on first bottoms. They have a profile simliar to the one that is described as representative for the series, but the surface layer is sandy loam, loamy sand, or loam 4 to 12 inches thick. Slopes are 0 to 2 percent. These soils are flooded once in 5 to 20 years along the Chattahoochee River. Elsewhere they are flooded more often, usually in winter and spring.

Included in mapping are small areas that have a silty clay loam surface layer. Also included are soils that have a loamy sand underlying layer; in a few other places, gray mottles are within 20 inches of the surface. Also included are small areas of Chewacla, wet variants, Cartecay, and Altavista soils.

These soils are suited to a wide range of crops. They respond to good management and, in spite of a slight to moderate hazard of flooding and the slow runoff, they can be farmed intensively. About 75 percent of the acreage is in forest or is idle, and the rest is cultivated or used as pasture. Soil material from a sizable area has been removed for making brick. (Capability unit IIw–2; woodland suitability group 1o7)

Urban Land

Urban lands consist of Urban land, of Urban land mapped with Borrow pits, or of Urban land mapped with Appling, Cecil, Gwinnett, Madison and Pacolet soils.

Urban land (Ud).—This unit consists of areas in the Marietta metropolitan area. In more than 75 percent of the acreage are shopping centers, schools, parking lots, motels, industries, streets, housing developments, airport runways, parking aprons, taxi strips, and other urban facilities.

In most places the original soil profile has been severely modified by cutting, filling, and shaping to accommodate community development. In some places the cuts are deep, and steep banks are severely eroded. In these cuts weathered mica schist, granite, or gneiss is exposed. A few places between structures and modified areas are undisturbed. Most of these places are in trees or grass. (Capability unit unassigned; woodland suitability group unassigned)

Urban land and Borrow pits (Ubp).—This land type consists mostly of cuts and fills. These areas are used as sites for shopping centers, industrial buildings, and multiple residences. Most mapped areas are along major highways, but there are a few mapped areas throughout the county.

The soils in this mapping unit have been disturbed or removed in most areas. In many places cuts extend into weathered mica schist, granite, or gneiss. In others the soil material is sandy clay loam or clay loam. Filled areas generally are made up of material removed from new cuts. This material generally is a mixture of sand, silt, clay, and boulders, but in a few places it does not contain boul-

ders. Reaction is slightly acid to very strongly acid. The organic-matter content and the supply of available plant nutrients are very low. Therefore, topsoil is needed to establish sod and shrubs.

Erosion is a concern in recently disturbed areas. Erosion can be controlled by establishing a cover vegetation of grasses, legumes, vines, and woody plants. (Capability unit unassigned; woodland suitability group unassigned)

Urban land-Appling complex, 2 to 10 percent slopes (UeC).—This complex consists of about 30 to 60 percent Urban land and 20 to 35 percent Appling soils. The rest is mainly Cecil and Madison soils. The landscape is comparatively smooth. Mapped areas are small to fairly large and fairly similar in composition.

Urban land is used mainly for residences, industrial buildings, parking lots, streets, and other urban structures. The soils in these areas have been greatly altered by grading, cutting, shaping, and smoothing for community development. In some areas between structures, however, the soils are unaltered.

Appling soils are deep and well drained. Where undisturbed, they have a profile similar to the one described as representative for the series. In most mapped areas the soils are covered with sod. A few areas are bare and eroded and have shallow gullies. (Capability unit IIIe–2; woodland suitability group 3o7)

Urban land-Cecil complex, 2 to 10 percent slopes (UfC).—This complex is about 30 to 60 percent Urban land and 20 to 35 percent Cecil soils. The rest is mainly Appling, Gwinnett, and Madison soils. The landscape is comparatively smooth. Mapped areas are small to fairly large and fairly similar in composition.

Urban land is used mainly for residences, industrial buildings, parking lots, streets, and other urban structures. The soils in these areas have been greatly altered by grading, cutting, shaping, and smoothing for community development. In some areas between structures, however, the soils are unaltered.

Cecil soils are deep and well drained. Where undisturbed, they have a profile similar to the one described as representative of the series. In most mapped areas the soils are covered with sod. A few areas are bare and eroded and have shallow gullies. (Capability unit IIIe–1; woodland suitability group 3o7)

Urban land-Gwinnett complex, 2 to 10 percent slopes (UgC).—This complex is about 30 to 60 percent Urban land and 20 to 35 percent Gwinnett soils. The rest is mainly Cecil, Madison, and Hiwassee soils. The landscape is comparatively smooth. Mapped areas are small to fairly large and fairly similar in composition.

Urban land is used mainly for residences, industrial buildings, parking lots, streets, and other urban structures. The soils in these areas have been greatly altered by grading, cutting, shaping, and smoothing for community development. In some areas between structures, however, the soils are unaltered.

Gwinnett soils are moderately deep to deep and well drained. The surface layer is dark reddish-brown to dark-red clay loam or loam about 4 to 9 inches thick. The subsoil is dark-red, dusky-red, or dark reddish-brown clay, clay loam, and sandy clay loam about 30 inches thick. In most mapped areas the soils are covered with sod. A few areas are bare and eroded and have shallow gullies. (Capability unit IIIe–1; woodland suitability group 3o7)

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Urban land-Madison complex, 2 to 10 percent slopes (UhC).—This complex is about 30 to 60 percent Urban land and 20 to 35 percent Madison soils. The rest is mainly Cecil, Gwinnett, and Hiwassee soils. This complex is on fairly broad to narrow ridgetops and gently sloping hillsides. Mapped areas are small to moderately large and fairly similar in composition.

Urban land is used mainly for residences, industrial buildings, parking lots, streets, and other urban structures. The soils in these areas have been altered by grading, cutting, shaping, and smoothing for community development. In some areas between structures, however, the soils are unaltered.

Madison soils are moderately deep to deep and well drained. Where undisturbed, they have a profile similar to the one described as representative for that series. In most mapped areas the soils are covered with sod. A few areas are bare and eroded and have shallow gullies. (Capability unit IIIe–1; woodland suitability group 3o7)

Urban land and Pacolet soils, 10 to 25 percent slopes (UlE).—This mapping unit is about 35 to 50 percent Urban land and about 25 to 35 percent Pacolet soils. The rest is mainly Appling, Gwinnett, and Madison soils. The landscape is strongly sloping to moderately steep. Mapped areas are small to fairly large. The composition is not uniform from one mapped area to another, but each generally contains both Urban land and Pacolet soils.

Urban land is used mainly for residences, industrial buildings, schools, parking lots, streets, and other urban structures. The soils in these areas have been modified by cutting, filling, and shaping for community development. In a few places steep banks are severely eroded and the sediments clog streams. In some areas between structures and modified areas, however, the soils are undisturbed. Most of these undisturbed areas are in trees or grass.

Pacolet soils are well drained and moderately deep to deep. Where undisturbed, they have a profile similar to the one described as representative for the series. The texture of the surface layer ranges from sandy loam to sandy clay loam.

The Appling, Gwinnett, and Madison soils are less extensive. They are well drained and are used and managed in much the same way as the Pacolet soils. (Capability unit VIe–2; woodland suitability group 3r8)

Wilkes Series

The Wilkes series consists of well-drained soils that are shallow over broken and fractured, soft rock. These soils formed in a mixture of materials weathered from hornblende gneiss, granite, schist and other rocks. They are on ridgetops and hillsides in the uplands. Mapped areas of these soils are generally small, but a few are as large as 95 acres. Slopes range from 10 to 40 percent.

In a representative profile, the surface layer is dark grayish-brown sandy loam that is stony and 5 inches thick. The subsurface layer is light olive-brown sandy loam 5 inches thick. The subsoil is 9 inches thick. It is yellowish-brown sandy clay loam in the upper 4 inches and yellowish-brown clay in the lower part. The subsoil is commonly mottled in the upper part with light olive brown and in the lower part with strong brown, yellowish red, and red. The underlying layer is mottled, disintegrated, partially

decomposed rock about 15 inches thick. Depth to hard rock is about 34 inches.

The natural fertility and organic-matter content are low. The available water capacity is low, and permeability is moderately slow. Reaction is strongly acid in the upper 14 inches of the profile, medium acid in the most clayey part of the subsoil, and slightly acid below. Tilth is poor.

Wilkes soils are not suited to cultivated crops or to most nonfarm uses. Most of the acreage is in trees, and the rest is in pasture or is idle. Wooded areas are mainly in loblolly and shortleaf pines and in stands of mixed upland hardwoods.

Representative profile of Wilkes stony sandy loam, 10 to 40 percent slopes, in hardwoods, 0.7 mile south of Rubes Creek and 2 miles southwest of Sweat Mountain:

A1—0 to 5 inches, dark grayish-brown (2.5Y 4/2) sandy loam; weak, fine, granular structure; very friable; common stones on the surface; many fine roots; common, hard, black concretions; few quartz pebbles; few worm casts of light olive brown; strongly acid; clear, smooth boundary.

A2—5 to 10 inches, light olive-brown (2.5Y 5/4) sandy loam; weak, fine, granular structure; very friable; many fine roots; common, hard, black concretions; few quartz pebbles; strongly acid; clear, smooth boundary.

B1t—10 to 14 inches, yellowish-brown (10YR 5/4) sandy clay loam; few, fine, faint, light olive-brown mottles; weak, medium, subangular blocky structure; friable; few fine and medium roots; many, hard, black concretions; strongly acid; clear, smooth boundary.

B2t—14 to 19 inches, yellowish-brown (10YR 5/6) clay; common, medium, prominent, strong-brown (7.5YR 5/6), yellowish-red (5YR 4/8), and red (2.5YR 4/8) mottles; moderate, fine, angular blocky structure; very firm; few, fine and medium roots; few, soft and hard, black concretions; clay films on ped surfaces; medium acid; clear, irregular boundary.

C—19 to 34 inches, olive-gray, yellowish-red, olive, and yellowish-brown, firm saprolite; slightly acid; abrupt, broken boundary.

R—34 inches +, olive and olive-gray, hard rock.

The A horizon ranges from 7 to 10 inches in thickness. The A1 horizon is dark grayish-brown to grayish-brown sandy loam 4 to 5 inches thick. The A2 horizon is olive or light olive-brown sandy loam or gravelly sandy loam 3 to 5 inches thick. The B1t horizon is light olive-brown or yellowish-brown sandy clay loam 4 to 5 inches thick that is mottled with light olive brown or yellowish brown and strong brown. The B2t horizon is yellowish-brown firm clay or sandy clay 5 to 7 inches thick that is mottled mostly with yellowish red, dark yellowish brown, strong brown, or red. The combined thickness of the A and B horizons is 15 to about 20 inches. Depth to soft rock ranges from 15 to 20 inches, and to hard rock, from 20 to 48 inches. Depth to mottles is generally 4 to 10 inches.

Wilkes soils commonly occur with the Appling, Louisburg, Musella, Louisa, Helena, and Madison soils. They are less red in the subsoil than the Musella and Madison soils. They contain more clay in the subsoil than the Louisburg and Louisa soils. They are shallower over rock and are better drained than the Helena soils. They are shallower over bedrock than the Appling soils.

Wilkes stony sandy loam, 10 to 40 percent slopes (WjF).—This soil is on ridgetops, hillsides, and short side slopes adjacent to drainageways. Mapped areas range from 3 to 95 acres in size.

Included in mapping are small areas of similar soils that have a gravelly sandy loam surface layer and a sandy loam or gravelly sandy loam subsoil. Also included are a few small areas of Helena, Louisa, and Musella soils.

This soil has poor tilth because stones are on the surface. Runoff is medium to rapid.

This Wilkes soil is not suited to cultivated crops because it is stony, has steep slopes, is severely susceptible to erosion, and is shallow over rock. It is severely limited for many nonfarm uses.

Most of the acreage is wooded; the rest is used for pasture or is idle. (Capability unit VIIe–2; woodland suitability group 4x2)

Wilkes Series, Clayey Subsoil Variant

The Wilkes series, clayey subsoil variant, consists of well-drained soils that are shallow over broken and fractured, soft rock. These soils formed in material weathered from diorite, hornblende gneiss, granite, schist, and other rocks. They are on ridgetops and hillsides in the uplands. Slopes range from 6 to 15 percent.

In a representative profile, the surface layer is light olive-brown sandy loam about 5 inches thick. The subsoil, to a depth of about 18 inches, is yellowish-brown clay. The underlying layer is greenish-gray, olive-brown, yellowish-brown, and yellowish-red, soft rock about 14 inches thick. Consolidated soft rock is at a depth of 32 inches.

The natural fertility and organic-matter content are low. The available water capacity is low, and permeability is moderately slow. Reaction is strongly acid in the surface layer, medium acid in the subsoil, and slightly acid below. Tilth of the surface layer is generally good.

These soils are not suited to cultivated crops and are slightly to severely limited for many nonfarm uses. Most of the acreage is wooded, and the rest is pastured, cultivated, or idle. Wooded areas are generally in shortleaf and loblolly pines and mixed stands of upland hardwoods.

Representative profile of Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes, in pine trees, 0.6 mile northwest of Due West school, 0.6 mile east of Allatoona Creek, and 400 feet northeast of pipeline:

Ap—0 to 5 inches, light olive-brown (2.5Y 5/4) sandy loam; weak, fine, granular structure; friable; many fine roots; common, fine, black and yellowish-red, hard concretions; few quartz pebbles; few worm casts; strongly acid; abrupt, smooth boundary.

B2t—5 to 18 inches, yellowish-brown (10YR 5/6) clay; moderate, medium, subangular blocky structure; very firm; common fine roots; few, soft and hard, black concretions; clay films on ped surfaces; medium acid; clear, wavy boundary.

C—18 to 32 inches, greenish-gray (5G 5/1), olive-brown (2.5Y 4/4), yellowish-brown (10YR 5/8) and yellowish-red (5YR 4/6), soft rock; few fine mica flakes; few fine root channels filled with dark grayish-brown material; thin bands of yellowish-red, strong-brown, and yellowish-brown clay in cracks and seams between rock strata; clay bands are discontinuous, are about a quarter inch wide, and make up less than 5 percent of the horizon, by volume; slightly acid; clear, wavy boundary.

R—32 to 48 inches, soft, consolidated, dark greenish-gray (5G 4/1) rock with thin, white streaks.

The Ap horizon is light olive brown or yellowish brown and is 4 to 6 inches thick. The A1 horizon, where present, is dark grayish-brown sandy loam 3 to 7 inches thick. The A2 horizon, where present, is olive-brown or light yellowish-brown sandy loam 4 to 6 inches thick. The B1t horizon, where present, is chiefly yellowish-brown sandy clay loam about 7 inches thick. The B2t horizon is mainly strong brown, yellowish brown, or light olive brown and is 6 to 13 inches thick. The B2t horizon is mottled with red, yellowish red, strong brown, or brownish yellow in some areas. The combined thickness of the A and B horizons is 10 to 20 inches.

Soils of the Wilkes series, clayey subsoil variant, are more clayey in the B2t horizon than the typical Wilkes soils.

These soils commonly occur with the Appling, Louisburg, Louisa, Helena, Madison, and typical Wilkes soils. They are less red in the subsoil than the Madison soils. They contain more clay in the subsoil than the Louisburg, Louisa, and the typical Wilkes soils. They are shallower to soft consolidated rock than the Appling and Helena soils and are better drained than the Helena soils.

Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes (WvD).—This soil is on narrow ridgetops and hillsides. Mapped areas are 3 to 25 acres in size.

Included in mapping are small areas of similar soils that have a gravelly sandy loam surface layer and areas of similar soils in which the solum is about 37 inches thick and the clayey subsoil is discontinuous. Also included are small areas of Louisburg, Louisa, and Appling soils. Runoff is medium. Although this soil has good tilth, it is not suited to cultivated crops because it is shallow to rock and is moderately to severely eroded. The shallow depth to rock also limits its usefulness for some nonfarm uses.

This soil is suited to pine trees. About three-fourths of the acreage is wooded; the rest is pastured, cultivated, or idle. (Capability unit VIe–3; woodland suitability group 4o1)

Use and Management of the Soils

This section describes management of the soils of Cobb County for town and country planning, for engineering, and for woodland. It discusses management of the soils for cultivated crops and pasture and gives average yields of the principal crops grown in the county. It also discusses use of the soils for wildlife.

Town and Country Planning

This section was prepared chiefly for planners, developers, landscape architects, builders, zoning officials, realtors, private and potential landowners, and others interested in use of the soils in Cobb County for purposes other than farming. Cobb County is near the city of Atlanta and is readily accessible to highway systems. Its population is increasing rapidly because the suburbs of Atlanta are steadily expanding into areas formerly used for farming. The demand for housing developments, shopping centers, schools, parks, golf courses, and other developments is increasing with the population.

In selecting a site for a house, a highway, an industry, recreational use, or other nonfarm purpose, the suitability of the soils in each site for such use must be determined. Some of the more common properties affecting the use of the soils for nonfarm purposes are soil texture, reaction, and depth; shrink-swell potential; steepness of slopes; permeability; depth to hard rock and to the water table; and hazard of flooding. On the basis of these and related characteristics, soil scientists and engineers have rated the soils of Cobb County for specific nonfarm purposes. The ratings and the nature of the soil limitations that influenced the ratings are shown in table 2.

The limitations are rated *slight*, *moderate*, and *severe*, and they pertain to unaltered soils. If the rating is *slight*, soil properties are favorable to the rated use, and limitations are so minor that they can be easily overcome. Good performance and low maintenance can be expected; therefore no limitations are shown. A *moderate* rating means that the soils have properties moderately favorable to the rated use, and limitations can be overcome or modified by planning or special maintenance. A *severe* rating means the soils have one or more properties unfavorable to the rated use. Limitations are difficult and costly to modify or overcome, and major soil reclamation, special design, or intensive maintenance are required.

In the paragraphs that follow, each nonfarm use is defined, and the properties important in rating the limitations of the soils for such purposes are given. This information, and the information in table 2 and in other parts of the survey, can be used along with the soil map at the back of the survey as a guide in planning the use of the soils for nonfarm purposes. Before beginning construction, however, onsite inspection of the soils should be made. The ratings of limitations apply only to the soils mapped in this county.

Sites for residences that hav community sewerage systems.—These are areas used for homesites (fig. 9). The ratings and limitations in table 2 are for houses that are no more than three stories high. The soil properties most important in rating the soils are bearing capacity, shrink-swell potential, depth to seasonal high water table, susceptibility to flooding, slope, and depth to bedrock.

Sites for residences that have septic tank filter fields.—These areas are used for homesites. The ratings and limitations in table 2 are for houses that are no more than three stories high. The soil properties most important in rating the soils are susceptibility to flooding, depth to seasonal high water table, percolation rate, slope, shrink-swell potential, and depth to rock.

Structures for light industries.—These structures are used for stores, offices, and small industries. They are not more than three stories high. Properties important in rating the soils for this use are slope, depth to the water table and to bedrock, susceptibility to flooding, and shrink-swell potential (fig. 10). It is assumed that sewage-disposal facilities are available, and these are not considered in the rating.

Sewage lagoons.—A sewage lagoon (*4*) is a shallow pond constructed to hold sewage for the time required for bacterial decomposition of its solids. The impoundment area is ordinarily constructed in nearly level areas using a dike to form the boundaries. The chief requirements of a soil for use as a floor for the basin of a lagoon are (1) effective sealing against seepage, (2) an even, fairly level surface, and (3) little or no organic-matter content. The properties most important in rating the soils for this use are permeability, the suitability of the material at the site for the dike, depth to bedrock, slope, content of organic matter, and content of coarse fragments more than 6 inches in diameter.

Recreational facilities.—Among the recreational facilities (*11*) considered in table 2 are picnic areas, golf fairways, camping areas, and playgrounds.

Picnic areas.—These areas are suitable for intensive use for pleasure outings at which a meal is eaten outdoors (fig. 11). It is assumed that most vehicular traffic in these areas is confined to access roads. Soil suitability for growing vegetation is not considered in the ratings. Properties affecting the suitability of soils for this use are susceptibility to flooding, wetness, slope, texture of the surface layer, and coarse fragments on the surface.

TABLE 2.—*Degree and kind of limitations*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soils. The soils for referring to other series that

Soils and map symbols	Sites for residences		Structures for light industries	Sewage lagoons
	With public or community sewerage system	With septic tank filter fields		
Altavista:				
AlB [1]	Slight	Severe: seasonal high water table.	Moderate: seasonal high water table.	Moderate: moderate permeability.
AL [1]	Severe: flooding	Severe: seasonal high water table.	Severe: flooding	Severe: flooding
Appling:				
AmB	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
AmC	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: slopes.	Severe: slopes
AmD	Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes
AnB3	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
AnC3	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: slopes.	Severe: slopes
Cartecay: Cah [1]	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Cartecay, silty variant: Cw. [1]	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Cecil:				
CYB2	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
CYC2	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: slopes.	Severe: slopes
Chewacla, wet variants: Csw. [1]	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Durham: DiB	Slight	Slight to moderate: moderate permeability.	Slight	Moderate: slopes
Gwinnett:				
GgB2	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
GgC2	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: slopes; moderate shrink-swell potential.	Severe: slopes
GgD2	Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes
GeB3	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
GeC3	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: moderate shrink-swell potential; slopes.	Severe: slopes

See footnotes at end of table.

of soils for town and country planning

in such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions appear in the first column of this table]

Recreational facilities				Trafficways	Suitability as source of topsoil
Picnic areas	Golf fairways	Camping areas	Playgrounds		
Slight	Slight	Slight to moderate: seasonal high water table.	Moderate: seasonal high water table; slopes.	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Severe: seasonal high water table.	Severe: seasonal high water table.	Severe: flooding; seasonal high water table.	Severe: flooding; seasonal high water table.	Moderate to severe: seasonal high water table; flooding.	Fair: moderate productivity.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Slight to moderate: slopes.	Moderate: slopes	Slight to moderate: slopes.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: slopes	Moderate: fair traffic-supporting capacity; slopes.	Fair: moderate productivity.
Moderate: sandy clay loam surface layer.	Moderate: sandy clay loam surface layer.	Moderate: sandy clay loam surface layer.	Moderate: slopes; sandy clay loam surface layer.	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: sandy clay loam surface layer.	Moderate: slopes; sandy clay loam surface layer.	Moderate: sandy clay loam surface layer.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Severe: seasonal high water table.	Severe: flooding	Severe: flooding	Severe: seasonal high water table; flooding.	Severe: seasonal high water table; flooding.	Fair: wetness.
Severe: seasonal high water table; flooding.	Severe: flooding	Severe: flooding	Severe: flooding; seasonal high water table.	Severe: flooding	Fair: wetness.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Slight to moderate: slopes.	Moderate: slopes	Slight to moderate: slopes.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Severe: seasonal high water table.	Severe: flooding	Severe: flooding	Severe: flooding; seasonal high water table.	Severe: flooding	Poor: wetness.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Slight to moderate: slopes.	Moderate: slopes	Slight to moderate: slopes.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: slopes	Moderate: slopes; fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.

TABLE 2.—*Degree and kind of limitations of*

Soils and map symbols	Sites for residences		Structures for light industries	Sewage lagoons
	With public or community sewerage system	With septic tank filter fields		
Gwinnett—Continued				
GeD3	Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes
GeE2	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Helena: HYC	Severe: moderate to high shrink-swell potential.	Severe: percolation rate slower than 75 minutes per inch.	Moderate to severe: moderate to high shrink-swell potential.	Moderate to severe: slopes.
Hiwassee:				
HSB	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate: moderate shrink-swell potential.	Moderate: slopes
HTC2	Slight	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: moderate shrink-swell potential; slopes.	Severe: slopes
HTD2	Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Louisa:				
LkE	Moderate to severe: depth to soft rock is 27 inches to more than 36 inches; slopes.	Severe: depth to soft rock is 27 inches to more than 36 inches; slopes.	Severe: slopes; depth to soft rock is 27 inches to more than 36 inches.	Severe: slopes; depth to soft rock is 27 inches to more than 36 inches.
LNF	Severe: slopes; depth to soft rock is 15 inches to more than 36 inches.	Severe: slopes; depth to soft rock is 15 inches to more than 36 inches.	Severe: slopes; depth to soft rock is 15 inches to more than 36 inches.	Severe: slopes; depth to soft rock is 15 inches to more than 36 inches.
Louisburg:				
LnE	Moderate to severe: depth to soft rock is 21 to 32 inches; slopes.	Severe: depth to soft rock is 21 to 32 inches; slopes.	Severe: depth to soft rock is 21 to 32 inches; slopes.	Severe: depth to soft rock is 21 to 32 inches; slopes.
LDF	Severe: slopes; depth to soft rock is 20 to 34 inches.	Severe: slopes; depth to soft rock is 20 to 34 inches.	Severe: slopes; depth to soft rock is 20 to 34 inches.	Severe: slopes; depth to soft rock is 20 to 34 inches.
Madison:				
MgB2	Slight	Moderate to severe: percolation rate 45 to 75 minutes per inch; depth to soft rock is 28 inches to more than 36 inches.	Severe: depth to soft rock is 28 inches to more than 36 inches.	Moderate: slopes
MgC2	Moderate: slopes	Moderate to severe: percolation rate 45 to 75 minutes per inch, depth to soft rock is 30 inches to more than 60 inches.	Moderate to severe: moderate shrink-swell potential; slopes; depth to soft rock is 30 inches to more than 60 inches.	Severe: slopes
MgD2	Moderate: slopes	Moderate to severe: percolation rate 45 to 75 minutes per inch; slopes.	Severe: slopes	Severe: slopes
MDC3	Moderate: slopes	Moderate to severe: percolation rate 45 to 75 minutes per inch.	Moderate to severe: slopes; moderate shrink-swell potential.	Severe: slopes
MDE3	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes

See footnotes at end of table.

soils for town and country planning—Continued

Recreational facilities				Trafficways	Suitability as source of topsoil
Picnic areas	Golf fairways	Camping areas	Playgrounds		
Moderate: slopes; clay loam surface layer.	Moderate: slopes; clay loam surface layer.	Moderate: slopes; clay loam surface layer.	Severe: slopes	Moderate: slopes; fair traffic-supporting capacity.	Poor: shallow to clayey material.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Poor: shallow to clayey material.
Slight to moderate: slopes.	Moderate: slow permeability.	Moderate: slow permeability.	Moderate to severe: slopes.	Severe: poor traffic-supporting capacity.	Poor to fair: shallow to clayey material.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Moderate: clay loam surface layer.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: slopes; clay loam surface layer.	Moderate: slopes; clay loam surface layer.	Moderate: slopes; clay loam surface layer.	Severe: slopes	Moderate: fair traffic-supporting capacity; slopes.	Poor: shallow to clayey material.
Moderate to severe: slopes.	Moderate to severe: slopes.	Moderate to severe: slopes.	Severe: slopes	Moderate to severe: slopes; bedrock within 6 feet.	Fair: moderate productivity.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Fair: moderate productivity.
Moderate to severe: slopes.	Moderate to severe: slopes.	Moderate to severe: slopes.	Severe: slopes	Moderate to severe: slopes; depth to soft rock is 21 to 32 inches.	Fair: moderate productivity.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Poor: coarse fragments on the surface.
Slight	Slight	Slight	Moderate: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Slight to moderate: slopes.	Moderate: slopes	Slight to moderate: slopes.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Fair: moderate productivity.
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor to fair: mainly shallow to clayey material.
Moderate: clay loam surface layer.	Moderate: slopes; clay loam surface layer.	Moderate: clay loam surface layer.	Severe: slopes	Moderate to severe: fair traffic-supporting capacity; depth to bedrock is 35 to 45 inches.	Poor: shallow to clayey material.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Poor: shallow to clayey material.

TABLE 2.—*Degree and kind of limitations of*

Soils and map symbols	Sites for residences		Structures for light industries	Sewage lagoons
	With public or community sewerage system	With septic tank filter fields		
Madison and Pacolet: MsD3	Moderate: slopes	Moderate to severe: percolation rate 45 to 75 minutes per inch; slopes.	Severe: slopes	Severe: slopes
MsE2	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes
Musella: MlD2	Moderate: depth to soft rock is 20 inches to more than 50 inches.	Moderate to severe: depth to soft rock is 20 inches to more than 50 inches; slopes.	Moderate to severe: slopes.	Severe: depth to soft rock is 20 inches to more than 50 inches; slopes.
MlE3	Severe: depth to soft rock is 20 inches to more than 50 inches; slopes.	Severe: depth to soft bedrock is 20 inches to more than 50 inches.	Severe: slopes	Severe: depth to soft rock is 20 to more than 50 inches; slopes.
Musella and Pacolet: MJF.	Severe: slopes; 5 to 20 percent of surface covered with cobblestones and stones.	Severe: depth to hard rock is 22 inches to more than 60 inches; slopes.	Severe: slopes	Severe: depth to hard rock is 22 inches to more than 60 inches; slopes.
Pacolet: PfD	Moderate: slopes	Severe: slopes	Severe: slopes	Severe: slopes
PgC3	Moderate: slopes	Moderate: percolation rate 45 to 75 minutes per inch.	Moderate to severe: moderate shrink-swell potential; slopes.	Severe: slopes
Roanoke: Ron [1]	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding
Toccoa: Tod	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Moderate: seasonal high water table.	Severe: moderately rapid permeability.
Toc [1]	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding; moderately rapid permeability.
*Urban land: Ud, Ubp, UeC, UfC, UgC, UhC, UiE. Properties too variable to rate. For soils in these units, refer to the respective series. [2]				
Wilkes: WjF	Severe: depth to soft rock is 15 to 20 inches; depth to hard rock is 20 to 48 inches.	Severe: percolation rate less than 1 inch in 75 minutes.	Severe: depth to soft rock is 15 to 20 inches; depth to hard rock is 20 to 48 inches.	Severe: slopes; depth to soft rock is 15 to 20 inches.
Wilkes, clayey subsoil variant: WvD.	Severe: depth to soft rock is 10 to 20 inches.	Severe: percolation rate less than 1 inch in 75 minutes; depth to soft rock is 10 to 20 inches.	Severe: depth to hard rock is 22 inches to more than 52 inches.	Severe: slopes; depth to soft rock is 10 to 20 inches.

[1] Areas of these soils along the Chattahoochee River are subject to overflow once in 5 to 20 years.

soils for town and country planning—Continued

Recreational facilities				Trafficways	Suitability as source of topsoil
Picnic areas	Golf fairways	Camping areas	Playgrounds		
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: slopes	Moderate: slopes; fair traffic-supporting capacity.	Poor: chiefly shallow to clayey material.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Poor: chiefly shallow to clayey material.
Slight to moderate: slopes.	Moderate: slopes	Moderate: slopes; gravelly surface layer.	Severe: slopes	Moderate to severe: depth to hard rock is 22 inches to more than 60 inches.	Poor: gravelly surface layer.
Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Severe: slopes	Poor: gravelly surface layer.
Moderate to severe: slopes.	Moderate to severe: 5 to 20 percent of surface covered with cobblestones and stones; slopes.	Severe: 5 to 20 percent of surface covered with cobblestones and stones.	Severe: slopes	Moderate to severe: slopes; depth to hard rock is 22 inches to more than 60 inches.	Poor: coarse fragments on the surface.
Moderate: slopes	Moderate: slopes	Moderate: slopes	Severe: slopes	Moderate: slopes; fair traffic-supporting capacity.	Poor: shallow to clayey material.
Moderate: sandy clay loam surface layer.	Moderate: sandy clay loam surface layer.	Moderate: sandy clay loam surface layer.	Severe: slopes	Moderate: fair traffic-supporting capacity.	Poor: shallow to clayey material.
Severe: seasonal high water.	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding; seasonal high water table.	Poor: wetness.
Slight	Slight	Slight	Moderate: slopes	Moderate: seasonal high water table.	Good.
Moderate: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Severe: flooding	Good.
Moderate to severe: slopes.	Moderate to severe: slopes; 3 to 15 percent of surface covered with stones.	Severe: 3 to 15 percent of surface covered with stones.	Severe: slopes	Severe: slopes	Poor: 3 to 15 percent of surface covered with stones.
Slight to moderate: slopes.	Moderate: slopes	Moderate: moderately slow permeability.	Severe: slopes; depth to soft rock is 10 to 20 inches.	Severe: poor traffic-supporting capacity.	Poor: shallow to clayey material.

[2] Urban land mapped with Borrow pits, and Appling, Cecil, Gwinnett, Madison, and Pacolet soils.

Figure 9.—**Part of a residential subdivision on Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded. This is one of the many soils suitable for residences in the county.**

Golf fairways.—Only suitability for fairways is rated because golf greens are made with borrow material. Soil properties important to this use are wetness, susceptibility to flooding, slope, permeability, content of coarse fragments, and texture of the surface layer.

Camping areas.—These areas are suitable for tent sites and camp trailers 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. Properties important in evaluating soils for camping areas are wetness, susceptibility to flooding, permeability, slope, texture of the surface layer, and content of coarse fragments.

Playgrounds.—These areas are developed and used intensively for playgrounds, 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, have good drainage and texture, and have a consistence that gives a firm surface. These areas generally are not larger than about 2 acres. Properties important in rating soils for playgrounds are slope, depth to bedrock, permeability, surface soil texture, wetness, and content of coarse fragments.

Trafficways.—This term refers to low-cost roads and residential streets that require limited cut and fill and subgrade preparation. The properties most important in rating the soils for trafficways are slope, depth to hard rock and the water table, susceptibility to flooding, content of coarse fragments, and traffic-supporting capacity.

Suitability as source of topsoil.—This is soil material used to cover or to resurface an area where vegetation is to be established and maintained. Considered in the ratings are properties that affect the productivity and workability of the soil and the amount of suitable material available. These are mainly texture, thickness of the source material, content of coarse fragments, and presence of toxic materials. The ratings are good, fair, and poor.

Engineering Uses of the Soils [2]

Of special interest to engineers are soil properties that affect the design, construction, and maintenance of roads, airports, pipelines, facilities for winter storage, structural foundations, and drainage and irrigation systems. The properties of soils may vary significantly within a single area. A large part of soil engineering practice consists of locating the various soils, determining their engineering properties, correlating these properties with the requirements of the job, and selecting the best soil material for each requirement.

This section contains information about the soils that is helpful to engineers. Special emphasis has been placed on engineering properties of the soils that relate to the construction of irrigation systems, farm ponds, terraces, waterways, agricultural drainage systems, and other structures that conserve soil and water. Among these properties are depth to rock and seasonal high water table, plasticity, reaction, shrink-swell characteristics, drainage, permeability, and shear strength.

The information can be used to:

(1) Make soil and land use studies that will aid in selecting and developing sites for industrial, business, residential, and recreational uses.

[2] ALBERT E. JENKINS, JR., civil engineer, Soil Conservation Service, assisted in the preparation of this subsection.

Figure 10.—**Severe gullying and caving on an unprotected road bank in an industrial park. The soil is Appling sandy loam, 10 to 15 percent slopes.**

(2) Make preliminary evaluations 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 practices and structures.

(5) Supplement information obtained from other published maps and reports and from aerial photographs.

(6) Determine the suitability of soil mapping units 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 subsection. Knowledge of the soils obtained from laboratory tests and field experience was used to make interpretations of soil properties that could be useful to engineers.

With the use of the soil map for identification, the interpretations made in this section can be useful for many purposes. It should be emphasized, however, that these interpretations are no substitute for sampling and testing at the site of specific engineering works where heavy loads are involved and where excavations are to be deeper than the depths of layers here reported. Also, engineers should not apply specific values to estimates of bearing capacity given in this survey. Nevertheless, by using this survey, an

Figure 11.—**A picnic area on Louisburg sandy loam, 10 to 25 percent slopes, near Allatoona Lake. This soil has moderate to severe limitations as sites for picnic areas.**

engineer can select and concentrate on those soil units most suitable for the proposed kind of construction.

Some of the terms used by the soil scientist may be unfamiliar to the engineer, and some terms 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 given in tables 3, 4, and 5. Table 3 gives test data obtained from the testing of samples taken from representative soils in Cobb County. These tests were performed by the State Highway Department of Georgia. Table 4 gives estimated engineering properties of the soils. In table 5 the soils are rated as a source of materials used in road fill, and the 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, especially in the sections "How This Survey Was Made," "Descriptions of the Soils," and "Town and Country Planning."

Engineering classification systems

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

The Unified system (*10*) was developed by the U.S. Department of Defense. 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).

Many highway engineers use the system approved by the American Association of State Highway Officials (AASHO) (*2*). 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–6(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 standard procedures of the American Association of State Highway Officials (AASHO). Each soil series tested was sampled in three localities so that the range in characteristics would be closer to the true range than it would be if fewer samples were taken. 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 10 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 several times in a mold under 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. From that point, the density decreases as moisture content increases. The highest density obtained in the compaction test is the maximum dry density. Data showing moisture density are important in earthwork because generally, optimum stability is obtained if the soil is compacted to about the maximum dry density when it is at approximately the optimum moisture 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 test for liquid limit and plastic limit measures 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 liquid state. The plastic 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.

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Estimated engineering properties

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

Depth to hard rock is the depth to be expected in most areas of the soil. The rock is hard enough to require drilling and blasting before it can be removed.

Depth to the seasonal high water table refers to the highest level of ground water during the wettest season of the year.

In the classification column, texture of each horizon is classified according to the USDA system, the Unified Soil Classification System, and the AASHO system.

Four columns show the percentage of soil particles, in each of the major horizons, that pass the No. 4, No. 10, No. 40, and No. 200 sieves. The No. 4 sieve removes the gravel coarser than 5 millimeters but passes finer particles; the No. 10 sieve separates and removes gravel but passes very coarse sand and smaller particles; the No. 40 sieve separates very coarse sand, coarse sand, and part of the medium sand from the smaller particles; and the No. 200 sieve removes medium sand, fine sand, and part of the very fine sand but passes silt and clay particles and the smaller particles of very fine sand.

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

Available water capacity is the capacity of the soil to hold water available for use by most plants. It is the difference between the amount of water in a soil at field capacity and the amount at wilting point of plants, commonly expressed as inches of water per inch of soil.

Reaction gives the acidity or alkalinity of the soil, expressed as pH values. A pH value of 7.0 is neutral. A lower value indicates acidity, and a higher value indicates alkalinity.

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 absorbs 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. Clean sands and gravels and those soils that have a small amount of nonplastic to slightly plastic fines have low shrink-swell potentials, as do most other nonplastic to slightly plastic soil materials.

Engineering interpretations

Engineering interpretations of the soils in Cobb County are given in table 5. This table rates the suitability of the soils as a source of road fill. It also lists features that adversely affect the location of highways and the construction of dikes or levees, farm ponds, agricultural drainage systems, irrigation systems, terraces and diversions, 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.

TABLE 3.—*Engineering*

[Test performed by State Highway Department of Georgia in cooperation with the Bureau of Public Roads in

Soil name and location	Parent material	Georgia report No. S63–Ga–33–	Depth	Moisture-density [1]		Volume change [2]		
				Maximum dry density	Optimum moisture	Shrinkage	Swell	Total change
			Inches	*Lb. per cu. ft.*	*Percent*	*Percent*	*Percent*	*Percent*
Hiwassee loam:								
1.5 miles S. of lower river road and Interstate Highway No. 20, and 300 yards W. of Chattahoochee River (modal profile).	Old alluvium.	1–3	13–60	101	21	9. 4	2. 8	12. 2
		1–5	68–84	112	14	2. 4	2. 2	4. 6
0.25 mile S. of Clarkdale and 50 feet E. of Southern Railroad spur (more clayey in the 15–60 inch layer than modal profile).	Old alluvium.	3–3	15–72	93	25	6. 6	3. 2	9. 8
		3–4	72–79	110	16	5. 8	1. 6	7. 4
0.75 mile S. of U.S. Highway 78, 200 yards W. of Maxham Road, and 200 yards E. of Sweetwater Creek (sandier in the 15–60 inch layer than modal profile).	Old alluvium.	4–3	13–62	105	18	14. 4	2. 2	16. 6
		4–5	96–114	109	16	6. 0	1. 3	7. 3
Louisa fine sandy loam:								
0.5 mile S. of Interstate Highway 20, and 50 feet E. of Hartmen Road (modal).	Schist.	2–3	8–28	114	14	1. 1	1. 7	2. 8
0.25 mile N. of Chattahoochee River, 1.25 miles S. of Parkaire Field, and 100 feet E. of Johnson Ferry Road (slightly more clayey in the 9–35 inch layer than modal profile).	Gneiss and schist.	5–4	9–35	100	23	3. 9	4. 3	8. 2
0.25 mile SE. of junction of Interstate Highways 285 and 75 (deeper to rock than modal profile).	Schist.	6–3	6–72	110	16	3. 7	1. 6	5. 3

[1] Based on the Moisture-density relations of soils using 5.5-lb. rammer and 12-in. drop, AASHO Designation T 99–57, Method A and C.
[2] Based on "A System of Soil Classification," by W. F. ABERCROMBIE (*1*).
[3] Mechanical analysis according to the AASHO Designation: T–88. Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser

test data

accordance with standard procedures of the American Association of State Highway Officials (AASHO) (2)]

Mechanical analysis [3]														Liquid limit	Plasticity index	Classification	
Percentage passing sieve—										Percentage smaller than—							
3-in.	2-in.	1½-in.	1-in.	¾-in.	⅜-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.			AASHO [4]	Unified [5]
------	------	------	------	------	------	100	94	84	60	58	56	48	45	42	17	A–7–6(8)	ML–CL [6]
------	------	------	------	------	100	98	74	29	14	14	13	12	11	44	21	A–2–7(0)	SC
------	------	------	------	------	------	100	99	93	71	70	65	61	60	45	17	A–7–6(11)	ML–CL
95	95	72	70	59	42	38	29	23	15	15	15	14	13	45	17	A–2–7(0)	GM–GC
------	------	------	------	------	------	------	100	91	48	48	46	41	38	36	16	A–6(5)	SC
------	------	------	------	------	------	100	99	85	33	30	26	21	18	[7] NP	[7] NP	A–2–4(0)	SM
------	------	------	100	98	95	91	76	48	22	20	15	10	7	NP	NP	A–1–b(0)	SM
------	------	------	------	100	99	98	91	74	33	30	25	20	18	NP	NP	A–2–4(0)	SM
------	------	------	------	------	100	99	96	73	31	27	23	19	17	NP	NP	A–2–4(0)	SM

than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

[4] Based on Standard Specifications for Highway Materials and Methods of Sampling and Testing, AASHO Designation M–145–49.

[5] Based on the Unified Soil Classification System (10).

[6] Soil Conservation Service and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within 2 points from A-line are to be given a borderline classification.

[7] NP=Nonplastic.

TABLE 4.—*Estimated*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear in the first column of this

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Hard rock	Seasonal high water table		USDA texture
	Inches	*Inches*	*Inches*	
Altavista:				
AlB	>60	22	0–14	Sandy loam
			14–50	Sandy clay loam
			50–57	Sandy clay loam
AL	>60	14	0–18	Silt loam and sandy loam
			18–53	Sandy clay loam
			53–60	Clay loam
Appling: AmB, AmC, AmD, AnB3,[2] AnC3[2]	>60	>60	0–6	Sandy loam
			6–17	Sandy clay loam
			17–38	Clay
			38–53	Sandy clay loam
			53–60	Clay loam
Cartecay: Cah	>60	6	0–26	Stratified layers of sandy loam and silt loam
			26–36	Loamy sand
			36–45	Silt loam
Cartecay, silty variant: Cw	>60	9	0–32	Silt loam
			32–45	Silty clay loam, silt loam, and sandy clay loam
Cecil: CYB2, CYC2	>60	>60	0–6	Sandy loam
			6–32	Clay
			32–45	Sandy clay loam
			45–60	Sandy loam
Chewacla, wet variants: Csw	>60	3	0–4	Silt loam
			4–48	Silty clay loam
Durham: DiB	>60	>60	0–11	Sandy loam
			11–61	Sandy clay loam
Gwinnett: GgB2,[3] GgC2,[3] GgD2,[3] GeB3, GeC3, GeD3, GeE2.[3]	>60	>60	0–5	Clay loam
			5–24	Clay
			24–36	Clay loam
			36–72	Weathered soft rock and clay
Helena: HYC	>60	27	0–5	Sandy loam
			5–14	Sandy clay loam
			14–37	Clay
			37–55	Weathered soft rock and clay
Hiwassee: HSB, HTC2,[2] HTD2[2]	>60	>60	0–5	Loam
			5–54	Clay
			54–70	Clay loam to gravelly sandy loam
Louisa: LkE, LNF	>60	>60	0–14	Gravelly sandy loam and gravelly loam
			14–26	Weathered, loose, soft, small schist fragments with 1 percent clay lenses.
			26–30	Soft bedrock.
Louisburg: LnE, LDF[5]	28–48	>60	0–23	Sandy loam
			23–31	Weathered soft rock and sandy loam
			31	Hard rock.

See footnotes at end of table.

engineering properties

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for table. The symbol < means less than; the symbol > means more than]

Classification—Continued		Percentage passing sieve—				Permeability	Available water capacity [1]	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	*Inches per hour*	*Inches per inch of soil*	*pH value*	
SM	A-2	95–100	95–100	70–85	20–35	2.0–6.3	0.13	4.5–5.5	Low.
CL, ML	A-6	95–100	95–100	70–95	50–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
SM, SC	A-4, A-6	95–100	95–100	70–95	36–50	0.63–2.0	.13	4.5–5.0	Low.
ML, SM	A-4, A-2	95–100	95–100	80–95	25–60	2.0–6.3	.18	5.0–5.5	Low.
CL, ML	A-4, A-6	95–100	95–100	70–95	50–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
MH, ML, CL	A-7	95–100	95–100	80–95	55–75	<0.2	.13	4.5–5.0	Moderate.
SM	A-2	95–100	95–100	55–75	20–35	2.0–6.3	.12	4.5–5.0	Low.
CL, ML	A-6	95–100	95–100	80–90	50–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
MH, ML–CL	A-7	100	95–100	80–95	55–75	0.63–2.0	.13	4.5–5.0	Moderate.
CL, SC, ML	A-6, A-7	100	95–100	80–90	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
ML, SM, CL	A-6, A-7	95–100	90–100	80–90	40–60	0.63–2.0	.17	4.5–5.0	Moderate.
SM, ML	A-2, A-4	95–100	95–100	60–90	25–60	2.0–6.3	.13	5.6–6.0	Low.
SM	A-2	95–100	95–100	55–80	13–25	>6.3	.08	5.6–6.0	Low.
ML, ML–CL	A-4, A-6	100	95–100	80–90	55–65	2.0–6.3	.18	5.6–6.0	Low.
ML	A-4, A-6	95–100	95–100	60–75	50–65	0.63–2.0	.18	5.6–6.5	Low.
ML, CL, ML–CL	A-4, A-6, A-7	100	95–100	60–90	55–75	0.63–2.0	.17	5.6–6.0	Moderate.
SM	A-2	85–100	85–100	65–75	20–35	2.0–6.3	.13	5.1–5.5	Low.
CL, MH	A-7, A-6	95–100	90–100	80–90	55–75	0.63–2.0	.13	4.5–5.0	Moderate.
ML, CL, SM	A-6, A-4	95–100	95–100	75–90	36–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
SM, ML	A-4	90–100	90–100	70–85	36–55	2.0–6.3	.13	4.5–5.0	Low.
ML	A-4, A-6	95–100	95–100	80–95	60–85	0.63–2.0	.18	5.1–5.5	Low to modertae.
ML–CL, MH	A-6	95–100	95–100	70–85	55–80	0.63–2.0	.17	5.1–6.0	Low to moderate.
SM	A-2	95–100	95–100	65–75	20–35	2.0–6.3	.12	5.1–5.5	Low.
SC, CL	A-6	95–100	95–100	60–75	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
SC, CL	A-4, A-6	90–100	85–100	65–80	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
CL, MH	A-7, A-6	95–100	90–100	75–90	60–80	0.63–2.0	.13	4.5–5.0	Moderate.
CL, SC	A-4, A-6	70–95	70–95	75–90	45–65	0.63–2.0	.15	4.5–5.0	Low to moderate.
SM, ML	A-4, A-6	[4] 50–90	50–90	50–85	35–60	0.63–2.0	.08	4.5–5.0	Low.
SM	A-2	95–100	95–100	60–70	20–35	2.0–6.3	.12	5.1–5.5	Low.
SC, CL	A-4, A-6	95–100	95–100	55–75	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
CH, MH, CL	A-7	95–100	95–100	55–75	50–80	<0.20	.13	4.5–5.0	Moderate to high.
ML, CL	A-4, A-6	[4] 95–100	95–100	70–90	50–60	0.20–0.63	.08	4.5	Low.
ML	A-4	95–100	90–95	65–80	50–60	2.0–6.3	.14	5.1–5.5	Low.
ML, CL, MH	A-7, A-6	100	90–100	80–95	50–75	0.63–2.0	.13	4.5–5.0	Moderate.
SC, SM, GM, GC, CL	A-2, A-6	35–100	25–100	25–85	15–60	0.63–2.0	.12	4.5–5.0	Low to moderate.
SM	A-2	80–90	75–85	40–75	25–35	2.0–6.3	.12	4.5–5.5	Low.
SM	A-1, A-2	[4] 70–100	70–95	45–80	20–35	2.0–6.3	.08	4.5–5.0	Low.
SM, SC	A-2	80–90	75–85	30–45	25–35	>6.3	.12	4.5–5.5	Low.
GP	A-1	[4] 5–10	<5	<5	<5	>6.3	.05	4.5–5.0	Low.

TABLE 4.—*Estimated*

Soil series and map symbols	Depth to—		Depth from surface	Classification
	Hard rock	Seasonal high water table		USDA texture
	Inches	*Inches*	*Inches*	
*Madison: MgB2, MgC2, MgD2, MDC3,[2] MDE3,[2] MsD3,[2] MsE2. For properties of the Pacolet soils in MsD3 and MsE2, see the Pacolet series.	>60	>60	0–5	Sandy loam
			5–10	Sandy clay loam
			10–25	Clay
			25–36	Sandy clay loam
			36–48	Soft schist rock with less than 5 percent clay bands.
*Musella: MID2,[2] MIE3,[2] MJF.[5] For properties of the Pacolet soils in MJF, see the Pacolet series.	22–60+	>60	0–6	Gravelly and stony loam
			6–13	Clay loam
			13–19	Gravelly clay
			19–37	Rock and clay
			37–40	Soft rock.
Pacolet: PfD, PgC3[2]	>60	>60	0–5	Sandy loam
			5–30	Clay
			30–38	Sandy clay loam
			38–48	Sandy loam
Roanoke: Ron	>60	6	0–18	Silt loam and silty clay loam
			18–62	Clay
Toccoa: Toc, Tod	>60	24	0–26	Stratified layers of sandy loam and silty clay loam.
			26–50	Stratified layers of coarse sand, sandy loam, and loamy sand.
Urban land: Ubp, Ud, UeC, UfC, UgC, UhC, UiE. Too variable to be rated. Onsite investigation needed.				
Wilkes: WjF[5]	20–48+	>60	0–10	Stony sandy loam and sandy loam
			10–14	Sandy clay loam
			14–19	Clay
			19–34	Soft decomposed rock
			34	Hard rock.
Wilkes, clayey subsoil variant: WvD	22–52+	>60	0–5	Sandy loam
			5–18	Clay
			18–32	Rock and clay
			32–48	Rock.

[1] The figure given in this column may vary within a range of 0.03± to 0.05± inch.

[2] Because of erosion the surface layer of this soil 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 soil more nearly resembles the subsoil for the series.

[3] The surface layer of this soil is less clayey than the surface layer given in this table for the soil series. The AASHO and Unified ratings of the surface layer of this mapping unit range one to two units coarser than soils that have a clay loam surface layer.

engineering properties—Continued

Classification—Continued		Percentage passing sieve—				Permeability	Available water capacity [2]	Reaction	Shrink-swell potential
Unified	AASHO	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
						Inches per hour	*Inches per inch of soil*	*pH value*	
SM, SC	A-2, A-4	85–100	85–100	60–85	20–40	2.0–6.3	.12	4.5–5.0	Low.
SC, CL	A-4, A-6	95–100	95–100	80–95	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
MH, CL	A-7	95–100	95–100	85–95	60–80	0.63–2.0	.13	4.5–5.0	Moderate.
SM, ML	A-4, A-6	[4] 90–100	90–100	65–85	36–60	0.63–2.0	.15	4.5–5.0	Low.
SM, SC	A-2, A-4	70–95	60–90	45–65	30–45	2.0–6.3	.14	4.5–5.0	Low.
CL, ML	A-6, A-4, A-7	85–100	75–95	60–80	50–65	0.63–2.0	.15	4.5–5.0	Low to moderate.
CL, MH	A-6, A-7	[4] 70–90	70–85	60–80	50–65	0.63–2.0	.12	4.5–5.0	Low to moderate.
ML, SM	A-7, A-6, A-2	[4] 85–100	85–100	55–80	30–60	0.20–0.63	.08	4.5–5.0	Low to moderate.
SM	A-2	90–100	80–95	65–75	20–35	2.0–6.3	.12	4.5–5.0	Low.
MH, CL	A-7, A-6	95–100	90–100	80–90	55–80	0.63–2.0	.13	4.5–5.0	Moderate.
CL, SC	A-6, A-4	95–100	95–100	75–90	40–60	0.63–2.0	.15	4.5–5.0	Low to moderate.
SM	A-2	95–100	95–100	70–85	20–35	2.0–6.3	.12	4.5–5.0	Low.
ML, CL	A-6	100	95–100	80–95	50–70	0.63–2.0	.17	4.5–5.5	Low to moderate.
MH, CL	A-7	95–100	95–100	85–95	55–80	<0.20	.13	4.5–5.0	Moderate to high.
SM, ML	A-2, A-4	95–100	95–100	60–75	20–55	2.0–6.3	.14	5.6–6.5	Low to moderate.
SM, ML	A-2, A-4	90–100	80–100	55–75	10–55	2.0–6.3	.09	5.6–6.5	Low.
SM	A-2	85–100	85–95	55–80	20–35	2.0–6.3	.12	5.1–5.5	Low.
SC, CL	A-4, A-6	95–100	95–100	55–85	40–60	0.63–2.0	.15	5.1–5.5	Low to moderate.
MH, CH	A-6, A-7	90–100	85–100	70–90	50–70	0.20–0.63	.13	5.6–6.0	Moderate to high.
								6.1–6.5	
SM	A-2	85–100	85–95	55–80	20–35	2.0–6.3	.12	5.1–5.5	Low.
MH, CH	A-6, A-7	90–100	85–100	65–90	50–70	0.20–0.63	.13	5.5–6.0	Moderate to high.
SM, SC	A-2, A-4	[4] 90–100	90–100	60–90	20–40	0.63–2.0	.08	6.1–6.5	Low.

[4] In the lower part of some profiles, the percentage of material retained by the No. 4 sieve will not agree with the percentage given in the soil description, because some of the soft rock fragments disintegrate during mechanical analysis.

[5] The surface layer is 3 to 20 percent coarse fragments that range from 3 to 24 inches in diameter.

TABLE 5.—*Engineering*

[An asterisk in the first column indicates that at least one mapping unit in this series is made up of two or more kinds of soil. The soils in referring to other series that appear

Soil series and map symbols	Suitability as source of road fill	Soil features affecting—		
		Highway location	Dikes or levees	Farm ponds
				Reservoir area
Altavista: AlB	Fair: seasonal high water table.	Seasonal high water table.	Low to moderate shrink-swell potential.	Soil features favorable
Altavista, occasionally flooded: AL.	Poor: seasonal high water table.	Seasonal high water table; subject to flooding.	Low to moderate shrink-swell potential.	Soil features favorable
Appling: AmB, AmC, AmD, AnB3, AnC3.	Fair: moderate shrink-swell potential.	Slopes erode easily in deep cuts and unprotected embankments.	Moderate shrink-swell potential.	Soil features favorable
Cartecay: Cah	Fair: seasonal high water table.	Seasonal high water table; subject to flooding.	Moderate strength and stability.	Permeability is moderately rapid.
Cartecay, silty variant: Cw.	Poor to fair: seasonal high water table.	Seasonal high water table; subject to flooding.	Low strength and stability; seasonal high water table.	Soil features favorable
Cecil: CYB2, CYC2	Fair: fair traffic-supporting capacity.	Slopes erode easily in deep cuts and unprotected embankments.	Moderate shrink-swell potential.	Soil features favorable
Chewacla, wet variants: Csw.	Poor: seasonal high water table.	Seasonal high water table; subject to flooding.	Seasonal high water table; low strength and stability.	Soil features favorable
Durham: DiB	Fair: fair traffic-supporting capacity.	Soil is moderately erodible on unprotected embankments.	Moderate strength and stability.	Soil features favorable
Gwinnett: GgB2, GgC2, GgD2, GeB3, GeC3, GeD3, GeE2.	Fair: fair traffic-supporting capacity.	Slopes erode easily in deep cuts; rock at a depth of 24 inches in places.	Moderate strength and stability; moderate shrink-swell potential; rock at a depth of 24 inches in places.	Soil features favorable
Helena: HYC	Poor: poor traffic-supporting capacity.	Moderate to high shrink-swell potential; plastic subsoil when wet; seasonal high water table.	Moderate to high shrink-swell potential; moderate to poor stability.	Soil features favorable
Hiwassee: HSB, HTC2, HTD2.	Fair: moderate shrink-swell potential; fair traffic-supporting capacity.	Slopes erode easily in deep cuts; moderate shrink-swell potential.	Moderate shrink-swell potential; moderate strength and stability.	Soil features favorable

interpretations of the soils

such mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instructions for in the first column of this table]

	Soil features affecting—Continued			
Farm ponds—Continued Embankments	Agricultural drainage	Irrigation	Terraces and diversions	Waterways
Moderate strength and stability.	Slopes of less than 2 percent are subject to stream overflow; moderate permeability; seasonal high water table.	Seasonal high water table.	Soil features favorable	Soil features favorable.
Low to moderate shrink-swell potential.	Subject to stream overflow; moderate permeability; seasonal high water table.	Seasonal high water table; moderate to slow infiltration.	Nearly level slopes	Seasonal high water table.
Moderate strength and stability; moderate shrink-swell potential.	Well drained	Slow infiltration rate in severely eroded areas; moderate permeability.	Soil features favorable on slopes of 10 percent or less.	Moderately erodible.
Moderate strength and stability.	Subject to stream overflow; wet areas lower than available outlets; seasonal high water table.	Seasonal high water table.	Nearly level slopes	Seasonal high water table.
Low strength and stability	Subject to stream overflow; moderate permeability; seasonal high water table; wet areas are lower than available outlets.	Seasonal high water table.	Nearly level slopes	Seasonal high water table.
Moderate shrink-swell potential.	Well drained	Moderate permeability	Soil features favorable	Moderately to highly erodible.
Low strength and stability	Subject to stream overflow; moderate permeability; seasonal high water table; wet areas lower than available outlets.	Not feasible because of wetness.	Nearly level slopes	Seasonal high water table; poor drainage.
Moderate strength and stability.	Well drained	Soil features favorable	Soil features favorable	Soil features favorable.
Moderate strength and stability; moderate shrink-swell potential.	Well drained	Slow infiltration rate in severely eroded area; slopes of 6 percent or more.	Soil features are favorable on slopes of 10 percent or less.	Moderately erodible.
Moderate to high shrink-swell potential.	Slow permeability; seasonal high water table.	Slow permeability; seasonal high water table.	Clayey subsoil	Moderately erodible.
Moderate strength and stability; moderate shrink-swell potential.	Well drained	Slow infiltration rate in areas that have a clay loam surface layer; slopes.	Soil features are favorable on slopes of 10 percent or less.	Moderately erodible.

TABLE 5.—*Engineering interpretations*

Soil series and map symbols	Suitability as source of road fill	Soil features affecting—		
		Highway location	Dikes or levees	Farm ponds
				Reservoir area
Louisa: LkE, LNF	Fair: depth to soft rock is 15 inches to more than 36 inches.	Slopes erode easily in deep cuts and unprotected embankments.	Moderate strength and stability; depth to rock is 15 inches to more than 36 inches.	Moderately rapid permeability; high seepage potential; slopes.
Louisburg: LnE, LDF	Fair: except where shallow to rock.	Depth to soft rock is 20 to 34 inches.	Depth to soft rock is 20 to 34 inches; moderate strength and stability.	Rapid permeability; slopes.
*Madison: MgB2, MgC2, MgD2, MDC3, MDE3, MsD3, MsE2. For the Pacolet part of MsD3 and MsE2 units, see the Pacolet series.	Fair: fair traffic-supporting capacity.	Slopes erode easily in deep cuts and unprotected embankments.	Moderate strength and stability; depth to soft rock is 22 inches in places.	Soil features favorable
*Musella: MID2, MIE3, MJF. For the Pacolet part of MJF unit, see the Pacolet series.	Poor: depth to rock is 20 inches to more than 50 inches; stony in places.	Depth to rock is 20 inches to more than 50 inches; slopes; stony in places.	Depth to rock is 20 inches to more than 50 inches; moderate strength and stability.	Slopes; high seepage potential in some areas.
Pacolet: PfD, PgC3	Fair: fair traffic-supporting capacity	Slopes erode easily in deep cuts and unprotected embankments; depth to rock is 34 inches in places.	Moderate strength and stability; depth to rock is 34 inches in places.	Soil features favorable
Roanoke: Ron	Poor: moderate to high shrink-swell potential; seasonal high water table.	Seasonal high water table; subject to flooding; moderate to high shrink-swell potential.	Moderate to high shrink-swell potential; moderate to poor stability.	Soil features favorable
Toccoa: Tod, Toc	Good	Seasonal high water table. Toc unit subject to flooding in most areas.	Moderate strength and stability.	Moderately rapid permeability; high seepage potential.
Wilkes: WjF	Poor: moderate to high shrink-swell potential; depth to soft rock is 15 to 20 inches.	Depth to soft rock is 15 to 20 inches; moderate to high shrink-swell potential.	Depth to soft rock is 15 to 20 inches; moderate to high shrink-swell potential; stony; variable strength and stability.	Fractured rock; high seepage potential in places; steep slopes in most places.
Wilkes, clayey subsoil variant: WvD.	Poor: moderate to high shrink-swell potential; depth to soft rock is 10 to 20 inches.	Depth to soft rock is 10 to 20 inches; moderate to high shrink-swell potential.	Depth to soft rock is 10 to 20 inches; moderate to high shrink-swell potential; variable strength and stability.	Fractured rock; high seepage potential in most places.

of the soils—Continued

Soil features affecting—Continued				
Farm ponds—Continued	Agricultural drainage	Irrigation	Terraces and diversions	Waterways
Embankments				
Moderate strength and stability; depth to rock is 15 inches to more than 36 inches.	Somewhat excessively drained.	Low available water capacity; slopes; depth to rock 15 inches to more than 36 inches.	Slopes	Slopes; rock fragments throughout subsoil; highly erodible.
Moderate seepage likely; moderate strength and stability; depth to rock is 20 to 34 inches.	Well drained to excessively drained.	Slopes; depth to rock is 20 to 34 inches; stony in places.	Slopes	Slopes; depth to rock is 20 to 34 inches; stony in places.
Moderate strength and stability; low to moderate shrink-swell potential.	Well drained	Slow infiltration rate in severely eroded areas; soil features favorable on 2 to 6 percent slopes.	Soil features are favorable on slopes of 10 percent or less.	Moderately erodible.
Moderate strength and stability; depth to rock is 20 inches to more than 50 inches; stony in places.	Well drained	Slopes; stony in places; depth to rock is 20 inches to more than 50 inches.	Slopes greater than 10 percent; not suitable for terraces; depth to rock is 20 inches to more than 50 inches.	Depth to rock is 20 inches to more than 50 inches; steep slopes and stony in places.
Moderate strength and stability; depth to rock is 34 inches in places.	Well drained	Slow infiltration rate in severely eroded areas; slopes.	Soil features are favorable on slopes of 10 percent or less.	Moderately erodible.
Moderate to high shrink-swell potential.	Subject to stream overflow; slow permeability; seasonal high water table; wet areas lower than available outlets.	Not feasible because of wetness.	Nearly level slopes	Seasonal high water table; poor drainage.
Moderate strength and stability; moderate seepage likely.	Seasonal high water table. Toc unit subject to stream overflow in most areas.	Moderately rapid permeability; seasonal high water table.	Nearly level slopes	Seasonal high water table.
Depth to soft rock is 15 to 20 inches; stony; moderate to high shrink-swell potential; variable strength and stability.	Well drained	Moderately slow permeability; depth to rock is 15 to 20 inches; stony; slopes.	Depth to soft rock is 15 to 20 inches; stony; slopes.	Depth to soft rock is 15 to 20 inches; stony; slopes; difficult to establish vegetation.
Depth to soft rock is 10 to 20 inches; moderate to high shrink-swell potential; variable strength and stability.	Well drained	Moderately slow permeability; depth to rock is 10 to 20 inches.	Depth to soft rock is 10 to 20 inches; slopes.	Depth to soft rock is 10 to 20 inches.

A rating of *good*, *fair*, or *poor* is given to show suitability of soil material as a source for road fill. The suitability of soil as 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, consideration was given to the presence of stones and boulders, depth to bedrock, shrink-swell potential, and moisture content.

Soils are not rated as a source of sand and gravel in table 5. Sources of sand within the county are few. Pumping stations along the Chattahoochee River provide sand that is somewhat poorly graded and is not entirely suitable for industrial use. Crushed stone and rock are produced by one stone quarry in the county.

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

Features of the soils considered in constructing dikes and levees are depth to rock, permeability, water table, stones, stability, and shrink-swell potential.

Some soils have features that make them unfavorable for use as reservoir areas of farm ponds or as sources of embankment material. The unfavorable features should be carefully evaluated in selecting sites for reservoirs and embankments. Greater than normal water loss can be expected in reservoirs 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. Lack of suitable outlets is the major limiting factor affecting agricultural drainage in the county.

Soil features that adversely affect irrigation are low available water capacity and slow infiltration and permeability. Irrigation is not widely practiced within the county, however, because few cash crops are grown.

Limitations for constructing terraces, diversions, and waterways are stones, shallowness to bedrock, steep slopes, high water table, and erodibility. Other difficulties are caused by slow infiltration and permeability and poor workability of certain plastic soils when wet. Where slopes are 10 percent or more, terraces are difficult to construct and maintain. Also, establishing waterways and cover vegetation on erodible soils is difficult.

Use of the Soils for Woodland [3]

Virgin forest originally covered about 98 percent of the total land area in Cobb County. Presently, about 63 percent of the total land area is in forest. Federally owned land in Kennesaw Mountain National Battlefield Park and Dobbins Air Force Base makes up 3,000 acres of the 139,507 acres now in woodland.

The principal commercial trees on bottom lands and on slopes of less than 15 percent on uplands are loblolly pine, shortleaf pine, yellow-poplar, sycamore, sweetgum, ash, water oak, red oak, and white oak. On ridgetops and on slopes of more than 15 percent on uplands, loblolly pine, shortleaf pine, white oak, red oak, and hickory are dominant.

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect the growth and management of trees. In table 6, the soils of Cobb County have been placed in woodland suitability groups according to their ability to produce wood crops. Each group consists of soils that have about the same suitability for trees, require about the same management, and have about the same potential productivity. Groupings are based on pertinent research, measurements by foresters and soil scientists, and the experiences of managers of forest land. Much of the site data given in this subsection was obtained from a cooperative study conducted by the U.S. Forest Service and the Soil Conservation Service.

Woodland suitability groups

A woodland suitability group consists of soils that have comparable potential productivity and comparable limitations, that produce similar wood crops, and that require similar management or treatment.

In the description of each woodland suitability group in table 6, the productivity and limitations of the soils in each group are given. The terms describing the soil limitations are explained in the following paragraphs. The assigned ratings, slight, moderate, and severe, are also explained.

Equipment limitation ratings refer to mechanical equipment that is normally used in woodland operations. Steepness of slope, wetness of the soil, roughness of the terrain, unfavorable soil texture, and obstacles such as rocks are the main limitations to the use of equipment. A rating of *slight* indicates that there are no particular problems in the use of equipment. A rating of *moderate* indicates that not all types of equipment can be used, or that there are periods of less than 3 months when equipment cannot be used because the soils are unstable or too wet. A rating of *severe* indicates that use of some kinds of equipment is restricted, and special equipment may be needed because the soil is wet more than 3 months or because soil texture limits the use of equipment.

Hazard of erosion is rated *slight*, *moderate*, or *severe*. This is the hazard of erosion in an area that is managed according to currently acceptable standards. A rating of *slight* indicates that no special techniques of management are required. A rating of *moderate* means that some provision in management must be made to prevent accelerated erosion. Construction and maintenance of roads, skid trails, fire lanes, and landings require use of special techniques. A rating of *severe* indicates that special techniques in management are needed and that special attention to construction and maintenance of roads, skid trails, fire lanes, and landings is necessary to minimize accelerated erosion.

Seedling mortality refers to the expected loss of natural or planted tree seedlings after adequate natural seeding or suitable planting. The rating is *slight* where seedling survival ordinarily exceeds 75 percent, where natural regeneration is adequate, or where an original planting is expected to produce a satisfactory stand. The rating is *moderate* where expected seedling survival is 50 to 75

[3] W. P. THOMPSON, forester, Soil Conservation Service, helped prepare this subsection.

TABLE 6.—*Suitability of soils for woodland use and management*

Woodland suitability group	Potential productivity for important wood crops		Species suitable for planting
	Species	Site class	
1o7 Alluvial soils that have good drainage and a sandy to loamy surface layer, and a loamy underlying layer; they have very high potential productivity, and no serious management problems; suitable for broadleaf and needleleaf trees: Toc, Tod.	Loblolly pine Yellow-poplar Sweetgum Red oak	90 110 100 90	Loblolly pine, yellow-poplar, sweetgum, cherrybark oak, sycamore, and black walnut.
2w8 Seasonally wet soils, on bottom lands and terraces, that have mainly a loamy surface layer and subsoil or underlying layer; they have high productivity, moderate equipment limitations, and slight to moderate seedling mortality; suitable for broadleaf and needleleaf trees: AL, AlB, Cah, Cw.	Loblolly pine Sweetgum Yellow-poplar Red oak Water oak	90 90 100 80 90	Loblolly pine, yellow-poplar, sweetgum, cherrybark oak, and sycamore.
2w9 Excessively wet soils, on bottom lands and terraces, that have a loamy surface layer, and loamy to clayey subsoil; they have high potential productivity, severe equipment limitations, and moderate to severe seedling mortality; suitable for water-tolerant broadleaf and needleleaf trees: Csw, Ron.	Loblolly pine Red maple Sweetgum Water oak Green ash	90 (1) 90 90 (1)	Loblolly pine, sweetgum, sycamore, and green ash.
3o7 Soils that have good drainage, chiefly a loamy surface layer and loamy to clayey subsoil, and soils that have been altered for community development; they have moderately high potential productivity, and no serious management problems; suitable for broadleaf and needleleaf trees: AmB, AmC, AmD, CYB2, CYC2, DiB, GgB2, GgC2, GgD2, HSB, MgB2, MgC2, MgD2, PfD, UeC, UfC, UgC, UhC.	Loblolly pine Yellow-poplar Red oak White oak	80 90 70–80 70–80	Loblolly pine, yellow-poplar, and red oak.
3r8 Soils that have good drainage, a loamy surface layer and loamy to clayey subsoil, and soils that have been altered for community development; they have moderately high potential productivity, and moderate equipment limitations and erosion hazard; suitable for broadleaf and needleleaf trees: LnE, MsE2, UiE.	Loblolly pine Yellow-poplar Red oak	80 90 80	Loblolly pine, yellow-poplar, and red oak.
3w8 Seasonally wet soils that have a loamy surface layer and loamy to clayey subsoil; they have moderately high potential productivity, moderate equipment limitations, and slight to moderate seedling mortality; suitable for broadleaf and needleleaf trees: HYC.	Loblolly pine Yellow-poplar Red oak Sweetgum White oak	80 90 70 80 70	Loblolly pine, yellow-poplar, sycamore, and sweetgum.
3x3 Stony soils that have good drainage and a loamy surface layer, and loamy to clayey subsoil; they have a moderately high potential productivity, moderate to severe equipment limitations, and a slight to moderate erosion hazard; best suited for needleleaf trees: LDF, MJF.	Loblolly pine Shortleaf pine	80 70	Loblolly pine.
4o1 Shallow soils that have good drainage and a loamy surface layer, and clayey subsoil underlain by broken, soft rock; they have moderate potential productivity, and no serious management problems; best suited for needleleaf trees: WvD.	Loblolly pine Shortleaf pine Red oak White oak	70 60 70 70	Loblolly pine.
4x2 Shallow stony soils that have good drainage and a loamy surface layer, and loamy to clayey subsoil underlain by broken, soft rock; they have moderate potential productivity, moderate equipment limitations, and slight to moderate seedling mortality; best suited for needleleaf trees: WjF.	Loblolly pine Shortleaf pine Red oak White oak	70 60 70 70	Loblolly pine and Virginia pine.
4c2e Chiefly, severely eroded soils that have good drainage and a loamy surface layer, and loamy to clayey subsoil; they have moderate potential productivity, moderate erosion hazard and equipment limitations, and slight to moderate seedling mortality; best suited for needleleaf trees: AnB3, AnC3, GeB3, GeC3, GeD3, HTC2, HTD2, MDC3, MsD3, PgC3.	Loblolly pine Shortleaf pine	70 60	Loblolly pine.

See footnote at end of table.

TABLE 6.—*Suitability of soils for woodland use and management*—Continued

Woodland suitability group	Potential productivity for important wood crops		Species suitable for planting
	Species	Site class	
4c3e Severely eroded to eroded soils that have good drainage and a loamy surface layer, and loamy to clayey subsoil; they have moderate potential productivity, severe erosion hazard and equipment limitations, and moderate seedling mortality; best suited to needleleaf trees: GeE2, MDE3.	Loblolly pine Shortleaf pine	70 60	Loblolly pine.
4f3 Gravelly soils that have good drainage and a loamy to clayey subsoil underlain by weathered rock; they have moderate productivity, moderate to severe erosion hazard and equipment limitations, and moderate to severe seedling mortality; best suited to needleleaf trees: MID2, MIE3.	Loblolly pine Shortleaf pine	70 60	Loblolly pine and Virginia pine.
4r2 Shallow soils that have good drainage and a loamy surface layer, and loamy subsoil underlain by weathered soft rock; these soils have moderate potential productivity, and moderate erosion hazard and equipment limitations; best suited for needleleaf trees: LkE, LNF.	Loblolly pine Shortleaf pine Red oak White oak	70 60 70 70	Loblolly pine and Virginia pine.

[1] Site class data not available.

percent. In this case, natural regeneration cannot always be relied upon for adequate and immediate restocking, and planting may be a desirable alternative. The rating is *severe* where seedling survival is less than 50 percent, and adequate restocking is not expected without additional management.

The symbol used to designate each group consists of three elements. The first element in the symbol indicates the relative potential productivity of the soils in the group for growing wood crops. It expresses the site quality based on the site index of one or more important forest types or species. The numeral 1 indicates very high potential productivity; the numeral 2 indicates high potential productivity; the numeral 3 indicates moderately high potential productivity; and the numeral 4 indicates moderate potential productivity.

The second element in the symbol indicates the soil property or physiographic characteristic that is the primary reason for the hazard, limitation, or restriction of the soils for woodland use or management.

x—Stoniness or rockiness.
w—Excessive wetness.
c—Kind or amount of clay in the upper part of the soil.
f—Coarse fragments in profile.
r—Relief or steepness of slopes.
o—No significant soil-related problem.

The third element in the symbol indicates the degree of hazard or limitation and the general suitability of the soils for certain kinds of trees. The numeral 1 indicates soils that have no limitations or only slight limitations and that are best suited to needleleaf trees. The numeral 2 indicates soils that have one or more moderate limitations and are best suited to needleleaf trees. The numeral 3 indicates soils that have one or more severe limitations and are best suited to needleleaf trees. Numerals 4, 5, and 6 are not used in this county. The numeral 7 indicates soils that have no limitations or only slight limitations and are well suited to either needleleaf or broadleaf trees. The numeral 8 indicates soils that have one or more moderate limitations and are well suited to needleleaf or broadleaf trees. The numeral 9 indicates soils that have one or more severe limitations and are suited to either needleleaf or broadleaf trees.

The fourth element, *e*, in the symbol indicates severely eroded soils in separate subgroups.

Potenial productivity is expressed as a site class for a given tree species. This is the average height in feet of dominant or codominant trees at age 35 for sycamore and at age 50 for all other species.

Species suitability is shown by listing the principal commercial tree species that should be favored in existing stands and by denoting the tree species that are suitable for planting. The selection of preferred species is influenced by their growth rate and by the quality, value, and general marketability of the products obtained from each species.

The woodland suitability group to which each mapping unit is assigned can be determined by referring to the "Guide to Mapping Units" or to the description of the particular mapping unit.

Use of the Soils for Cultivated Crops and Pasture [4]

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

[4] JOHN B. HUNGERFORD, conservation agronomist, Soil Conservation Service, helped prepare this subsection.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groupings are made according to the limitations of the soils when used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major, and generally expensive, landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible, but unlikely, major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops requiring special management.

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

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

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

Class I soils have few limitations that restrict their use (none in Cobb County).

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

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

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

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, range, woodland, or wildlife (none in Cobb County).

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.

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

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

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

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

Capability Units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIIe–2 or IIIe–4. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

Management by capability units

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

CAPABILITY UNIT IIe–1

This unit consists of moderately deep to deep, well-drained soils on uplands. These are soils of the Cecil, Gwinnett, Hiwassee, and Madison series. Most of these soils are eroded. Slopes range from 2 to 6 percent. The uppermost 5 to 8 inches of the soil is friable loam or sandy loam. The subsoil is friable sandy clay loam, clay loam, or firm clay.

The soils in this unit are strongly acid to very strongly acid throughout. The supply of plant nutrients and the organic-matter content are low. Tilth is good in most places, and plant roots generally penetrate effectively to a depth of 36 inches or more. Permeability is moderate, and the available water capacity is medium.

About 25 percent of the acreage of these soils is cultivated or is used as pasture. These soils are suited to all crops grown locally, including grasses and legumes. Crops are easy to establish and maintain, and they respond well if fertilizer is applied. Clean-cultivated crops should not be grown continuously, because there is a slight to moderate hazard of erosion. These soils are suited to sprinkler irrigation.

Where the soils in this unit are cultivated, they should be managed in such a way that soil losses from erosion are held within allowable limits. A suitable cropping system is needed. The choice of this system is governed by the steepness and length of slopes and the practices used for control of erosion. An example of a suitable cropping system on a terraced slope of 2.5 percent is 1 year of cotton, corn, or some other row crop followed by 1 year of small grain.

CAPABILITY UNIT IIe–2

This unit consists of deep, well drained to moderately well drained soils on uplands and stream terraces. These soils are of the Altavista, Appling, and Durham series. They are slightly eroded. Slopes range from 0 to 6 percent. The surface layer is friable sandy loam, and the subsoil is sandy clay loam to clay.

The soils in this unit are strongly acid to very strongly acid throughout. Natural fertility and organic-matter content are low. Tilth is good, and plant roots penetrate effectively to a depth of 24 inches or more. Permeability is moderate, and available water capacity is medium. These soils warm up slowly in spring.

About 25 percent of the acreage of these soils is cultivated or is used as pasture. The rest is wooded or idle or is used as building sites for residences or industries.

These soils are well suited to most of the crops grown locally, including grasses and legumes, but they are less well suited to wheat, alfalfa, pimento peppers, barley, and peaches. Crops are easy to establish and to maintain, and they respond well if fertilizer is applied. Clean-cultivated crops should not be grown continuously, because there is a slight to moderate hazard of erosion. These soils are well suited to sprinkler irrigation.

Where the soils in this unit are cultivated, erosion can be controlled by using a combination of erosion-control practices and a cropping system that includes close-growing annuals or perennials or crops that produce a large amount of residue. An example of a suitable cropping system on a slope of 3 percent is cotton or another row crop and small grain planted on the contour in parallel, alternate strips and rotated each year. For good crop growth, an adequate amount of fertilizer and lime must be applied and all plant residue should be returned to the soil.

CAPABILITY UNIT IIw–2

This unit consists of deep, well-drained soils on first bottoms and in depressions, near heads of drainageways, and at the base of slopes on uplands. These soils are of the Toccoa series. Slopes range from 0 to about 4 percent. The surface layer varies greatly in texture, but it commonly is sandy loam, loamy sand, or loam about 4 to 12 inches thick. Below this are stratified layers of sandy loam, loamy sand, sand, silt loam, loam, and silty clay loam.

These soils are slightly acid to medium acid throughout. They are low in natural fertility and moderate to low in organic-matter content. Tilth is good, and plant roots can penetrate effectively to a depth of 24 inches or more. Permeability is moderately rapid, and the available water capacity is medium.

About 25 percent of the acreage of these soils is cultivated or is used for pasture. Crops on these soils respond well if large amounts of suitable fertilizer are applied.

The soils in this unit generally are not subject to erosion, but they are subject to occasional scouring by floodwater and slow runoff of surface water. A cropping system that helps to maintain organic-matter content is needed. Corn can be grown continuously if adequate amounts of fertilizer and lime are applied, and if all plant residue is returned to the soil.

Overflow from streams once or twice annually is the main hazard where the soils on first bottoms are cultivated. Soils along the Chattahoochee River are flooded once in 5 to 20 years. Slow runoff of surface water may damage crops on the soils in depressions, near heads of drainageways, and at the base of slopes on uplands.

CAPABILITY UNIT IIIe–1

This unit consists of deep to moderately deep, well-drained soils on uplands. Most of the soils are eroded, some are severely eroded, and others have been greatly altered for urban uses. In this unit are soils of the Cecil, Gwinnett, and Madison series and areas of Urban land. Slopes are 2 to 10 percent. In the less eroded areas, the uppermost 4 to 8 inches of these soils is friable sandy loam or loam. In the severely eroded areas, the surface layer is mainly clay loam or sandy clay loam 4 to 5 inches thick. The subsoil generally ranges from clay loam and sandy clay loam to clay in texture and from about 25 to more than 45 inches in thickness. It is predominantly firm to friable.

These soils are low in natural fertility, contain little organic matter, and are strongly acid to very strongly acid throughout. Plant roots can penetrate effectively to a depth of 26 inches or more. Permeability is moderate. The available water capacity is medium. The surface layer generally is in good tilth. Gwinnett clay loam, 2 to 6 percent slopes, severely eroded, has poor tilth because the surface layer consists mainly of material from the subsoil. This soil is difficult to till because of gullies, and it can be cultivated without clodding only within a narrow range of moisture content.

Less than a fourth of the acreage of these soils is in crops and pasture. The rest is wooded or idle or is used for nonfarm purposes.

The soils in this unit are suited to scuppernongs, apples, truck crops, and similar specialty crops, and to all other crops commonly grown in the county. Crops respond well to fertilizer.

Because of the runoff, erosion is the chief hazard where these soils are cultivated or left bare. Contour tillage and terracing are practices that help to control erosion. The cropping system should include close-growing crops, and all plant residue should be returned to the soil. The steepness and length of slopes govern the choice of the erosion-control practices and cropping systems. An example of a suitable cropping system on a terraced slope of 5 percent is 1 year of cotton, pimento peppers, or some other row crop followed by 2 years of small grain and lespedeza.

CAPABILITY UNIT IIIe–2

This capability unit consists of well-drained soils that are slightly eroded or severely eroded. These soils are of the Appling series and the Urban land miscellaneous land type. Slopes range from 2 to 10 percent. The surface layer ranges from sandy loam to sandy clay loam about 3 to 6 inches thick. The subsoil is sandy clay loam to clay and is mottled.

The soils in this unit are very strongly acid throughout. They are low in natural fertility and organic-matter content. Plant roots can penetrate effectively to a depth of more than 36 inches. Permeability is moderate, and the available water capacity is medium. The surface layer is generally in good tilth. Appling sandy clay loam, 2 to 6 percent slopes, severely eroded, has poor tilth because the surface layer consists mostly of material from the subsoil. Tillage is difficult because of gullies, and this Appling soil can be cultivated only within a narrow range of mois-

ture content without clodding. These soils warm up slowly in spring.

About 20 percent of the acreage is used for crops and pasture. The rest is wooded or used as building sites for residences or industries.

If fertility and organic-matter content are maintained, these soils are suited to truck crops, scuppernongs, apples, and other specialty crops, and to most other crops grown locally.

Erosion is a hazard in cultivated areas, in urban areas, and in areas that are left bare. Practices that help to control erosion are needed, including a complete system for the disposal of water. The steepness and length of slopes govern the choice of the erosion-control practices and the cropping system. An example of a suitable cropping system on a slope of 8 percent that is 150 feet long is cotton or some other row crop and grass planted on the contour in parallel, alternate strips and rotated every 2 years.

CAPABILITY UNIT IIIe–4

Helena sandy loam, 2 to 10 percent slopes, is the only soil in this unit. This is a moderately well drained soil on uplands. The surface layer is sandy loam 4 to 7 inches thick, and the subsoil ranges from sandy clay loam to clay. Depth to the seasonal high water table is about 27 inches.

This soil is strongly acid to very strongly acid throughout. Natural fertility and organic-matter content are low. Permeability is slow; available water capacity is medium. Tilth is generally good in the surface layer but poor in the subsoil.

About 75 percent of the acreage is wooded, and the rest is pastured, cultivated, or idle.

This soil is suited to most of the crops grown locally, and crops respond well to fertilizer. It is especially well suited to permanent pasture and to supplemental summer pasture, but it generally is not suited to alfalfa, wheat, or barley.

Where this soil is cultivated, erosion is a hazard and must be controlled by contour planting and cultivation, terracing, or use of a cropping system that includes close-growing crops. The steepness and length of slopes govern the choice of the cropping system and erosion-control practices. An example of a suitable cropping system on a slope of 8 percent that is 150 feet long is corn or some other row crop and grass planted on the contour in parallel, alternate strips and rotated every 2 years.

CAPABILITY UNIT IIIw–2

This unit consists of deep, somewhat poorly drained soils on flood plains. These soils are of the Cartecay series and Cartecay, silty variant. Slopes are 0 to 2 percent. The surface layer ranges from silt loam to loamy sand 4 to 12 inches thick. The underlying layers are predominantly mottled stratified sandy loams or silt loam to loamy sand 4 to 12 inches thick, but in some places they are silty clay loam or sandy clay loam.

The soils in this unit are medium acid to slightly acid throughout. Natural fertility is low, and organic-matter content is moderate. Except in wet spots, tilth is good. Permeability is moderately rapid; available water capacity is medium to high.

About 75 percent of the acreage of these soils is wooded or idle. The soils are suited to corn, grain sorghum, tall fescue, bermudagrass, annual lespedeza, and white clover. They generally are not suited to cotton, wheat, alfalfa, sericea lespedeza, kudzu, or crimson clover. These soils generally are suited to sprinkler irrigation, and nearby streams usually are a good source of water.

Row crops can be grown continuously on these soils if flooding is controlled and if all crop residue is turned under. These practices also help to maintain the organic-matter content and good tilth. Crops on these soils respond well to a complete fertilizer and to lime.

Overflow from streams once or twice annually for a period of a few days is the main hazard where these soils are cultivated. Along the Chattahoochee River, overflow occurs only once in 5 to 20 years. A drainage system that removes excess surface water and improves internal drainage is needed.

CAPABILITY UNIT IIIw–3

Altavista silt loam, occasionally flooded, is the only soil in this unit. It is a deep, moderately well drained soil on low stream terraces. Slopes are 0 to 2 percent. The surface layer generally is silt loam 10 to 15 inches thick. The subsoil is mottled sandy clay loam to clay loam.

This soil is very strongly acid to strongly acid throughout. Natural fertility and organic-matter content are low. Tilth is good. Plant roots can penetrate effectively to a depth of about 20 inches. Permeability is moderate; available water capacity is high.

About 70 percent of the acreage of this soil is wooded. This soil is suited to tall fescue and white clover and is moderately well suited to corn, grain sorghum, bermudagrass, soybeans, and annual lespedeza or kudzu. It is not suited to cotton, and some other clean-tilled crops may fail in some years because of wetness. Crops on this soil respond moderately well to fertilizer. Planting corn or some other row crop each year and returning all residue to the soil is an example of a suitable cropping system.

In areas used intensively for row crops, turning under cover crops and including a suitable perennial in the cropping system help maintain the supply of organic matter and keep the soil in good tilth. If annual crops are grown, all residue should be kept on the surface between cropping seasons. Most crops respond favorably to regular applications of lime and a complete fertilizer. Legumes, however, need nitrogen only at the time of planting.

Annual flooding and a high water table are the chief limitations. A drainage system is needed to carry off excess surface water and improve internal drainage.

CAPABILITY UNIT IVe–1

This unit consists of moderately deep to deep, well-drained, slightly eroded to severely eroded soils on uplands. Slopes ranges from 6 to 15 percent. These soils are of the Appling, Gwinnett, Hiwassee, Madison, and Pacolet series. In the slightly eroded to eroded areas, the uppermost 3 to 9 inches of these soils is friable sandy loam, clay loam, or loam. In the more eroded areas, the surface layer is chiefly clay loam and sandy clay loam material from the subsoil. In most places the subsoil is sandy clay loam, clay loam, or clay.

These soils are strongly acid to very strongly acid throughout. Natural fertility and organic-matter content are low. Tilth is good to poor. Roots can penetrate effectively to a depth of 24 inches or more. Permeability is moderate; available water capacity is medium.

About 20 percent of the acreage of these soils is cultivated or is used for pasture. The rest is wooded or idle or is used as building sites for residences or industries.

These soils generally are suited to most of the crops grown locally but are better suited to grasses and legumes than to row crops. Row crops can be grown occasionally in rotation with perennial crops. The most eroded soils are difficult to till and can be cultivated without clodding or puddling only within a narrow range of moisture content.

Where these soils are cultivated, erosion is the chief hazard. Contour tillage, terracing, grassed waterways, and stripcropping are practices that help to control erosion. In addition, a close-growing crop should be included in the cropping system. Lime and fertilizer are needed for favorable yields and should be applied regularly. An example of a suitable cropping system on a slope of 8 percent is 3 years of grass followed by 1 year of corn planted on the contour.

CAPABILITY UNIT IVw–1

Chewacla soils, wet variants, is the only mapping unit in this unit. These are deep, poorly drained soils on flood plains. Slopes range from 0 to 2 percent. The surface layer is dominantly silt loam but ranges from fine sandy loam, sandy loam, and sandy clay loam to silty clay loam about 12 inches thick. It generally overlies a mottled silty clay loam, sandy clay loam, or silt loam subsoil.

The soils in this unit are strongly acid to medium acid throughout. Natural fertility is low, and organic-matter content is medium. Tilth is generally good, but it is poor in the wetter areas. The water table generally is near the surface, and plant roots can penetrate effectively to a depth of only about 8 to 12 inches unless the soils are drained. Permeability is moderate, and the available water capacity is high.

Most of the acreage of these soils is wooded. The soils are suited to annual lespedeza, white clover, tall fescue, dallisgrass, and vetch, but unless drained, they are not suited to other crops grown locally. Regular applications of lime and a complete fertilizer are needed for good crop growth.

Flooding is the chief hazard on these soils. A drainage system is needed to remove the excess surface water and to improve internal drainage. An example of a suitable cropping system for areas where these soils are adequately drained is a row crop for 2 years followed by 2 years of grass and clover.

CAPABILITY UNIT IVw–2

Only Roanoke silt loam is in this unit. It is a deep, poorly drained soil on low stream terraces. Slopes range from 0 to 2 percent. The surface layer is silt loam about 7 inches thick, and the subsoil is mainly silty clay and clay. Depth to the seasonal high water table is about 6 inches. Most of the acreage is subject to flooding.

This soil is strongly acid to very strongly acid throughout. Natural fertility is low, and organic-matter content is low to medium. Tilth is generally good except in wet areas. The available water capacity is medium, and permeability is slow. The depth to which plant roots penetrate depends mainly on the depth to the water table.

About 75 percent of the acreage of this soil is wooded. Much of the acreage, unless drained, is not suitable for cultivated crops. This soil is best suited to tall fescue, dallisgrass, annual lespedeza, white clover, and other forage plants. Lime and a complete fertilizer are needed and should be applied regularly.

Flooding and a high water table are the chief hazards on this soil. A drainage system is needed to remove the excess surface water and to improve internal drainage.

Suitable crops can be grown continuously in areas where this soil is adequately drained and good tilth is maintained. A planned sequence of crops aids in the control of weeds, insects, and disease and makes the use of fertilizer more efficient.

CAPABILITY UNIT VIe–2

This unit consists of moderately deep to deep, well-drained soils that are slightly eroded to severely eroded. These soils are of the Madison, Gwinnett, and Pacolet series, and Urban land miscellaneous land type. The soils are on uplands; slopes range from 10 to 25 percent. The uppermost 2 to 7 inches of these soils is friable sandy loam, clay loam, or sandy clay loam. The subsoil is predominantly clay.

These soils are very strongly acid throughout. Natural fertility and organic-matter content are low. Tilth generally is good in the less eroded areas and poor in the more eroded areas. Plant roots can penetrate effectively to a depth of 22 inches or more. Permeability is moderate, and the available water capacity is medium.

Most of the acreage of these soils has been cultivated but about 80 percent is now wooded or is idle. The rest is used for pasture, row crops, or nonfarm purposes. Steepness of the soils and the severe hazard of erosion make these soils unsuited to cultivation. All of the grasses and legumes grown locally, except alfalfa, can be grown on these soils, but establishing a stand is difficult. Pasture plants or hay crops can be established more easily if tillage and planting are done on the contour. Response of suited plants is generally favorable if lime and fertilizer are applied. If replanting must be done, seeding pasture plants and hay crops in alternate strips helps to control erosion.

Grazing must be controlled in pasture to maintain the plant cover.

CAPABILITY UNIT VIe–3

Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes, is the only soil in this capability unit. It is a shallow, well-drained soil on uplands. The surface layer is sandy loam about 5 inches thick. The subsoil is clay about 13 inches thick.

This soil is strongly acid in the surface layer, medium acid in the subsoil, and slightly acid below. Natural fertility and organic-matter content are low. Tilth generally is good, and plant roots can penetrate effectively to a depth of 10 to 20 inches. Permeability is moderately slow. Available water capacity is low.

About 75 percent of the acreage of this soil is wooded. The rest is pastured, cultivated, or idle. The moderate to severe hazard of erosion, steepness of slopes, and shallowness to rock make this soil unsuited for row crops. This soil can be pastured but is better suited to pine trees than to other uses. Placing logging roads and firebreaks on the contour and doing all other woodland operations on the contour help control erosion.

CAPABILITY UNIT VIIe-1

Madison clay loam, 15 to 25 percent slopes, severely eroded, is the only soil in this capability unit. It is a well-drained and moderately deep to deep soil on uplands. The uppermost 4 to 5 inches of this soil is clay loam. The subsoil is mainly clay loam to clay.

This soil is very strongly acid throughout. Natural fertility and organic-matter content are low. Tilth is poor. Plant roots can penetrate effectively to a depth of about 25 inches or more. Permeability is moderate, and available water capacity is medium.

Most of the acreage of this soil has been cultivated, and about 80 percent is now wooded. The steepness of slopes and the severe hazard of erosion make this soil unsuited to cultivation. It is suited to shortleaf and loblolly pines. Placing logging roads and firebreaks on the contour and doing all other woodland operations on the contour help control erosion.

CAPABILITY UNIT VIIe-2

This unit consists of shallow to moderately deep soils that are slightly eroded to severely eroded and well drained to excessively drained. These soils are of the Louisburg, Louisa, Musella, Pacolet, and Wilkes series. They are on uplands. Slopes range from 6 to 60 percent. The uppermost 2 to 7 inches of these soils is loamy and in most places is stony or gravelly. The subsoil is loamy.

These soils are very strongly acid to slightly acid in the surface layer and very strongly acid to medium acid in the subsoil. Natural fertility and organic-matter content are low. Tilth is generally poor. Plant roots can penetrate effectively to a depth of about 12 inches to more than 36 inches. Permeability ranges from moderately slow to rapid.

The steep slopes, coarse fragments in the surface layer, and the severe hazard of erosion make these soils unsuitable for cultivation and generally unsuited to pasture or hay. They are suited to shortleaf and loblolly pines. Placing logging roads and firebreaks on the contour and doing all other woodland operations on the contour help control erosion.

Estimated yields

In table 7 are estimated average yields per acre that can be expected for the principal cultivated crops and pasture grasses commonly grown on the soils in the county. 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 in long-term experiments, and on estimates made by agronomists who are familiar with the crops and soils of the county. To obtain the high level of management needed for obtaining the yields listed in table 7, the farmer should (a) choose carefully plants to be grown and the cropping system to be used; (b) prepare a good seedbed; (c) plant or seed using a suitable method at the recommended rate and at the appropriate time; (d) control weeds and insect pests; (e) inoculate the seeds of legumes; (f) use high-quality seeds; (g) control excess water by drainage, waterways, contour farming, or stripcropping; and (h) apply fertilizer and lime as indicated by soil tests. Figures are not given in the table if yields are so low or management needs are so great that it is not practical to grow the crops on the soil. Mapping units that are not listed in table 7 are used primarily for nonfarm purposes or are not generally suited to crops or pasture.

The following paragraphs give, for specified crops, the rates of fertilization and seeding and other practices that are required to obtain the yields shown in table 7.

Corn.—Apply 100 to 120 pounds of nitrogen (N), 60 to 70 pounds of phosphoric acid (P_2O_5), and 60 to 70 pounds of potash (K_2O) per acre. Plant enough seed to produce 12,000 to 15,000 plants per acre. Turn under all crop residue or grow a winter cover crop and turn it under. Apply lime according to the need indicated by soil tests.

Oats.—Apply 20 to 30 pounds of nitrogen (N), 40 to 50 pounds of phosphoric acid (P_2O_5), and 60 to 80 pounds of potash (K_2O) per acre at time of planting. In addition, apply 40 to 60 pounds of nitrogen per acre late in winter. Adequate control of plant diseases must be provided. The planting rate is 2 bushels in the drill and 3 bushels broadcast per acre.

Grain sorghum.—Apply 20 to 30 pounds of nitrogen (N), 40 to 60 pounds of phosphoric acid (P_2O_5), and 60 to 80 pounds of potash (K_2O) per acre at the time of planting. In addition, sidedress with nitrogen at the rate of 40 to 50 pounds per acre. Adequate control of plant diseases must be provided. The planting rate is 4 to 6 pounds per acre.

Sericea lespedeza.—Apply 40 to 60 pounds of phosphoric acid (P_2O_5), 60 to 90 pounds of potash (K_2O), 8 to 20 pounds of nitrogen (N), and 1 ton of lime per acre at the time of seeding. Annually thereafter, apply 40 to 60 pounds of phosphoric acid (P_2O_5) and 60 to 90 pounds of potash (K_2O) per acre. Also required is 1 ton of lime per acre at least 1 year in 3, or as indicated by the results of soil tests. The planting rate is 30 to 35 pounds per acre.

Pasture.—On soils for which table 7 lists an estimated acre yield of 9 or 10 animal-unit-months or more for coastal bermudagrass, apply 125 to 175 pounds of nitrogen (N), 50 to 70 pounds of phosphoric acid (P_2O_5), and 70 to 100 pounds of potash (K_2O) per acre. The planting rate is 10,000 to 14,000 sprigs per acre. Lime is applied according to the need indicated by soil tests. On soils for which table 7 lists an estimated acre yield of 6 animal-unit-months or more for tall fescue and white clover, apply 80 to 100 pounds of nitrogen (N), 40 to 60 pounds of phosphoric acid (P_2O_5), and 60 to 80 pounds of potash (K_2O) per acre. One ton of lime per acre is also required every 3 years, or according to the need indicated by soil tests.

Use of the Soils for Wildlife [5]

Successful management of areas for wildlife habitat requires that food, cover, and water be available in a suitable combination. The lack of any one of these necessities in an area may severely limit the numbers of wildlife or may account for the absence of particular species of wildlife. Information about soils is useful for establishing or improving suitable habitat. Most wildlife habitat can be improved by planting suitable vegetation and by managing existing vegetation to bring about natural establishment and increase the growth of desired plants. Water areas can be created, or natural ones can be improved.

The suitability of the soils in the survey area for elements of wildlife habitat and kinds of wildlife is rated in table 8. Elevation, aspect, and other features of the land-

[5] PAUL D. SCHUMACHER, biologist, Soil Conservation Service, helped prepare this section.

TABLE 7.—*Estimated average acre yields of principal crops*

[Yields listed are average yields expected under a high level of management, without irrigation. Absence of yield figure indicates that the crop is not suited to the particular soil or generally is not grown on it. Soils and land types not suited to crops are not listed in the table]

Soil	Corn [1]	Oats	Grain sorghum	Hay			Pasture		
				Sericea lespedeza	Coastal bermudagrass	Tall fescue	Tall fescue and white clover	Coastal bermudagrass	Sericea lespedeza
	Bu.	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Animal-unit-months* [2]	*Animal-unit-months* [2]	*Animal-unit-months* [2]
Altavista sandy loam, 0 to 4 percent slopes	85	75	60	3.0	5.6	3.8	6.5	9.0	5.0
Altavista silt loam, occasionally flooded	70	55	50		3.6	3.6	6.0	6.0	
Appling sandy loam, 2 to 6 percent slopes	85	80	55	3.0	5.6	3.8	6.0	9.0	5.0
Appling sandy loam, 6 to 10 percent slopes	75	70	50	2.8	5.0	3.2	5.5	8.5	4.5
Appling sandy loam, 10 to 15 percent slopes	60	58	45	2.6	4.6	3.0	5.0	7.5	4.0
Appling sandy clay loam, 2 to 6 percent slopes, severely eroded	50	55	40	2.4	4.4	2.8	4.5	7.0	3.5
Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	45	42	40	2.2	4.0	2.6	4.5	6.5	3.0
Cartecay silt loam, silty variant	85		65		4.0	4.0	7.0	6.6	
Cartecay soils	85		65		4.0	4.0	7.0	6.6	
Cecil sandy loam, 2 to 6 percent slopes, eroded	85	75	55	3.0	5.0	3.8	6.0	8.0	5.0
Cecil sandy loam, 6 to 10 percent slopes, eroded	70	65	50	2.6	4.5	3.2	5.5	7.5	4.5
Chewacla soils, wet variants	45					3.2	5.5		
Durham sandy loam, 2 to 6 percent slopes	85	80	55	3.2	5.6	3.8	6.5	9.0	5.0
Gwinnett loam, 2 to 6 percent slopes, eroded	85	75	65	3.1	5.5	3.8	6.0	8.5	3.0
Gwinnett loam, 6 to 10 percent slopes, eroded	80	70	60	2.9	5.0	3.4	6.0	8.0	2.5
Gwinnett loam, 10 to 15 percent slopes, eroded	65	60	48	2.6	4.5	3.0	5.5	7.5	2.5
Gwinnett clay loam, 2 to 6 percent slopes, severely eroded	55	58	42	2.6	4.4	2.8	5.5	7.0	3.0
Gwinnett clay loam, 6 to 10 percent slopes, severely eroded	45	48	35	2.2	4.0	2.6	5.0	6.5	3.0
Gwinnett clay loam, 10 to 15 percent slopes, severely eroded							4.0	5.5	2.5
Gwinnett clay loam, 15 to 25 percent slopes, eroded							4.5	6.0	2.0
Helena sandy loam, 2 to 10 percent slopes	50	50	40	2.2	3.6	3.0	5.0	6.0	4.5
Hiwassee loam, 2 to 6 percent slopes	85	80	60	3.2	5.2	3.6	6.0	8.5	5.5
Hiwassee clay loam, 6 to 10 percent slopes, eroded	70	60	45	2.6	4.0	2.8	5.0	6.5	4.5
Hiwassee clay loam, 10 to 15 percent slopes, eroded	60	50	35	2.2	3.5	2.6	4.5	6.0	3.5
Madison sandy loam, 2 to 6 percent slopes, eroded	70	70	50	2.6	4.6	3.4	5.5	7.5	4.5
Madison sandy loam, 6 to 10 percent slopes, eroded	60	60	40	2.4	4.0	3.2	5.0	7.0	4.0
Madison sandy loam, 10 to 15 percent slopes, eroded	55	55	40	2.2	3.6	3.0	4.5	6.0	4.0
Madison clay loam, 6 to 10 percent slopes, severely eroded	40	40	30	2.0	4.0	3.4	4.0	6.5	3.0
Madison and Pacolet soils, 10 to 15 percent slopes, severely eroded							3.5	5.8	2.5
Madison and Pacolet soils, 15 to 25 percent slopes, eroded							4.0	5.5	3.0
Pacolet sandy loam, 10 to 15 percent slopes	50	55	40	2.6	3.8	3.2	5.0	6.5	2.5
Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	40	40	30	2.0	3.5	2.4	4.0	5.5	2.0
Roanoke silt loam	45					3.2	5.0		
Toccoa sandy loam, local alluvium	85	75	55	3.0	5.5	4.0	6.6	9.0	5.0
Toccoa soils	90	75	65	3.0	4.5	4.2	7.0	7.5	5.0
Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes				1.8	3.5	2.5	4.5	5.5	3.0

[1] For yields of corn on some soils when irrigated, see Ga. Agr. Expt. Sta. Bul. N.S. 60 (*3*).

[2] Animal-unit-months is used to express the amount of forage or feed required to maintain 1 animal unit for a period of 30 days.

TABLE 8.—*Suitability of soils for elements of wildlife and kinds of wildlife*

[Ratings are 1—well suited; 2—suited; 3—poorly suited; 4—unsuited]

Soil and map symbols	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Kinds of wildlife		
								Openland	Woodland	Wetland
Altavista:										
AlB	2	1	1	1	3	3	2	1	1	3
AL	3	2	2	1	3	2	2	2	1	2
Appling:										
AmB	1	1	1	1	3	4	4	1	2	4
AmC	2	2	1	1	3	4	4	2	2	4
AmD	3	2	2	2	3	4	4	3	2	4
AnB3	3	2	3	3	2	4	4	3	3	4
AnC3	4	3	3	3	2	4	4	4	3	4
Cartecay: Cah	3	2	2	2	3	2	2	3	2	2
Cartecay, silty variant: Cw	3	2	2	2	3	2	2	3	2	2
Cecil:										
CYB2	1	1	1	2	2	4	4	1	2	4
CYC2	2	1	2	2	2	4	4	2	2	4
Chewacla, wet variants: Csw	4	3	4	2	3	1	1	4	2	1
Durham: DiB	1	1	1	1	3	4	4	1	2	4
Gwinnett:										
GgB2	1	1	1	2	2	4	4	1	2	4
GgC2	2	1	2	2	2	4	4	2	2	4
GgD2	3	2	3	3	2	4	4	3	3	4
GeB3	3	2	3	3	2	4	4	3	3	4
GeC3	4	3	3	3	2	4	4	4	3	4
GeD3	4	3	3	4	2	4	4	4	3	4
GeE2	4	3	3	3	1	4	4	4	3	4
Helena: HYC	3	2	2	2	3	4	4	3	2	4
Hiwassee:										
HSB	1	1	1	1	3	4	4	1	2	4
HTC2	2	1	2	2	2	4	4	2	2	4
HTD2	3	2	3	3	2	4	4	3	3	4
Louisa:										
LkE	4	4	3	3	2	4	4	4	3	4
LNF	4	4	4	3	2	4	4	4	3	4
Louisburg:										
LnE	4	4	3	3	3	4	4	4	3	4
LDF	4	4	3	3	3	4	4	4	3	4
Madison:										
MgB2	1	1	1	2	2	4	4	1	2	4
MgC2	2	1	2	2	2	4	4	2	2	4
MgD2	3	2	3	3	2	4	4	3	3	4
MDC3	4	3	3	3	2	4	4	4	3	4
MDE3	4	4	4	4	1	4	4	4	3	4
Madison and Pacolet:										
MsD3	4	3	3	4	2	4	4	4	3	4
MsE2	4	3	3	3	1	4	4	4	3	4
Musella:										
MID2	4	3	3	3	2	4	4	4	3	4
MIE3	4	4	3	4	2	4	4	4	3	4
Musella and Pacolet: MJF	4	4	3	3	1	4	4	4	3	4
Pacolet:										
PfD	3	2	2	3	3	4	4	3	3	4
PgC3	4	3	3	3	2	4	4	4	3	4

TABLE 8.—*Suitability of soils for elements of wildlife and kinds of wildlife*—Continued

[Rating are 1—well suited; 2—suited; 3—poorly suited; 4—unsuited]

Soil and map symbols [1]	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Hardwood woody plants	Coniferous woody plants	Wetland food and cover plants	Shallow water developments	Kinds of wildlife		
								Openland	Woodland	Wetland
Roanoke: Ron	4	3	4	2	3	1	1	4	2	1
Toccoa:										
Tod	1	1	1	1	4	3	3	1	2	3
Toc	2	1	2	1	4	3	3	2	2	3
Urban land: Ud, Ubp, UeC, UfC, UgC, UhC, UiE. Properties too variable to rate.										
Wilkes: WjF	4	4	3	3	2	4	4	4	3	4
Wilkes, clayey subsoil variant: WvD	4	3	3	3	2	4	4	4	3	4

scape that influence habitat were not considered in the ratings. These features must be appraised onsite. A rating of *well suited*, indicated by numeral 1, means that only low-intensity management is needed to reasonably assure satisfactory results in establishing or improving habitat. A rating of *suited*, indicated by numeral 2, means that moderate-intensity management is needed for satisfactory results. A rating of *poorly suited*, indicated by numeral 3, means that establishing or improving habitat is difficult, and intensive management is needed to maintain it. A rating of *unsuited*, indicated by numeral 4, means that managing the soil for habitat is highly impractical if not impossible.

Special attention is needed in rating soils for woodland habitat that consists of coniferous woody plants. Coniferous habitat harbors a larger number and a greater variety of wildlife if plant growth is slow and canopy closure is delayed than if plant growth is rapid. Soil properties that promote rapid growth and canopy closure, therefore, are limitations. In general, the properties that promote the quick establishment and rapid growth of conifers also promote the establishment of hardwoods. Consequently, serious competition occurs between the two kinds of trees.

The wildlife habitat elements and the types of wildlife referred to in table 8 are defined in the following paragraphs.

Grain and seed crops are agricultural grains or seed-producing annuals planted to produce food for wildlife. Examples are corn, sorghum, wheat, oats, millet, soybeans, and proso.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are established by planting and that furnish wildlife food and cover. Examples are fescue, bromegrass, lovegrass, orchardgrass, reed canarygrass, panicgrass, bahia, white clover, trefoil, alfalfa, and annual lespedeza, perennial lespedeza, and shrub lespedeza.

Wild herbaceous upland plants are native or introduced perennial grasses and forbs that provide food and cover principally to upland wildlife. They are established mainly through natural processes. Examples are bluestem, wild ryegrass, oatgrass, pokeweed, strawberry, lespedeza, beggarweed, wild bean, nightshade, goldenrod, dandelion, cheat, poorjoe, and ragweed.

Hardwood woody plants are nonconiferous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs (browse), or foliage used extensively as food by wildlife. They are commonly established through natural processes, but they also may be planted. Examples are oak, beech, cherry, hawthorn, dogwood, viburnum, maple, birch, poplar, grape, honeysuckle, blueberry, brier, greenbrier, autumn-olive, and multiflora rose.

Coniferous woody plants are cone-bearing trees and shrubs that are important to wildlife. They mainly provide cover, but they also furnish food in the form of browse, seeds, or fruit-like cones. These plants commonly are established through natural processes, but they also may be planted. Examples are pine and redcedar.

Wetland food and cover plants are annual and perennial wild herbaceous plants in moist to wet sites, exclusive of submerged or floating aquatics. These plants produce extensive food or cover that is used mainly by wetland forms of wildlife. Examples are smartweed, wild millet, bulrush, spike-sedge, rushes, sedges, burreed, wild rice, rice cutgrass, mannagrass, and cattail.

Shallow water-developments are impoundments or excavations for control of water generally not exceeding 6 feet in depth. Examples are low dikes and levees, shallow dugouts, level ditches, devices for control of water level in marshy drainageways or channels.

Open-land wildlife are quail, dove, meadowlark, field sparrow, cottontail rabbit, fox, and other birds and mammals that normally live on cropland, pasture, meadow, lawns, and in other open-land areas where grasses, herbs, and shrubs grow.

Woodland wildlife are woodcock, thrush, vireo, wild turkey, squirrel, deer, raccoon, and other birds and mammals that normally live in wooded areas where hardwood trees and shrubs and coniferous trees grow.

Wetland wildlife are duck, geese, rail, heron, shorebirds, mink, and other birds and mammals that normally live in marshes, swamps, and other wet areas.

Help in planning and establishing habitat for wildlife or fish can be obtained from the district conservationist of the Soil Conservation Service.

Formation and Classification of the Soils

This section consists of two main parts. The first part explains how the factors of soil formation affected the development of soils in Cobb County. In the second part, the system of soil classification currently used is explained, and each soil series in the county is placed in classes of this system.

Formation of the Soils

Soil is produced when parent material, climate, relief, and plants and animals interact for a period of time. These factors determine the nature of the soil that forms at any point on the earth. All of these factors affect the formation of each soil, but the relative importance of each factor differs from place to place. In some areas one factor may dominate in the formation of a soil and determine most of the properties. For example, soils that formed in quartz sand generally have faint horizons because quartz sand is highly resistant to weathering. Even in quartz sand, however, a distinct profile can be formed under certain types of vegetation if the relief is low and flat and if the water table is high. The five factors of soil formation are discussed in the paragraphs that follow.

Parent material

Parent material is the unconsolidated mass from which soil forms. It is largely responsible for the chemical and mineralogical composition of a soil. Most of the soils in Cobb County formed from residual materials, that is, materials weathered from the underlying rock.

The western half of Cobb County is underlain by granite gneiss (Lithonia type), which includes diorite and injected gneiss; diorite gneiss; and hornblende gneiss, which includes diorite gneiss, gabbro, and injected gneiss (*5*). This part of the county also includes a small area of Ashland schist near Acworth and one area of biotite gneiss and schist that extends north from Kennesaw Mountain through the town of Kennesaw to the Cherokee County line. The rest of the county is underlain chiefly by biotite gneiss and schist, which includes injected gneiss. This formation begins on the Cherokee County line at Sweat Mountain, extends south through Marietta, and enters Douglas County near Austell.

Small areas of quartzite are scattered throughout the eastern half of the county. Two of the largest areas are Sweat Mountain and Black Jack Mountain. One narrow area of Brevard schist parallels the Chattahoochee River from the Douglas County line to the east of Vinings. There is also a narrow area of granite gneiss adjacent to the Brevard schist. The granite gneiss begins south of Mableton and parallels the Brevard schist until it enters Fulton County east of Vinings. The areas of quartzite, Brevard schist, and granite gneiss make up less than 5 percent of the eastern half of the county.

The proportion of felsic and mafic minerals in these parent rocks, as well as of quartz that is very resistant to weathering, limits the amount of clay in the soils. Louisburg soils, for example, formed in material weathered from siliceous rock and quartz sand, which are very resistant to weathering. These soils, therefore, are sandy and have faint horizons; in small, scattered areas hard rock is exposed. In contrast, the Appling, Cecil, and Hiwassee soils formed from parent material less resistant to weathering and contain fairly large quantities of clay, chiefly from feldspars. The Madison and Louisa soils, on the other hand, also contain appreciable amounts of clay, but the material from which they formed contains muscovite, which is resistant to weathering and is retained in the soil.

Climate

Climate affects the formation of soils through its influence on the rate of weathering of rocks and the decomposition of minerals and organic matter. It also affects biological activity in the soils and the leaching and movement of weathered materials.

Cobb County has a moist, temperate climate with an average daily minimum temperature of about 30° F. in January and an average daily maximum temperature of about 90° F. in August. The warm, moist climate promotes rapid weathering of hard rock. Consequently, in much of the area, the soils are 3 to 6 feet thick over a thick layer of loose, disintegrated, weathered rock which blankets the hard rock underlying the county.

About 50 inches of precipitation falls annually. Much of this percolates through the soil, moves dissolved or suspended materials downward, and leaves the soils generally low in bases. Plant remains decay rapidly and produce organic acids that help to hasten the breakdown of minerals in the underlying rock. Thus, the organic-matter content is low in the surface layer of soils that have good drainage.

Relief

Relief influences soil formation through its effect on runoff, movement of water within the soil, plant cover, and, to some extent, soil temperature.

The length, shape, steepness, and aspect of slopes hasten or delay runoff. Runoff is more rapid on steep slopes; therefore, steep soils erode faster than level ones, even if both are of the same material. In Cobb County, for example, soils on steep slopes underlain by rock generally are thinner and have a more weakly expressed profile than soils that formed in similar material on broad, fairly level ridgetops. Rock outcrops also are more common.

A level or nearly level surface allows more time for water to penetrate and percolate through the soil profile. This in turn influences the solution and translocation of soluble materials. The moisture available in the soil also determines to a significant extent the amount and kinds of plants that grow. Thus, steep soils that have a slowly permeable surface layer are generally drier than level or nearly level soils, and less vegetation grows on them.

Cobb County ranges from nearly level to very steep, but is not extremely hilly. The effect of relief on soil temperature, therefore, is not so pronounced as in more mountainous areas. In general, however, slopes that face south are warmer than those that face north.

Plants and animals

Plants, animals, bacteria, and other organisms are active in the soil-forming processes. The changes they bring about depend mainly on the life processes peculiar to each. The kinds of plants and animals that live on and in the soil are determined, in turn, by the climate, the parent material, the relief, and the age of the soil.

Most of the soils in Cobb County formed under a forest of hardwoods and softwoods. These trees supply most of the organic matter available in the soils, though the hardwoods contribute more than the softwoods. The organic-matter content in most of the soils is low to medium.

Growing plants provide a cover that helps to reduce erosion and stabilize the surface. Leaves, twigs, roots, and entire plants accumulate on the surface of forest soils and then decompose through the action of percolating water and of micro-organisms, earthworms, and other forms of life. The roots of plants widen cracks in the rocks permitting more water to penetrate. Also, the uprooting of trees by wind influences the formation of soils through the mixing of soil layers and the loosening of underlying material.

Small animals, earthworms, insects, and micro-organisms influence the formation of soils by mixing organic matter into the soil and by accelerating the formation of organic matter by breaking down the remains of plants. Small animals burrow into the soil and mix the layers. Earthworms and other small invertebrates feed on the organic matter in the upper few inches. They slowly but continually mix the soil material and may alter it chemically. Bacteria, fungi, and other micro-organisms hasten the weathering of rocks and the decomposition of organic matter.

Time

Generally, a long time is required for a soil to form (*7*). Most of the soils on uplands in Cobb County have been in place long enough for distinct horizons to develop, but some soils that formed in alluvium have not.

Most soils in Cobb County have distinct horizons. The surface layer contains an accumulation of organic matter, and silicate clay minerals have formed and moved downward to produce horizons that are relatively high in clay content. In such soils, oxidation or reduction of iron has had its effect, depending on natural drainage. Many of the soils have been drained well enough to have a red or dark-red subsoil, and they contain highly oxidized iron. A few have impaired drainage, and consequently, have a gray subsoil that contains reduced iron. In addition, leaching of soluble calcium, magnesium, potassium, and other weatherable material has caused an increase in exchangeable hydrogen. Cecil and Hiwassee soils are examples of old soils in Cobb County.

Soils that have essentially the same parent material and drainage sometimes differ in degree of profile development chiefly because of time. Examples are the Altavista soils on stream terraces and the Toccoa soils on flood plains. These soils are similar in texture and occupy similar positions on the landscape. The Altavista soils, however, have been in place long enough to have a distinct, dark-colored surface layer and a subsoil with an accumulation of clay. The Toccoa soils, on the other hand, have not been in place long enough for distinct horizons to form or for much clay to accumulate.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First, through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The current system of classifying soils was placed in general use by the National Cooperative Soil Survey in 1965. It is under continual study (*6*, *9*). Therefore, readers interested in developments of this system should refer to the latest literature available. In table 9 the soil series in Cobb County are classified according to the current system of soil classification. 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. The exceptions are Entisols and Histosols, which occur in many different climates. Four soil orders are represented in Cobb County—Entisols, Inceptisols, Alfisols, and Ultisols. Entisols are young mineral soils that do not have genetic horizons or have only the beginnings of such horizons. Inceptisols are mineral soils in which horizons have definitely started to develop. They generally are on young, but not recent, land surfaces. Alfisols are soils containing a clay-enriched B horizon that has high base saturation.

Ultisols are mineral soils that have distinct horizons and are commonly on old land surfaces. They contain a clay enriched B horizon that has low base saturation. The base saturation decreases with depth.

SUBORDER: Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders have a narrower climatic range than the orders. The criteria for suborders chiefly reflect the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Each suborder is divided into great groups according to the presence or absence of genetic horizons and the arrangement of these horizons.

SUBGROUP: Each great group is divided into subgroups. One of these subgroups represents the central (typic) segment of the great group, and the others, called intergrades, contain those soils having properties mostly of the one great group, but also one or more properties of soils in another great group, suborder, or order.

FAMILY: Each subgroup is divided into families, primarily on the basis of properties important to the growth of plants. Among the properties considered are texture,

TABLE 9.—*Classification of soil series*

Series	Family	Subgroup	Order
Altavista [1]	Fine-loamy, mixed, thermic	Aquic Hapludults	Ultisols.
Appling	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Cartecay	Coarse-loamy, mixed, nonacid, thermic	Aquic Udifluvents	Entisols.
Cartecay, silty variant [2]	Fine-loamy, mixed, nonacid, thermic	Aquic Udifluvents	Entisols.
Cecil	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Chewacla, wet variants [3]	Fine-loamy, mixed, nonacid, thermic	Aeric Fluventic Haplaquepts	Inceptisols.
Durham	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols.
Gwinnett	Clayey, kaolinitic, thermic	Typic Rhodudults	Ultisols.
Helena	Clayey, mixed, thermic	Aquic Hapludults	Ultisols.
Hiwassee	Clayey, kaolinitic, thermic	Typic Rhodudults	Ultisols.
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.
Musella	Fine-loamy, mixed, thermic	Typic Rhodudults	Ultisols.
Pacolet	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Roanoke	Clayey, mixed, thermic	Typic Ochroquults	Ultisols.
Toccoa	Coarse-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Wilkes	Loamy, mixed, thermic, shallow	Typic Hapludalfs	Alfisols.
Wilkes, clayey subsoil variant [4]	Clayey, mixed, thermic, shallow	Typic Hapludalfs	Alfisols.

[1] In some areas the soils mapped in this county have an accumulation of silt loam thick enough to be outside the range defined for the series. Their use and behavior are similar.

[2] Between depths of 10 and 40 inches is silt loam and silty clay loam, which is outside the range defined for the Cartecay series. The acreage is too small to justify establishment of a new series.

[3] The material between depths of 12 and 24 inches is grayish brown (10YR 5/2), which is outside the range defined for the Chewacla series. The acreage is too small to justify establishment of a new series.

[4] The B2t horizon is too clayey for the range defined for the Wilkes series. The acreage is too small to justify establishment of a new series.

mineralogy, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES: The series consists of a group of soils that formed from a particular kind of parent material and have genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, structure, reaction, consistence, and mineralogical and chemical composition.

New soil series must be established and concepts of some established series, especially older ones that have been used little in recent years, must be revised in the course of the soil survey program across the country. A proposed new series has tentative status until review of the series concept at the National, State, and regional levels of responsibility for soil classification results in a judgment that the new series should be established. All of the soil series described in this publication have been established earlier.

General Nature of the County

This section describes the physiography and drainage, the water supply, and the climate of the county. It also discusses farming and transportation.

Physiography and Drainage

Cobb County is in the Piedmont Plateau of Georgia. The elevation is about 750 feet above sea level along the Chattahoochee River, but it ranges from about 900 feet to more than 1,800 feet on the ridgetops and mountains. The county is made up of broad, convex ridgetops dissected by many drainageways. Slopes generally are gentle to strong. They are steep near the major streams and on small mountains. These areas have been subject to geologic erosion, and the igneous and metamorphic rocks that underlie them generally are deeply weathered.

The Chattahoochee River, Sweetwater Creek, Allatoona Creek, Noonday Creek, and Rubes Creek are the major streams that drain the county. The northern part of the county is drained by Allatoona Creek, Noonday Creek, and Rubes Creek. The eastern and southeastern parts of the county are drained by the Chattahoochee River, and the southwestern part of the county is drained by Sweetwater Creek.

Water Supply

Cities and towns in the county are supplied with water from the Chattahoochee River. Allatoona Lake, Lake Acworth, Sweetwater Creek, Noonday Creek, Allatoona Creek, and the many smaller streams in the county are additional sources of water. Water for domestic use on some farms is obtained from dug wells that are about 40 to 70 feet deep and from drilled wells that are about 100 to 250 feet deep. These wells generally are a dependable source of water throughout the year. The large streams, branches, creeks, and farm ponds in the county are the main sources of water for livestock. The streams, lakes, and ponds in the county furnish recreation and are suitable for the production of fish.

Climate [6]

The climate of Cobb County is influenced by its location in the foothills of the Appalachian Mountains and by the local terrain, which ranges from rolling to hilly. The elevation in most of the county ranges from 900 to 1,200 feet

[6] Prepared by HORACE S. CARTER, climatologist for Georgia, National Weather Service, U.S. Department of Commerce.

above sea level. The Gulf of Mexico and Atlantic Ocean also influence the area's climate. Tables 10 and 11 give data on temperature and precipitation in the counties.

The elevation and hilly terrain have a tempering effect on the summer temperatures. Daytime highs are usually slightly lower than at lower elevations south of the county. The temperature reaches or exceeds 90° F. on less than half the days in June, July, and August. Nights are also mild, and early morning temperatures are mostly in the mid and upper sixties. The average minimum for the three summer months is about 65° F.

Winters are moderately cold, but the higher mountains to the north serve as a partial barrier to the movement of cold continental air masses into the area. The delay and modification of cold outbreaks by the mountains tend to prevent extremely rapid drops in temperature. Freezing temperatures occur more than half the nights during the three winter months, and on rare occasions a temperature of near zero is recorded. Winter cold spells usually last only a few days, and periods of mild, open weather are not unusual, even in midwinter.

The hilly terrain in Cobb County results in large differences in minimum temperatures within short distances. On clear, still nights, radiationally cooled air flows down the slopes into the valleys and is replaced by warmer air from above. Under extreme conditions, minimum temperatures may be 10° to 15° colder in the valleys than on the surrounding hills. Slope aspect also affects the local temperatures. A slope that faces south receives more heat from the sun than a slope that faces north and may have a considerably warmer microclimate.

The frost-free growing season usually extends from about the first of April to early in November and averages about 220 days (table 11). However, there are large local variations due to differences in elevation and slope aspect. Freezing temperatures may occur several days later in spring and earlier in fall in the colder valleys than on uplands.

TABLE 10.—*Temperature and precipitation*

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	52. 2	30. 9	69	15	4. 63	2. 5	8. 3
February	55. 4	32. 6	72	19	5. 05	2. 1	9. 5
March	62. 9	38. 8	79	26	6. 01	3. 6	9. 3
April	73. 0	48. 3	84	36	4. 65	1. 7	7. 8
May	82. 5	56. 6	91	44	3. 49	1. 7	6. 8
June	88. 2	63. 9	96	56	3. 75	1. 8	7. 3
July	89. 5	65. 9	96	61	4. 64	1. 2	8. 4
August	90. 0	65. 1	96	60	3. 46	1. 1	7. 1
September	84. 2	60. 0	94	50	3. 37	. 5	5. 8
October	73. 8	48. 4	85	36	2. 67	. 4	6. 8
November	62. 8	38. 7	76	26	3. 31	. 9	6. 4
December	53. 3	31. 6	69	18	4. 32	2. 0	7. 2
Year [1]	72. 4	48. 4	98	13	49. 35	40. 9	61. 3

[1] The extreme temperature that will be equaled or exceeded on at least 4 days in 2 out of 10 years.

TABLE 11.—*Probabilities of last freezing temperatures in spring and the first in fall*

Probability	Dates for given probability at temperature of—		
	24° F. or lower	28° F. or lower	32° F. or lower
Spring:			
1 year in 10 later than	March 22	April 4	April 18
2 years in 10 later than	March 14	March 24	April 10
5 years in 10 later than	February 22	March 14	April 1
Fall:			
1 year in 10 earlier than	November 14	November 4	October 21
2 years in 10 earlier than	November 20	November 10	October 26
5 years in 10 earlier than	November 28	November 18	November 5

Annual precipitation averages almost 50 inches and is fairly evenly distributed throughout the year. There is a maximum late in spring. March averages about 6 inches, and October averages less than 3 inches. Most warm season precipitation occurs as showers and thundershowers that develop as moist air from the south flows northward over the warm land surfaces. The showers occur mostly in the afternoon and early evening and are usually of short duration. Most winter and spring precipitation results from low-pressure systems and associated weather fronts that move through the area at fairly regular intervals from late in November through March. Winter rains may last several hours, depending on the size and rate of movement of the storm center. There is some snowfall during most winters but rarely any significant accumulation on the ground.

Average windspeeds range from about 11 miles per hour in February and March to 7 miles per hour in August. Prevailing winds are from the north quadrant most of the year; southerly winds blow in summer.

Average relative humidity ranges mostly from 80 to 90 percent early in the morning and from 50 to 65 percent early in the afternoon. Thunderstorms occur on 50 to 60 days a year, and 4 tornadoes have been reported in the county during the last 15 years.

Farming and Transportation

In 1964, according to the U.S. Census of Agriculture, 24.7 percent of the county, or 54,722 acres, was in farms. The average farm was 80.1 acres in size. Most of the farms were operated by the owner, but a few were worked by part owners or by tenants. About 66 percent of the operators also worked at other jobs off the farm. Much of the acreage in farms was wooded or in pasture. Livestock and livestock products were the chief sources of farm income.

Local markets are available for farm products, although they are somewhat limited. Most markets are in the Atlanta area.

The county is crossed by several major highways. Major railroads, motor freightlines, and buslines provide most of the shipping facilities and commercial transportation.

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Glossary

Acidity, soil. See Reaction.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Somewhat poorly drained soils are wet for significant periods but not all the time, and in some soils commonly have mottlings below 6 to 16 inches, in the lower A horizon and in the B and C horizons.

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

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

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

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

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Hard rock. Rock that requires blasting and drilling for its economical removal.

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

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

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

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

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

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

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Leaching. The removal of soluble materials from soils or other material by percolating water.

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

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

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid,* and *very rapid.*

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

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

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

Relief. The elevations or inequalities of a land surface, considered collectively.

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

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

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows: *Very coarse sand* (2.0 to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter); II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

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 soils includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

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

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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

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

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

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. In referring to a capability unit or a woodland group, read the introduction to the section it is in for general information about its management. Other information is given in tables as follows:

Approximate acreage and extent, table 1, p. 9.
Town and country planning, table 2, p. 34.
Engineering uses of the soils, tables 3, 4, and 5, pp. 44 through 53.
Suitability of soils for woodland, table 6, p. 55.
Estimated yields, table 7, p. 62.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland suitability group
			Symbol	Page	Symbol
AL	Altavista silt loam, occasionally flooded	10	IIIw-3	59	2w8
AlB	Altavista sandy loam, 0 to 4 percent slopes	10	IIe-2	58	2w8
AmB	Appling sandy loam, 2 to 6 percent slopes	11	IIe-2	58	3o7
AmC	Appling sandy loam, 6 to 10 percent slopes	11	IIIe-2	58	3o7
AmD	Appling sandy loam, 10 to 15 percent slopes	12	IVe-1	59	3o7
AnB3	Appling sandy clay loam, 2 to 6 percent slopes, severely eroded	12	IIIe-2	58	4c2e
AnC3	Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	12	IVe-1	59	4c2e
Cah	Cartecay soils	13	IIIw-2	59	2w8
Csw	Chewacla soils, wet variants	16	IVw-1	60	2w9
Cw	Cartecay silt loam, silty variant	14	IIIw-2	59	2w8
CYB2	Cecil sandy loam, 2 to 6 percent slopes, eroded	15	IIe-1	57	3o7
CYC2	Cecil sandy loam, 6 to 10 percent slopes, eroded	15	IIIe-1	58	3o7
DiB	Durham sandy loam, 2 to 6 percent slopes	17	IIe-2	58	3o7
GeB3	Gwinnett clay loam, 2 to 6 percent slopes, severely eroded	18	IIIe-1	58	4c2e
GeC3	Gwinnett clay loam, 6 to 10 percent slopes, severely eroded	18	IVe-1	59	4c2e
GeD3	Gwinnett clay loam, 10 to 15 percent slopes, severely eroded	18	IVe-1	59	4c2e
GeE2	Gwinnett clay loam, 15 to 25 percent slopes, eroded	19	VIe-2	60	4c3e
GgB2	Gwinnett loam, 2 to 6 percent slopes, eroded	17	IIe-1	57	3o7
GgC2	Gwinnett loam, 6 to 10 percent slopes, eroded	17	IIIe-1	58	3o7
GgD2	Gwinnett loam, 10 to 15 percent slopes, eroded	18	IVe-1	59	3o7
HSB	Hiwassee loam, 2 to 6 percent slopes	20	IIe-1	57	3o7
HTC2	Hiwassee clay loam, 6 to 10 percent slopes, eroded	20	IVe-1	59	4c2e
HTD2	Hiwassee clay loam, 10 to 15 percent slopes, eroded	20	IVe-1	59	4c2e
HYC	Helena sandy loam, 2 to 10 percent slopes	19	IIIe-4	59	3w8
LDF	Louisburg stony sandy loam, 15 to 45 percent slopes	23	VIIe-2	61	3x3
LkE	Louisa gravelly sandy loam, 10 to 25 percent slopes	22	VIIe-2	61	4r2
LnE	Louisburg sandy loam, 10 to 25 percent slopes	23	VIIe-2	61	3r8
LNF	Louisa soils, 25 to 60 percent slopes	22	VIIe-2	61	4r2
MDC3	Madison clay loam, 6 to 10 percent slopes, severely eroded	25	IVe-1	59	4c2e
MDE3	Madison clay loam, 15 to 25 percent slopes, severely eroded	25	VIIe-1	61	4c3e
MgB2	Madison sandy loam, 2 to 6 percent slopes, eroded	24	IIe-1	57	3o7
MgC2	Madison sandy loam, 6 to 10 percent slopes, eroded	24	IIIe-1	58	3o7
MgD2	Madison sandy loam, 10 to 15 percent slopes, eroded	24	IVe-1	59	3o7
MID2	Musella gravelly soils, 6 to 15 percent slopes, eroded	26	VIIe-2	61	4f3
MIE3	Musella gravelly soils, 15 to 25 percent slopes, severely eroded	26	VIIe-2	61	4f3
MJF	Musella and Pacolet stony soils, 10 to 45 percent slopes	27	VIIe-2	61	3x3
MsD3	Madison and Pacolet soils, 10 to 15 percent slopes, severely eroded	25	VIe-2	60	4c2e
MsE2	Madison and Pacolet soils, 15 to 25 percent slopes, eroded	25	VIe-2	60	3r8
PfD	Pacolet sandy loam, 10 to 15 percent slopes	27	IVe-1	59	3o7
PgC3	Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	28	IVe-1	59	4c2e
Ron	Roanoke silt loam	29	IVw-2	60	2w9
Toc	Toccoa soils	30	IIw-2	58	1o7
Tod	Toccoa sandy loam, local alluvium	30	IIw-2	58	1o7
Ubp	Urban land and Borrow pits	30	-----	--	---
Ud	Urban land	30	-----	--	---
UeC	Urban land-Appling complex, 2 to 10 percent slopes	31	IIIe-2	58	3o7
UfC	Urban land-Cecil complex, 2 to 10 percent slopes	31	IIIe-1	58	3o7
UgC	Urban land-Gwinnett complex, 2 to 10 percent slopes	31	IIIe-1	58	3o7
UhC	Urban land-Madison complex, 2 to 10 percent slopes	31	IIIe-1	58	3o7
UiE	Urban land and Pacolet soils, 10 to 25 percent slopes	31	VIe-2	60	3r8
WjF	Wilkes stony sandy loam, 10 to 40 percent slopes	32	VIIe-2	61	4x2
WvD	Wilkes sandy loam, clayey subsoil variant, 6 to 15 percent slopes	33	VIe-3	60	4o1

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