SOIL SURVEY

Clarke and Oconee Counties, Georgia

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
UNIVERSITY OF GEORGIA, COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATIONS
Issued November 1968

Major fieldwork for this soil survey was done in the period 1960–65. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1965. 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 Oconee River Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Clarke and Oconee Counties contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in determining the value of tracts of land for agriculture, industry, or recreation.

Locating Soils

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

On each sheet of the detailed map, soil areas are outlined and are identified by 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 of the soils of the two counties in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit, woodland group, or any other group in which the soil has been placed.

Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. 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 in the soil descriptions and in the discussions of the capability units and other groupings.

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

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

Community planners and others concerned with suburban development can read about the soil properties that affect the choice of homesites, industrial sites, schools, and parks in the section "Use of the Soils for Residential, Industrial, Recreational, and Related Nonfarm Uses."

Engineers and builders will find, under "Use of the Soils for Engineering," tables that give engineering descriptions of the soils in the two counties and that name soil features that affect engineering practices and structures.

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

Newcomers in Clarke and Oconee Counties may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "Additional Facts about Clarke and Oconee Counties."

Cover picture: Cecil sandy loam, 2 to 6 percent slopes, eroded, used for trees and wildlife. The area at the edge of the woods produces food for wildlife, and the wooded tract provides wood products.

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Contents

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SOIL SURVEY OF CLARKE AND OCONEE COUNTIES, GEORGIA

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

CLARKE AND OCONEE COUNTIES are in the northeastern part of Georgia (fig. 1) and are entirely within the Southern Piedmont major land resource area. Drainage for the two counties is provided by the Oconee and Apalachee Rivers and their tributaries. The total land area is about 311 square miles. Athens, the county seat of Clarke County, is on the Oconee River. Watkinsville, the county seat of Oconee County, is 6 miles south of Athens.

Most of the soils of these two counties are deep. The soils on uplands range from gently sloping to steep, but the soils on flood plains are mainly nearly level and are subject to frequent flooding.

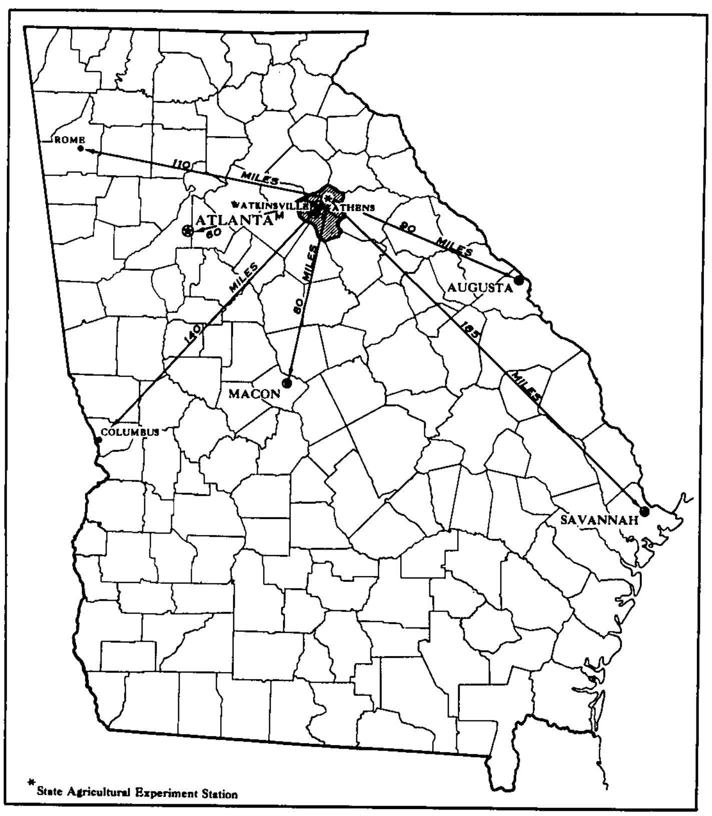

Figure 1.—**Location of Clarke and Oconee Counties in Georgia.**

Cotton, corn, and small grains are important cash crops on many of the farms. Much of the farm income is derived from the sale of livestock and livestock products, especially poultry.

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in 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.

The eight soil associations of Clarke and Oconee Counties are discussed in the following pages. More detailed information about the soils is given in the section "Descriptions of the Soils."

1. Congaree-Chewacla-Alluvial Land Association

Nearly level, deep to moderately deep, well-drained to poorly drained soils on flood plains

This association consists of nearly level soils in narrow strips or in strips of medium width along streams. The soils have formed in alluvium. They are flooded from one time to several times each year, mostly in winter and spring. Depth to the water table ranges from zero, when the water table is at the surface, to as deep as 30 inches or more. The association occupies about 7 percent of the survey area.

Congaree, Chewacla, and Alluvial land are dominant in this association. The areas of Alluvial land are intermingled with areas of Congaree and Chewacla soils.

Therefore, the proportions of the various soils were not estimated.

The Congaree soils are moderately well drained or well drained and have a surface layer of reddish-brown silt loam to sandy loam. Beneath the surface layer, the soil material is yellowish-red to yellowish-brown sandy clay loam.

The Chewacla soils are somewhat poorly drained and have a surface layer of pale-brown or reddish-brown to dark-brown fine sandy loam. The material just beneath the surface layer is strong-brown sandy clay loam mottled with grayish brown. At a depth of about 25 inches, the soil material is predominantly olive gray but is distinctly mottled with dark brown.

Alluvial land is stratified. It consists of soil material that varies greatly in color, texture, drainage, and thickness. Because of these variations, this land type cannot be classified as a soil series.

The soils of this association are strongly acid to very strongly acid. Permeability ranges from moderately slow to moderately rapid, and the available water capacity ranges from moderately low to moderately high. The content of organic matter is moderate to low.

Trees common to the area grow well on these soils, and most of the acreage is reverting to trees, mainly hardwoods. If flooding is controlled, or if crops are grown during seasons when flooding is not a hazard, the better drained soils are suitable for cultivation. Most of the areas are suited to pasture, but drainage is needed in the wetter sites.

The dominant soils of this association are generally considered to have severe limitations for residential and industrial developments. The limitations are moderate to severe if these soils are used for such purposes as areas for intensive play, campsites, and picnic areas.

2. Appling-Cecil Association

Nearly level to sloping, deep, well-drained soils that have a reddish-yellow to red, clayey subsoil mottled in the lower part; on broad, slightly dissected uplands

This association is on nearly level, smooth, broad plateaus and in gently sloping to sloping areas that are slightly dissected by shallow draws. The slopes range from 2 to about 10 percent. The association occupies about 5 percent of the survey area.

Well-drained Appling and Cecil soils, underlain by bedrock at a depth of 8 to more than 15 feet, are dominant. Appling soils make up about 40 percent of the association, and Cecil soils, about 30 percent.

The Appling soils have a surface layer of grayish-brown coarse sandy loam or sandy clay loam about 4 to 11 inches thick. Their subsoil is strong-brown to yellowish-red or red clay loam to clay or sandy clay, mottled with yellowish brown and red.

The Cecil soils have a surface layer of brown to dark grayish-brown or yellowish-red sandy loam, mainly between 4 and 8 inches thick. Their subsoil is red sandy clay loam or clay about 30 to 58 inches thick.

Colfax and Madison soils make up a minor acreage in the association. The Colfax soils are somewhat poorly drained, and the Madison soils are well drained.

The dominant soils of the assocation are strongly acid. Permeability and the available water capacity are moderate. Internal drainage is medium.

The soils of this association are easily worked and are well suited to locally grown crops. Most of the areas have been cleared, but many soils that were formerly cultivated, especially the steeper ones, have reverted to loblolly and shortleaf pines.

The major soils are stable, even when wet. Therefore, they are considered suitable as sites for foundations for houses. For the most part, the soils are suitable for foot travel shortly after rains. In some places the upper part of the Appling profile is used rather extensively as topsoil for resurfacing lawns and other areas where plants are grown.

3. Cecil Association

Nearly level to sloping, deep, well-drained soils that have a red, clayey subsoil; chiefly on smooth uplands

This association consists of deep, well-drained soils, mostly in large, smooth areas of upland plateaus (fig. 2). The slopes range from 2 to 15 percent but are mainly between 2 and 8 percent. The steeper areas are along the larger drainageways. This association occupies about 25 percent of the survey area.

Figure 2.—**Broad, nearly level area of Cecil soils in association 3 used intensively for cultivated crops.**

Cecil soils make up about 80 percent of the association. They have a surface layer of brown to dark grayish-brown or yellowish-red to light yellowish-brown sandy loam or sandy clay loam about 4 to 8 inches thick. Their subsoil is red clay that extends to a depth of about 42 to 60 inches. Depth to weathered bedrock is generally more than 8 feet.

Minor soils in this association are micaceous Madison, dark-red Davidson, red Pacolet, and reddish-yellow Appling, which are all on uplands. Also, areas of Alluvial land occupy narrow bands in drainageways.

The soils of this association are easy to work and have moderate permeability and moderate available water capacity. Their profile is strongly acid throughout.

This association is used more intensively for cultivated crops or pasture than most of the associations. Nearly all of the acreage was formerly cultivated. The soils are suited to a number of crops and are used mainly for corn, small grains, cotton, lespedeza, and grasses for pasture. Many of the soils, especially the steeper ones, are reverting to loblolly and shortleaf pines.

The soils of this association are considered to have only slight limitations for residential and industrial uses and slight limitations if used as sites for intensive recreation. They are used for most of the improved roads, houses, and industrial developments in the two counties.

4. Davidson-Cecil Association

Gently sloping to steep, deep, well-drained soils that have a red and dark-red, clayey subsoil; on ridgetops and hillsides

This association consists of gently sloping soils on long, broad ridgetops, and of moderately steep to steep soils on the side slopes of valleys. Numerous small draws dissect the side slopes. The soils are deep and well drained, and they have a red or dark-red, clayey subsoil. The association occupies about 10 percent of the survey area.

Davidson and Cecil soils are dominant in this association. Davidson soils make up about 45 percent of the acreage, and Cecil soils, about 20 percent.

The Davidson soils have a surface layer of dark-brown to dark reddish-brown sandy loam about 4 to 10 inches thick over a subsoil of dark-red clay to clay loam. The combined thickness of the surface layer and subsoil is 40 to 60 inches. Weathered bedrock is at a depth ranging from 6 to more than 10 feet.

The Cecil soils have a surface layer of brown or dark grayish-brown to yellowish-red, friable sandy loam 4 to 8 inches thick. Their subsoil is red, firm clay loam or clay that extends to a depth of 42 to 60 inches. Weathered bedrock is generally at a depth of more than 8 feet.

Louisburg and Musella soils make up a minor part of this association. Other minor soils are the Madison and Pacolet.

The dominant soils of this association are strongly acid and are low to medium in natural fertility. Permeability and the available water capacity are moderate. In the cultivated areas, runoff ranges from slow to rapid, depending on the steepness of the slopes.

The soils on the smoother ridgetops are easily tilled and respond well to good management. They are farmed intensively. The areas that are not severely eroded are suited to a number of crops, including corn, cotton, and small grains, and pasture grasses and pine trees also grow well.

The less sloping areas of the major soils are considered to be well suited to dwellings, industrial buildings, highways, and campsites. They are also suitable for golf fairways and areas suitable for intensive play. Because of their slopes, the steeper areas have moderate to severe limitations for all of these uses.

5. Davidson-Pacolet-Musella Association

Very gently sloping to steep, well-drained soils that have a dark-red and red, clayey subsoil, 15 to 60 inches thick; on narrow to fairly broad ridgetops and on valley slopes

This association consists of very gently sloping soils on narrow to fairly broad ridgetops, and of moderately steep to steep soils on the sides of valleys. It occupies about 2 percent of the survey area.

Dominant in the association are the Davidson and Pacolet soils, but Musella soils also occupy a rather large acreage. Davidson soils make up about 65 percent of the association; Pacolet soils, about 20 percent; and Musella soils and minor soils, about 15 percent.

The Davidson soils have a surface layer of dark-brown to dark reddish-brown sandy loam about 4 to 10 inches thick. Their subsoil consists of dark-red clay or clay loam that extends to a depth of 40 to 60 inches.

Pacolet soils resemble the Cecil soils in profile characteristics and properties, but they are shallower over the underlying material than are the Cecil soils. Their surface layer is mainly brown to light yellowish-brown sandy loam 3 to 7 inches thick, and their subsoil is red clay about 30 inches thick.

Musella soils have a profile similar to that of the Davidson soils in color, but they are shallower over the underlying material than are the Davidson soils. In most places weathered bedrock is at a depth of only 25 to 35 inches. The surface layer of the Musella soils is yellowish-red to dark-brown clay loam. The subsoil is dark-red clay or clay loam, and it is thin and discontinuous.

Minor soils in this association are the Colfax and Madison. Soils formed in alluvium along narrow streams also make up a small acreage.

The dominant soils of this association are strongly acid and are medium to low in natural fertility. They have a thick root zone, moderate permeability, and generally moderate available water capacity.

The soils on the smoother ridgetops are cultivated or used for pasture, and the steeper ones are in trees. The soils respond well to good management and are suited to the commonly grown crops.

The dominant soils in the association have an appreciable amount of clay in their subsoil, but they are fairly stable if used for foundations. The smoother, less sloping areas are considered suitable for foundations for residences and industrial buildings, although some areas, especially severely eroded ones, are sticky and slippery when wet. If these soils are used for secondary roads and drives, the soils have some limitations for foot traffic. Therefore, surfacing is necessary if the areas are to be used for intensive play.

6. Pacolet-Madison-Davidson Association

Moderately sloping to steep, deep, well-drained soils that have a red and dark-red, clayey subsoil; on highly dissected uplands

This association consists of soils of uplands that are highly dissected by numerous drainageways. The ridgetops are mainly narrow, and the slopes generally range from 5 to 15 percent. The landscape near the major streams is highly dissected, however, and the slopes in those areas are as steep as 25 percent. The association occupies about 37 percent of the survey area.

The dominant soils are the Pacolet, Madison, and Davidson. About 70 percent of the association consists of Pacolet soils; 25 percent, of Madison soils; and 3 percent, of Davidson soils. The rest of the acreage consists mainly of areas of Alluvial land on the flood plains of streams.

The Pacolet soils have a surface layer of brown or dark grayish-brown to yellowish-red or light yellowish-brown, friable sandy loam about 3 to 7 inches thick. The subsoil is red, firm clay or sandy clay that extends to a depth of about 40 inches. In most places weathered bedrock is at a depth of more than 8 feet.

The Madison soils have a surface layer of reddish-brown to yellowish-red sandy loam about 4 to 11 inches thick. Their subsoil is red, micaceous clay loam to clay about 30 inches thick. Mica, fragments of schist, and in a few places, fragments of weathered gneiss are in the lower part of the subsoil and in the underlying material. Weathered bedrock is generally at a depth of more than 8 feet.

The Davidson soils have a surface layer of dark-brown to dark reddish-brown, friable, loamy material about 4 to 10 inches thick. Their subsoil is dark-red clay and clay loam that extends to a depth of 40 to 60 inches. In many places the lower part of the subsoil contains few to several fragments of rock. Weathered bedrock is generally at some depth greater than 8 feet.

In places the soils of this association are eroded and have lost most of their original surface layer. All of the major soils are well drained and strongly acid. Permeability and the available water capacity are moderate, and natural fertility is medium to low.

All but the steepest areas were formerly used for cultivated crops. Now, most of the acreage is wooded, but some areas of soils on the wider and smoother ridgetops are cultivated or in pasture. The steep slopes are wooded.

Because of their slopes, the major soils generally are considered to have moderate to severe limitations for use as industrial sites and as sites for intensive play areas or some other recreational uses. They are suitable for trees and for several kinds of wildlife.

7. Madison-Cecil Association

Gently sloping, deep, well-drained soils that have mostly a red, clayey, micaceous subsoil; on broad, smooth ridgetops

The soils of this association are mainly on smooth, fairly wide ridgetops and on ridgetops of medium width. In places where the ridges are narrow, the topography is undulating. The association occupies about 7 percent of the survey area.

Deep, well-drained Madison and Cecil soils are dominant in this association. Madison soils make up about 50 percent of the acreage, and Cecil soils, about 30 percent. The rest of the association consists mainly of Pacolet soils.

The Madison soils have developed in material weathered from quartz mica schist, granite, and gneiss. Where those soils are not severely eroded, they have a surface layer of brown, reddish-brown, or yellowish-red sandy loam 4 to 11 inches thick. The lower part of the subsoil contains tilted, thin layers of micaceous material that extend upward from the substratum. Weathered, micaceous rock is below a depth of about 48 inches.

The Cecil soils have a surface layer of brown to dark grayish-brown, yellowish-red, or light yellowish-brown sandy loam about 4 to 8 inches thick. Their subsoil is red clay loam to sandy clay about 34 to 56 inches thick. Weathered rock is generally at a depth of more than 8 feet.

The dominant soils of this association are strongly acid. They have a thick root zone and moderate available water capacity. Natural fertility is medium to low.

If these soils are fertilized and receive water, they are suited to the commonly grown crops. In the past they were the most extensively cultivated of any of the soils in the survey area.

Generally, the major soils do not have serious limitations if they are used as sites for buildings. The severely eroded areas are slightly sticky after rains, although the shrink-swell potential is only medium.

8. Madison-Pacolet-Louisa Association

Dominantly well-drained, moderately steep to steep soils that have mostly a red, micaceous, clay loam subsoil; on hillsides and valley slopes

This association consists of moderately steep to steep soils on the sides of hills and in stream valleys. The soils are well drained, and most of them are deep. The association occupies about 7 percent of the survey area.

Madison and Pacolet soils are dominant, and Louisa soils are rather extensive in places. Madison soils make up about 65 percent of the association, and Pacolet soils, about 20 percent. Louisa soils occur only in places and make up about 10 percent.

The Madison soils have a surface layer of brown to yellowish-red sandy loam about 4 to 11 inches thick. Their subsoil is red or dark-red, micaceous clay loam or clay about 30 inches thick. Decomposed micaceous rock is at some depth between 48 and 60 inches. In most places weathered bedrock is at a depth of more than 8 feet.

The Pacolet soils have a surface layer of brown or dark grayish-brown to yellowish-red or light yellowish-brown sandy loam about 4 to 8 inches thick. The subsoil of red, firm clay to clay loam is about 30 to 58 inches thick. Fragments of rock are common at a depth of about 60 inches. Weathered bedrock is generally at a depth of about 8 feet.

The Louisa soils have a surface layer of grayish-brown, brown, or yellowish-brown, firm sandy loam about 6 to 8 inches thick. The upper part of the subsoil is red clay loam, but the lower part consists of coarsely mottled, red, strong-brown, and pale-brown, decomposed mica schist. In most places the combined surface layer and subsoil are less than 20 inches thick.

The soils of this association are strongly acid. The available water capacity of the Madison and Pacolet soils is moderate, and the available water capacity of the Louisa soils is low. Natural fertility is medium to low.

These soils are generally too steep for cultivation. They are suited to trees and grass.

Because of their slopes, the major soils are considered to have severe or moderate limitations for some nonagricultural uses. Limitations are severe to moderate if these soils are used as foundations for buildings, as areas suitable for intensive play, or for sewage lagoons.

How This Survey Was Made

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

They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. As they traveled over the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug 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. To use this soil survey efficiently, it is necessary to know the kinds of groupings most used in a local soil classification.

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 Madison, 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 go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Appling coarse sandy loam and Appling sandy clay loam are two soil types in the Appling series. The difference in texture of their surface layers is apparent from their names.

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Madison sandy loam, 2 to 6 percent slopes, eroded, is one of several phases of Madison sandy loam, a soil type that ranges from nearly level to hilly.

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 greatly help in drawing boundaries accurately. The soil map in the back of this survey 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 management of farms and fields, a mapping unit is nearly equivalent to a soil type or a phase of a soil type. 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 type or soil phase.

In preparing some detailed maps, the soil scientists have a problem of delineating areas where different kinds of soils are so intricately mixed and so small in size that it is not practical to show them separately on the map. Therefore, they show this mixture of soils as one mapping unit and call it a soil complex. Ordinarily, a soil complex is named for the major kinds of soil in it, for example, Madison-Louisa complex, 6 to 10 percent slopes, eroded. In some places two or more similar soils are mapped as a single unit, called an undifferentiated soil group, if the differences between the soils are too small to justify separate mapping. An example of such soils in Clarke and Oconee Counties is Chewacla soils and Alluvial land.

Most surveys include areas where the soil material is so rocky, so shallow, or so frequently worked by wind and water that it cannot be classified by soil series. These areas are shown on the map like other mapping units but are given descriptive names, such as Gullied land or Rock outcrop, and are called land types.

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 soils 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 soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil surveys. On the basis of the yield and practice tables and other data, the soil scientists set up trial groups, and then test them by further study and by consultation with farmers, agronomists, engineers, and others. Then, the scientists 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.

Descriptions of the Soils

This section describes the soil series and mapping units of Clarke and Oconee Counties. The approximate acreage and proportionate extent of each mapping unit are given in table 1.

The procedure is first to describe the soil series, and then the mapping units in that series. Thus, to get full information on any one mapping unit, it is necessary to read the description of that unit and also the description of the soil series to which it belongs. As mentioned in the section "How This Survey Was Made," not all mapping units are members of a soil series. Rock outcrop, for example, is a miscellaneous land type that does not belong to a soil series. It is listed, nevertheless, in alphabetic order along with the soil series.

In comparing a mapping unit with a soil series, many will prefer to read the short description in paragraph form. It precedes the technical description that identifies layers by A, B, and C horizons and depth ranges. The technical profile descriptions are mainly for soil scientists and others who want detailed information about soils.

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

Soil	Clarke County		Oconee County		Total
	Acres	Percent	Acres	Percent	
Appling coarse sandy loam, 2 to 6 percent slopes, eroded	1, 125	1. 4	2, 070	1. 7	3, 195
Appling coarse sandy loam, 6 to 10 percent slopes, eroded	750	. 9	910	. 8	1, 660
Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	185	. 2	300	. 3	485
Buncombe loamy sand	250	. 3	375	. 3	625
Cecil sandy loam, 2 to 6 percent slopes, eroded	8, 670	10. 8	14, 830	12. 5	23, 545
Cecil sandy loam, 6 to 10 percent slopes, eroded	6, 650	8. 3	11, 325	9. 5	18, 010
Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded	3, 010	3. 8	4, 100	3. 4	7, 110
Cecil soils, 0 to 2 percent slopes, overwash	580	. 7	680	. 6	1, 260
Chewacla soils and Alluvial land	1, 400	1. 8	940	. 8	2, 340
Colfax sandy loam, 2 to 6 percent slopes	260	. 3	570	. 5	830
Congaree soils and Alluvial land	2, 950	3. 7	3, 885	3. 3	6, 835
Davidson sandy loam, 2 to 6 percent slopes, eroded	1, 080	1. 4	1, 620	1. 4	2, 700
Davidson sandy loam, 6 to 10 percent slopes, eroded	1, 255	1. 6	2, 070	1. 7	3, 325
Davidson sandy loam, 15 to 25 percent slopes, eroded	1, 000	1. 3	1, 320	1. 1	2, 320
Davidson clay loam, 2 to 6 percent slopes, severely eroded	700	. 9	1, 130	. 9	1, 830
Davidson clay loam, 6 to 10 percent slopes, severely eroded	1, 220	1. 5	1, 750	1. 5	2, 970
Davidson clay loam, 10 to 15 percent slopes, severely eroded	1, 040	1. 3	1, 500	1. 3	2, 540
Davidson clay loam, 15 to 25 percent slopes, severely eroded	740	. 9	900	. 7	1, 640
Louisburg loamy sand, 6 to 10 percent slopes	114	. 1	235	. 2	349
Louisburg loamy sand, 10 to 25 percent slopes	430	. 5	765	. 6	1, 195
Louisburg stony loamy sand, 10 to 25 percent slopes	400	. 5	635	. 5	1, 035
Madison sandy loam, 2 to 6 percent slopes, eroded	2, 425	3. 0	3, 440	2. 9	5, 865
Madison sandy loam, 6 to 10 percent slopes, eroded	1, 350	1. 7	2, 070	1. 7	3, 420
Madison sandy loam, 10 to 15 percent slopes, eroded	1, 550	1, 9	2, 170	1. 8	3, 720
Madison sandy loam, 15 to 25 percent slopes, eroded	5, 050	6. 3	6, 900	5. 8	11, 950
Madison sandy clay loam, 2 to 6 percent slopes, severely eroded	300	. 4	330	. 3	630
Madison sandy clay loam, 6 to 10 percent slopes, severely eroded	1, 050	1. 3	2, 170	1. 8	3, 220
Madison sandy clay loam, 10 to 25 percent slopes, severely eroded	5, 790	7. 2	8, 275	6. 9	14, 090
Madison-Louisa complex, 6 to 10 percent slopes, eroded	60	(1)	430	. 4	490
Madison-Louisa complex, 10 to 15 percent slopes, eroded	190	. 2	750	. 6	940
Madison-Louisa complex, 15 to 25 percent slopes, eroded	1, 550	1. 9	2, 545	2. 1	4, 095
Musella clay loam, 15 to 25 percent slopes, eroded	425	. 5	855	. 7	1, 280
Pacolet sandy loam, 10 to 15 percent slopes, eroded	3, 960	5. 0	5, 150	4. 3	9, 110
Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	7, 000	8. 8	9, 620	8. 1	16, 650
Pacolet stony sandy loam, 6 to 15 percent slopes, eroded	270	. 3	260	. 2	530
Pacolet stony sandy loam, 15 to 25 percent slopes, eroded	260	. 3	475	. 4	735
Pacolet sandy clay loam, 10 to 15 percent slopes, severely eroded	7, 150	8. 9	8, 470	7. 1	15, 650
Pacolet-Gullied land complex, 6 to 10 percent slopes	1, 970	2. 5	3, 530	3. 0	5, 500
Pacolet-Gullied land complex, 10 to 25 percent slopes	3, 130	3. 9	5, 890	4. 9	9, 020
Rock outcrop	16	(1)	75	(1)	91
Wehadkee and Alluvial land, wet	2, 120	2. 7	3, 195	2. 7	5, 315
Worsham sandy loam, 2 to 6 percent slopes	410	. 5	530	. 4	940
Total	80, 000	100	119, 040	100	199, 040

[1] Less than 0.1 percent.

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. The capability unit, woodland group, and wildlife group in which the mapping unit has been placed, and the pages on which each of these groupings is described, can be found by referring to the "Guide to Mapping Units" at the back of this survey.

Alluvial Land

Alluvial land is a nearly level miscellaneous land type consisting of sediments recently deposited by water on the flood plains of streams. It is subject to varying intensities of flooding. From the surface downward, the sediments vary greatly in thickness, color, and texture. Internal drainage ranges from good to poor.

Alluvial land is not mapped separately in this survey area but is mapped in undifferentiated units with Chewacla, Congaree, and Wehadkee soils. It is described in more detail under mapping units of the Chewacla, Congaree, and Wehadkee series.

Appling Series

The Appling series consists of well-drained soils on uplands. These soils have formed over weathered material derived from granite and granite-gneiss, in many places mixed with some material from mica schist. The slopes range from 2 to 10 percent but are mostly between 3 and 7 percent.

In many areas where no erosion or only moderate erosion has taken place, the surface layer is grayish-brown coarse sandy loam about 4 to 11 inches thick. The subsoil is generally sandy clay loam to clay or clay loam. Distinct mottles begin at some depth between 12 and 20 inches. Bedrock is at a depth of 6 to 10 feet. The profile of these soils is strongly acid throughout.

Appling soils are commonly adjacent to Madison, Cecil, and Davidson soils, but they have a predominantly coarser textured surface layer than do those soils. Also, their subsoil is less micaceous than that of the Madison soils and less reddish than those of the Cecil and Davidson soils.

Originally, the Appling soils had a cover of hardwoods. The trees were mainly oaks and hickories, but yellow-poplars grew in places. Most of the acreage has been cleared, but many of the fields that were formerly cleared and cultivated have reverted to forests of loblolly and shortleaf pines. Now, a large part of the acreage is in trees, although many areas are still cultivated or used for pasture. Cotton, corn, small grains, and lespedeza are commonly grown in the less sloping areas. The steeper and eroded areas are commonly used for pasture.

Representative profile of Appling coarse sandy loam, 2 to 6 percent slopes, eroded (three-fourths of a mile south of the railroad station at Farmington and 100 yards east of U.S. Highway No. 441, Oconee County):

Ap—0 to 6 inches, grayish-brown (2.5Y 5/2) coarse sandy loam; weak, fine, granular structure; very friable; numerous fine roots; strongly acid; abrupt, smooth boundary.

B1t—6 to 9 inches, strong-brown (7.5YR 5/6) sandy clay loam; moderate, medium and coarse, subangular blocky structure; friable to slightly firm; coarse sand common; slight mixing with material from the Ap horizon; strongly acid; clear, smooth boundary.

B21t—9 to 12 inches, strong-brown (7.5YR 5/6) clay; moderate, medium and coarse, subangular blocky structure; firm; a few clay films on ped faces; some fine mica flakes; strongly acid, clear, smooth boundary.

B22t—12 to 25 inches, yellowish-red (5YR 5/6) clay; a few, fine, distinct, red (10R 4/6) mottles; moderate, medium and coarse, subangular blocky structure; firm; a few clay films on ped faces; common fine mica flakes; strongly acid; diffuse, wavy boundary.

B3—25 to 36 inches, prominently mottled red (10R 4/6) and yellowish-brown (10YR 5/6) clay loam; mottles are many and coarse; weak, coarse, subangular blocky structure; very friable; many fine and medium mica flakes and a few lumps of soft, nearly white feldspar; strongly acid; diffuse, wavy boundary.

C—36 to 58 inches, yellowish-brown (10YR 5/6), micaceous loamy material; coarse, red (10R 4/6) mottles, lumps of nearly white feldspar; massive; very friable; contains some mica.

In the less eroded areas of these soils, the A horizon ranges from 4 to 11 inches in thickness and from brown or light yellowish brown to dark brown, dark grayish brown, or grayish brown in color. The dominant texture of the A horizon is coarse sandy loam, but the texture ranges to sandy clay loam. Where severely eroded areas of these soils have been cultivated, the surface layer ranges from less than 2 inches to about 4 inches in thickness. In those areas remnants of the A horizon are mixed with material from the B1t horizon in many fields, and the present surface layer is yellowish-brown sandy clay loam.

The B1t horizon ranges from strong brown to reddish yellow or yellowish red in color and from 3 to 6 inches in thickness. The B2 horizons range from strong brown to yellowish red in color and from sandy clay or clay to clay loam in texture. They have distinct or prominent, red, yellowish-brown, or brownish-yellow mottles in the lower part.

The solum ranges from about 34 to 55 inches in thickness. Depth to hard rock ranges from 6 to 10 feet.

Appling coarse sandy loam, 2 to 6 percent slopes, eroded (AxB2).—This deep soil has the profile described for the series. In most of the acreage, so much material has been removed by erosion that the plow layer now extends into the subsoil.

Included in some areas mapped as this soil are a few small areas of an uneroded soil that has a thicker surface layer. Also included are small galled spots, areas where there are a few shallow gullies, and areas of a soil that has a red or micaceous subsoil. The surface layer in the galled spots and gullied areas is reddish-yellow light sandy clay loam. In other small included areas near Winterville and south of Eastville, the profile is lighter colored than typical for Appling soils.

Appling coarse sandy loam, 2 to 6 percent slopes, eroded, is generally in good tilth and has a thick root zone. It is moderately permeable. The available water capacity is moderate but slightly lower than that of an uneroded Appling soil.

This soil is well suited to farming. It responds well to good management and is suited to a wide range of crops. Further erosion is a moderate hazard, however, if this soil is used for cultivated crops and is not protected.

Appling coarse sandy loam, 6 to 10 percent slopes, eroded (AxC2).—This soil has a surface layer that is 4 to 8 inches thick over a clay loam or sandy clay subsoil. It is a deep soil. In most of the acreage, however, enough soil material has been removed by erosion that the plow layer now extends into the subsoil.

Included in some areas mapped as this soil are small areas of a soil that has a thicker surface layer. Also included are small galled spots, areas where there are a few shallow gullies, and small areas of a soil that has a red subsoil. The surface layer in the galled spots and gullied areas is reddish-yellow light sandy clay loam.

This Appling soil is in good tilth and has a thick root zone. The rate of infiltration is slightly slower and the available water capacity is lower than in a less eroded Appling soil. Permeability and the available water capacity are moderate.

This soil is suitable for farming. It responds well to good management and is suited to a wide range of crops. The hazard of further erosion is moderate to severe, however, if cultivated crops are grown and the soils are not protected. Nearly half of the acreage is in second-growth volunteer loblolly pines, part is in pasture, and the rest is idle.

Appling sandy clay loam, 6 to 10 percent slopes, severely eroded (AnC3).—Erosion has removed most of the original surface layer of this soil, and in places the upper part of the subsoil. The areas have been cut by shallow gullies and by a few deep ones. The present surface layer is yellowish-brown sandy clay loam about 3 inches thick. In most cultivated areas, it is a mixture of remnants of the original surface layer and the upper part of the subsoil. The subsoil is sandy clay or clay that has distinct or prominent, yellowish-red and red mottles in the lower part.

Surface runoff is rapid, and the hazard of further erosion is severe if this soil is cultivated and is not protected. Tilth is poor because of the high content of clay in the surface layer.

This soil is better suited to close-growing crops, pasture, and trees than to cultivated crops. It can be cultivated only within a narrow range of moisture content. Because of the slopes and hazard of erosion, the soil is not suited to intensive cultivation. Cultivated crops are grown to some extent, but many areas, formerly cultivated, are reverting to trees.

Buncombe Series

The Buncombe series consists of excessively drained, sandy soils that formed in alluvial material on flood plains. The slopes range from 0 to 6 percent but are mainly between 2 and 4 percent.

In many places the surface layer is brown loamy sand about 6 to 16 inches thick. The soil material beneath the surface layer is light-brown to yellowish-brown loamy sand to sand that extends to a depth of 5 feet or more. The profile is very strongly acid throughout.

Buncombe soils are adjacent to areas of Alluvial land. They have a subsoil that is more sandy and droughty than the subsoil of most of the other soils formed in alluvium.

Originally, the Buncombe soils had a cover of hardwoods. The main kinds of trees were oaks and hickories, but poplars grew in places. Most of the areas have been cleared, but many areas that were formerly cleared have reverted to forests of trees and brush.

Representative profile of Buncombe loamy sand on flood plains of the North Oconee River (reached by going 1½ miles east of U.S. Highway No. 441 on College Station Road, then 400 yards north of that road, Clarke County):

Ap—0 to 8 inches, brown (7.5YR 4/4) loamy sand; single grain to weak, fine, granular structure; very friable; a few fine and medium mica flakes; very strongly acid; diffuse, smooth boundary.

C1—8 to 22 inches, light-brown (7.5YR 6/4) loamy sand; single grain; very friable; common fine and medium mica flakes; very strongly acid; diffuse, smooth boundary.

C2—22 to 36 inches, yellowish-brown (10YR 5/8) sand; single grain; loose; very strongly acid; diffuse, smooth boundary.

C3—36 to 65 inches +, yellowish-brown (10YR 5/8) sand; a few, fine, light yellowish-brown mottles; single grain; loose; very strongly acid.

The Ap horizon, or the combined A horizons in areas that have not been cultivated, ranges from 6 to 16 inches in thickness and from brown to strong brown or grayish brown in color. The C horizons range from light yellowish brown or yellowish brown to light brown or light olive brown in color. Their texture ranges from loamy sand to sand. The profile ranges from about 52 to 65 inches in thickness. Depth to bedrock ranges from 6 to more than 10 feet.

Buncombe loamy sand (Bfs) (0 to 6 percent slopes).—This is the only Buncombe soil mapped in Clarke and Oconee Counties. It has formed in alluvium on first bottoms along the Oconee River and is subject to frequent flooding. The profile is the one described for the series.

This soil is in good tilth and has a thick root zone, but it is low in content of organic matter. Its response to management is fair. Permeability is very rapid. Therefore, this soil is droughty during periods of low rainfall. It is suited to only a few kinds of plants.

Most areas of this soil are wooded, but small areas are used for row crops and pasture. All of the crops require moderate to large amounts of fertilizer for good yields.

Cecil Series

The Cecil series consists of well-drained soils on uplands. These soils have formed mainly in material weathered from gneiss and granite but mixed in many places with quartzitic or basic material. The slopes range from 0 to 10 percent but most commonly are between 2 and 10 percent.

In many areas that do not have a cover of overwash or that are not severely eroded, the A horizon consists of yellowish-red sandy loam 4 to 8 inches thick. The Cecil soil that has a cover of overwash has a somewhat thicker surface layer of reddish loamy material, and the severely eroded Cecil soil has a thinner surface layer of reddish sandy clay loam. The subsoil is red sandy clay loam to clay about 30 to 55 inches thick. Bedrock is at a depth of 4 to 8 feet. The profile is strongly acid or very strongly acid throughout.

Cecil soils are commonly adjacent to Madison, Davidson, and Appling soils. Their subsoil is less micaceous than that of the Madison soils and is not so dark a red as that of the Davidson soils. It is free of mottling and is redder than the subsoil of the Appling soils.

The Cecil soils occupy the largest acreage of any of the soils in Clarke and Oconee Counties. Originally, they were covered by hardwoods, mainly oaks and hickories, although poplars grew in places. Most areas have been cleared, but many fields that were formerly cleared and cultivated have reverted to forests of loblolly and shortleaf pines. Row crops, small grains, and lespedeza are grown on most of the gently sloping areas. The steeper areas are used mainly for pasture or trees.

Representative profile of Cecil sandy loam, 2 to 6 percent slopes, eroded (1¼ miles southwest of Oconee Central High School and one-fifth of a mile north of Union Church, on the grounds of the Southern Piedmont Experiment Station at Watkinsville, Oconee County):

Ap—0 to 7 inches, yellowish-red (5YR 4/6) sandy loam; weak, fine, granular structure; very friable; many fine roots and pores; rapid permeability; strongly acid; clear, wavy boundary.

B1—7 to 13 inches, red (2.5YR 4/6) sandy clay loam; weak, coarse, subangular blocky structure; friable; many fine roots and pores; moderately rapid permeability; strongly acid; gradual, wavy boundary.

B21—13 to 23 inches, red (2.5YR 4/8) clay loam; moderate, medium and fine, subangular blocky structure; friable to firm; many fine roots and pores; strongly acid; clear, smooth boundary.

B22—23 to 37 inches, red (2.5YR 4/6) clay; moderate, medium, subangular blocky and angular blocky structure; firm; common fine roots and pores; lower part contains some mica flakes; strongly acid; diffuse, wavy boundary.

B3—37 to 52 inches, red (2.5YR 4/8) clay loam; weak, medium, subangular blocky structure; friable; small, shiny mica flakes common; strongly acid; diffuse, wavy boundary.

C—52 to 70 inches +, red (2.5YR 4/8) saprolite that is easily crushed to loam or heavy loam; massive; has some characteristics similar to those of gneiss; friable; no roots; small, shiny, clear mica flakes common.

Where these soils lack a cover of overwash and are not severely eroded, their A horizon ranges from brown or dark grayish brown to light yellowish brown or yellowish red in color and from 4 to 8 inches in thickness. In the Cecil soil that has a cover of overwash, the color of the A horizon ranges from reddish brown to dark red, and the thickness of that horizon ranges from 10 to 20 inches. The A horizon of the severely eroded Cecil soil is red and ranges from 1 to 3 inches in thickness. The B2 horizons have a texture of clay loam to clay. The solum ranges from 42 to 69 inches in thickness. Depth to bedrock ranges from 4 to 8 feet.

Cecil sandy loam, 2 to 6 percent slopes, eroded (CYB2).—This soil has the profile described for the series. In much of the acreage, so much material has been lost through erosion that the plow layer now extends into the subsoil.

Included in the areas mapped as this soil are small patches where little or no erosion has taken place. Other inclusions are small galled spots, areas that contain a few shallow gullies, and patches where the subsoil is dark red. In the galled spots and gullied areas, the surface layer is red sandy clay loam.

This Cecil soil has a thick root zone and is generally in good tilth. Permeability and the available water capacity are moderate, and surface runoff is medium. Further erosion is a slight to moderate hazard if this soil is cultivated.

This soil is well suited to farming. It responds well to good management and is suited to a number of crops. Most of the acreage is in cultivated crops, pasture, and second-growth volunteer loblolly pines.

Cecil sandy loam, 6 to 10 percent slopes, eroded (CYC2).—This soil has a surface layer of light yellowish-brown to brown sandy loam 6 to 8 inches thick over a subsoil of red clay. In much of the acreage, so much soil material has been removed by erosion that the plow layer now extends into the subsoil.

Included in areas mapped as this soil are small patches where little or no erosion has taken place. Also included are small areas in which the subsoil is dark red or is micaceous. Other inclusions consist of small galled spots and areas that contain a few shallow gullies. In the galled spots and gullied areas, the surface layer is red sandy clay loam. The included areas were too small to be mapped separately or are not significant to management.

This Cecil soil has a thick root zone and is generally in good tilth. The available water capacity and permeability are moderate, and surface runoff is medium. Further erosion is a severe hazard if this soil is cultivated.

This soil is suited to farming. It responds well to good management and can be used for a number of crops. Most of the acreage is in second-growth loblolly pines, pasture, or cultivated crops.

Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded (CZB3).—Erosion has removed most or all of the original surface layer of this soil, and in places part of the subsoil. The present surface layer is red sandy clay loam about 1 to 3 inches thick. The subsoil is red clay or clay loam.

Included in the areas mapped as this soil are a few small patches of a soil that has a mottled subsoil. Also included are areas that contain some small gullies and a few deep gullies.

Surface runoff is rapid, and the hazard of further erosion is severe if this soil is cultivated. Permeability is moderate. This soil has a moderately thick root zone but is generally in poor tilth because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed satisfactorily only within a narrow range of moisture content.

This soil is not suited to intensive cultivation. It can be used for hay or other close-growing crops, and it is suitable for pasture or trees. Most of the acreage is in trees or is reverting to woodland (fig. 3).

Cecil soils, 0 to 2 percent slopes, overwash (CbA).—These soils occupy small areas throughout Clarke and Oconee Counties. Their profile is similar to the one described for the series, but a layer of overwash, consisting of sandy loam to loam or heavy loam, covers the surface. This loamy material was washed from adjacent areas of Davidson, Appling, Cecil, and Madison soils. The present surface layer is loamy material that is 10 to 20 inches thick. The subsoil is red, friable clay. The entire profile is very strongly acid.

Figure 3.—**Loblolly pines growing on Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded. This soil is well suited to pines. When the stand is thinned, the better trees are left to increase their growth and the salvage cuts of cull trees are sold.**

Runoff is slow, and the available water capacity is high. Permeability is moderate.

These soils are suited to most of the locally grown crops. They can be cultivated year after year, but a cover crop or crop residue must be turned under if good soil tilth is to be maintained.

Chewacla Series

The Chewacla series consists of deep, somewhat poorly drained soils on first bottoms. These soils have formed in recent alluvium washed from Appling, Cecil, Madison, Louisburg, and other soils of the uplands. Their slopes range from 0 to 2 percent.

In many places the surface layer is dark reddish-brown fine sandy loam about 10 inches thick. Beneath the surface layer is strong-brown sandy clay loam mottled with grayish brown below a depth of about 10 to 15 inches. The soil material below a depth of about 25 inches is olive-gray, stratified sandy clay loam. The entire profile is strongly acid.

Chewacla soils are adjacent to Wehadkee and Congaree soils and to areas of Alluvial land. They are not so well drained as the Congaree soils but are better drained and have a browner surface layer than the Wehadkee. The Chewacla soils are less variable in texture and drainage than Alluvial land.

The original vegetation was chiefly sweetgum, water oak, white oak, willow, and elm.

The Chewacla soils in Clarke and Oconee Counties are not mapped separately but are mapped only in an undifferentiated unit with Alluvial land.

Representative profile of Chewacla fine sandy loam (100 yards north of the North Highway Bypass, along the west side of the tracks of the Southern Railroad, Clarke County):

Ap—0 to 10 inches, dark reddish-brown (5YR 3/4) fine sandy loam; weak, medium and fine, granular structure; very friable; many fine roots and pores; contains some mica flakes; strongly acid; diffuse, smooth boundary.

C1—10 to 25 inches, strong-brown (7.5YR 5/6) sandy clay loam; common, medium, distinct, grayish-brown mottles below a depth of about 10 to 15 inches, and these mottles increase in number with increasing depth; weak, medium and fine, subangular blocky structure; friable; many fine roots and pores; contains some mica flakes; strongly acid; diffuse, smooth boundary.

C2—25 to 50 inches, olive-gray (5YR 5/2) sandy clay loam; common, distinct, dark-brown mottles; massive; stratified; contains some mica flakes; strongly acid.

The color of the A horizon ranges from pale brown to reddish brown or dark reddish brown. In small areas the texture of the A horizon is coarse sandy loam or silt loam. Depth to mottling ranges from about 10 to 15 inches.

Chewacla soils and Alluvial land (Cob) (0 to 2 percent slopes).—This undifferentiated soil group consists of Chewacla soils intermixed with areas of moderately wet Alluvial land. Chewacla soils make up about 60 percent of the acreage, and Alluvial land, about 40 percent. The soils are not extensive. They occur on flood plains 20 to 60 feet in width, along streams throughout the survey area. The water table is high.

The Chewacla soils have the profile described for the Chewacla series. Alluvial land lacks uniform soil characteristics. In that land type, the soil profiles, to a depth of about 50 inches, show wide variations in texture and color from the surface downward, as well as from one site to another. In the soil material in the uppermost 12 to 18 inches, the color ranges from yellowish red to dark reddish brown and the texture ranges from gravelly sand to sandy clay loam. The underlying material is yellowish red to brown and is stratified. The layers are 4 to 10 inches thick and range from coarse sand to sandy clay loam in texture. A layer of coarse sand or fine gravel is generally at a depth of 30 to 50 inches. The water table is within this layer much of the time.

The Chewacla soils have moderately high natural fertility and contain a moderate amount of organic matter. Tilth is poor to fair. Permeability is moderate to moderately slow, and the available water capacity is moderate to high. Alluvial land is variable in natural fertility, in content of organic matter, and in permeability and available water capacity.

Unless these soils are drained, they are too wet for satisfactory production of row crops. They can be used for pasture, hay, or trees. Nearly a third of the acreage is now in trees, and a large acreage is in pasture. Only a small acreage is cultivated.

Colfax Series

The Colfax series consists of somewhat poorly drained soils in depressions, and gently sloping areas of the uplands. These soils have formed mainly in material weathered from gneiss and granite but in many places mixed with material weathered from schist. The slopes range from about 2 to 6 percent.

In many places the surface layer is dark-gray sandy loam about 5 to 11 inches thick. The upper part of the subsoil is mottled grayish-brown and yellowish-brown sandy clay loam. The lower part is more grayish than the upper, but it also has a texture of sandy clay loam. Bedrock is at a depth of 6 to 8 feet. The profile is very strongly acid throughout.

Colfax soils occur with Appling, Worsham, and Cecil soils. Their subsoil is less well drained than that of the Appling soils but better drained than that of the Worsham soils. It is less red than that of the Cecil soils.

Originally, the Colfax soils were covered with hardwoods. The trees were mainly oaks and hickories, but poplars grew in some places. The soils are still used chiefly for trees or pasture, and many fields have reverted to forests of hardwoods and briers. The areas that are still cleared are commonly used for pasture, but corn, small grains, and lespedeza can be grown.

Representative profile of Colfax sandy loam, 2 to 6 percent slopes (one-half mile north of the intersection of Highway Nos. 78 and 53, and 100 feet west of Highway 78, Oconee County):

Ap—0 to 7 inches, dark-gray (2.5Y 4/1) sandy loam; weak, fine, granular structure; very friable; very strongly acid; gradual, smooth boundary.

A2—7 to 11 inches, light brownish-gray (2.5Y 6/2) sandy loam; weak, fine, granular structure; very friable; very strongly acid; gradual, smooth boundary.

B21t—11 to 15 inches, mottled grayish-brown (2.5Y 5/2) and yellowish-brown (10YR 5/6) sandy clay loam; moderate, medium, subangular and angular blocky structure; firm; very strongly acid; gradual, wavy boundary.

B22t—15 to 35 inches, grayish-brown (2.5Y 5/2) sandy clay loam; a few, fine, distinct, yellowish-red and a few, medium, prominent, red mottles; moderate, medium, angular blocky and subangular blocky structure; firm; very strongly acid; diffuse, smooth boundary.

B23t—35 to 50 inches +, light olive-gray (5Y 6/2) sandy clay loam; many, coarse, prominent, red and many, medium, distinct, yellowish-red mottles; moderate, coarse, angular blocky structure; firm, very strongly acid.

The A horizons range from gray or dark gray to light olive gray in color and from 5 to 11 inches in thickness. The color of the B horizons ranges from mottled grayish brown and yellowish brown to mottled light olive gray. Depth to bedrock ranges from 6 to 8 feet.

Colfax sandy loam, 2 to 6 percent slopes (CiB).—This is the only Colfax soil mapped in Clarke and Oconee Counties. Its profile is the one described for the series.

Included in areas mapped as this soil are small areas in which the subsoil is more grayish and has a texture of sandy clay. Also included are small galled spots, areas that contain a few shallow gullies, and areas of a soil that is covered by a layer of overwash from adjoining soils.

This Colfax soil is generally in poor tilth and has a seasonal high water table at a depth of only 12 to 24 inches. The available water capacity is moderate to low, and permeability is moderately slow.

This soil is suited to a number of crops and can be cultivated intensively if the excess water is removed. About half of the acreage is in pasture, and the rest is cultivated or in trees.

Congaree Series

The Congaree series consists of moderately well drained or well drained soils formed in alluvium. These soils are on first bottoms and are subject to flooding. Their slopes range from 0 to 2 percent.

In many places the surface layer is reddish-brown loam about 15 to 18 inches thick. It is underlain by yellowish-red sandy clay loam 30 to more than 40 inches thick. The entire profile is strongly acid.

Congaree soils occur with Chewacla and Wehadkee soils and with areas of Alluvial land. They are better drained than the Chewacla and Wehadkee soils and are much less variable in texture, color, and drainage than Alluvial land.

Originally, these soils had a cover of yellow-poplar, elm, oak, hickory, maple, and elder.

Congaree soils are not mapped separately in Clarke and Oconee Counties but are mapped in an indifferentiated unit with Alluvial land.

Representative profile of Congaree loam (on the east side of the Cedar Creek flood plain and 200 yards north of the Oconee River, Clarke County):

Ap—0 to 18 inches, reddish-brown (5YR 4/4) loam; weak, medium, granular structure; very friable; contains mica flakes; abundant fine roots and pores; low content of organic matter; strongly acid; diffuse, smooth boundary.

C1—18 to 46 inches, yellowish-red (5YR 4/6) sandy clay loam; weak, medium and fine, subangular blocky structure; friable; contains mica flakes; many fine roots and pores; strongly acid; diffuse, smooth boundary.

C2—46 to 60 inches +, dark reddish-brown (5YR 3/4) sandy clay loam; few, faint, very dark brown mottles; massive; friable; a few mica flakes and a few fine roots; strongly acid.

The Ap horizon ranges from silt loam to sandy loam in texture. The color of the C horizons ranges from yellowish red or dark reddish brown to yellowish brown. In many places below a depth of 30 inches, the soil material contains brown mottles.

Congaree soils and Alluvial land (Coa) (0 to 2 percent slopes).—This undifferentiated unit consists of strongly acid Congaree soils intermixed with areas of Alluvial land on bottoms along the major streams. Congaree soils make up about 65 percent of the acreage, and Alluvial land, about 35 percent. The areas are generally less than 50 yards wide, but they range from only a few yards to about 100 yards in width.

In most respects the Congaree soils have the profile described for the Congaree series. Their surface layer is about 15 inches thick, however, and is underlain by 30 to 42 inches of sandy clay loam. Alluvial land consists of stratified material, too variable in characteristics for classifying as a soil series. In that land type, the profiles, from the surface to a depth of about 50 inches, range widely in color and texture and vary significantly from one side to another. The loamy sand to loam that makes up the surface layer is brown to yellowish red and is 4 to 10 inches thick. Beneath it is stratified material consisting of layers, 2 to 10 inches thick, of dark-brown to reddish-yellow, micaceous sandy clay loam to sand. Alluvial land is generally well drained and has a water table at about the same depth as the one in the Congaree soils.

Included in the areas mapped as this unit are areas of a fine-textured soil that shows some horizon development.

The soils of this unit are in good tilth and have a thick root zone. The content of organic matter is moderate to low. The Congaree soils have moderate permeability and moderate to high available water capacity. Because of its variable soil characteristics, Alluvial land has variable permeability and variable available water capacity.

The soils of this unit are suitable for farming. They respond well to good management and are suited to most crops commonly grown on bottom lands. The acreage is mostly in trees or pasture, but some areas are cultivated.

Davidson Series

The Davidson series consists of well-drained soils on uplands. These soils have formed mainly in material weathered from diorite, hornblende, or gneiss, but partly in material weathered from mica schist. The slopes range from 2 to 25 percent but are most commonly between 4 and 15 percent.

In many places where no erosion has taken place, or where erosion is only slight to moderate, the surface layer is dark reddish-brown sandy loam 4 to 10 inches thick. The subsoil is dark-red clay to clay loam. Bedrock is at a depth of 6 to 10 feet. The profile of these soils is strongly acid or very strongly acid throughout.

Davidson soils are commonly adjacent to Cecil, Madison, Appling, and Musella soils. They are more reddish than the Cecil, Appling, and Madison soils and are less micaceous than the Madison soils. Their profile is thicker than that of the Musella soils.

Originally, the Davidson soils had a cover of hardwoods. The trees were mainly oaks and hickories, but poplars grew in places. Most of the areas have been cleared, but many fields have reverted to forests of loblolly and shortleaf pines. The gently sloping areas are generally used to grow cotton, corn, small grains, and lespedeza, and some of the steeper areas are used for pasture. A large acreage is in trees.

Representative profile of Davidson sandy loam, 2 to 6 percent slopes, eroded (11 miles south of Watkinsville; along a gravel road east of U.S. Highway No. 129 and near an old bridge across the Apalachee River, Oconee County):

Ap—0 to 7 inches, dark reddish-brown (5YR 3/4) sandy loam; weak, fine, granular structure; very friable; many fine roots and pores; strongly acid; diffuse, smooth boundary.

B1t—7 to 13 inches, dark-red (2.5YR 3/6) clay loam; moderate, medium and fine, angular and subangular blocky structure; friable; very strongly acid; diffuse, smooth boundary.

B21t—13 to 26 inches, dark-red (2.5YR 3/6) clay; moderate, medium and fine, subangular blocky structure; friable; contains a few small mica flakes; strongly acid; diffuse, smooth boundary.

B22t—26 to 36 inches, dark-red (2.5YR 3/6) clay; moderate, medium, angular blocky structure; firm; contains mica flakes and a few fragments that appear to be similar to the parent material in color; strongly acid; diffuse, smooth boundary.

B3t—36 to 51 inches, dark-red (2.5YR 3/6) clay loam; moderate, medium and coarse, subangular blocky structure; friable; contains some fragments that are similar to the parent material in color; strongly acid; diffuse, smooth boundary.

C—51 to 66 inches +, red (2.5YR 4/6 to 4/8) micaceous loam; massive; firm; contains no fine roots but contains a fairly large amount of mica.

The A horizon of the severely eroded Davidson soils ranges from dark brown to dark reddish brown or red in color and from 2 to 8 inches in thickness. In the other Davidson soils, the A horizon ranges from dark brown to dark reddish brown in color, from sandy loam to loam in texture, and from 4 to 10 inches in thickness. The B horizons range from red to dark red in color and from clay to heavy clay loam in texture. Their combined thickness ranges from 30 to 60 inches.

Davidson sandy loam, 2 to 6 percent slopes, eroded (DqB2).—In most places this soil has the profile described for the series. Included in the areas mapped, however, are small patches in which the surface layer is loam. Also included are small areas of a soil that has a lighter colored surface layer, and other areas that have a thinner profile.

This Davidson soil has a thick root zone and is generally in good tilth. Permeability and the available water capacity are moderate.

This soil is well suited to farming. Erosion is a slight to moderate hazard, however, if cultivated crops are grown. Response to proper management is good, and this soil is suited to a number of crops. Most of the acreage is in second-growth volunteer pines, pasture, or cultivated crops.

Davidson sandy loam, 6 to 10 percent slopes, eroded (DqC2).—The surface layer of this soil is 5 to 9 inches thick. It is underlain by 30 to 50 inches of dark-red clay. In part of the acreage, the plow layer extends into the subsoil.

Small areas of a soil that has a lighter colored surface layer, and other areas in which the subsoil is micaceous, are included in areas mapped as this soil. Also included are small galled spots in which the surface layer is red clay loam, areas that contain a few shallow gullies, and small areas in which the surface layer is loam.

This Davidson soil has a slightly slower rate of infiltration than Davidson sandy loam, 2 to 6 percent slopes, eroded. It is generally in good tilth and has a thick root zone. Both the available water capacity and permeability are moderate. Surface runoff is medium.

This soil is suitable for farming. It responds well to good management and is suited to a number of crops. If cultivated crops are grown, however, the hazard of further erosion is severe. Most of the acreage is in second-growth volunteer loblolly pines, pasture, and cultivated crops.

Davidson sandy loam, 15 to 25 percent slopes, eroded (DqE2).—The surface layer of this soil is 4 to 8 inches thick. The subsoil is dark-red or red clay 30 to 50 inches thick. The shallowest areas are near the crests of ridges, and the deepest ones are at the base of slopes. In most of the acreage, the plow layer extends into the subsoil.

Included in the areas mapped as this soil are small areas of a soil that has a lighter colored surface layer. Also included are areas in which the subsoil is micaceous; small galled spots in which the surface layer is clay loam; and areas that contain a few shallow gullies.

Permeability and the available water capacity are moderate. Surface runoff is rapid when the surface layer is bare.

This soil is too steep for safe cultivation. Most of the acreage is in second-growth volunteer loblolly pines or pasture, but a small acreage is cultivated.

Davidson clay loam, 2 to 6 percent slopes, severely eroded (DhB3).—Erosion has removed most of the original surface layer of this soil, and in places part of the subsoil. In most places the areas contain some shallow gullies or a few deep ones. The present surface layer has a texture of clay loam and is 3 to 8 inches thick. In cultivated areas it consists of a mixture of remnants of the original surface layer and part of the subsoil. The subsoil is made up of 40 to 60 inches of red or dark-red clay or clay loam.

Surface runoff is rapid, and further erosion is a severe hazard if this soil is cultivated and is not protected. Permeability is moderate. Tilth is generally poor because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed satisfactorily only within a narrow range of moisture content.

This soil responds fairly well to good management. It is not well suited to intensive cultivation, however, because of the slopes and hazard of further erosion. Hay or other close-growing crops can be grown, and this soil can be used for pasture or trees. Much of the acreage is in trees or is reverting to woodland.

Davidson clay loam, 6 to 10 percent slopes, severely eroded (DhC3).—The present surface layer of this soil is 3 to 8 inches thick in most places. It is underlain by 40 to 60 inches of red clay. In most cultivated fields, remnants of the original surface layer are mixed with the uppermost few inches of the subsoil. The entire profile contains mica flakes and quartz pebbles.

Included in areas mapped as this soil are patches where the surface layer is sandy clay loam. Also included are small areas of a soil that has a lighter colored surface layer or a thinner profile.

This Davidson soil has a thick root zone, but it is in generally poor tilth because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed satisfactorily only within a narrow range of moisture content. Surface runoff is medium to rapid. Further erosion is a severe hazard if this soil is cultivated and is not protected.

This soil is poorly suited to cultivation, but it can be used for perennial vegetation. Most of the acreage is in second-growth volunteer loblolly pines or pasture, but some areas are cultivated.

Davidson clay loam, 10 to 15 percent slopes, severely eroded (DhD3).—Erosion has removed most of the original surface layer of this soil and in places part of the subsoil. Most areas contain small gullies or a few deep gullies. The present surface layer consists mainly of remnants of the original surface layer mixed with material from the upper part of the subsoil. It is 2 to 7 inches thick and is underlain by a subsoil of red or dark-red clay and clay loam 30 to 60 inches thick.

Surface runoff is rapid. Therefore, the hazard of further erosion is severe if this soil is cultivated. Permeability is moderate. Because of the high content of clay in the surface layer, this soil is generally in poor tilth. The root zone is moderately thick to thick. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed satisfactorily only within a narrow range of moisture content.

Response is fairly good to proper management, but this soil is not suitable for intensive cultivation. Hay or other close-growing crops can be grown, or the soil can be used for pasture or trees. Most of the acreage is in trees or is reverting to woodland.

Davidson clay loam, 15 to 25 percent slopes, severely eroded (DhE3).—This soil has lost most of its original surface layer through erosion, and part of the subsoil has been removed in places. The present surface layer is 2 to 6 inches thick. The subsoil is 30 to 50 inches thick and consists of red or dark-red clay and clay loam. The areas contain some small gullies and a few deep ones.

Surface runoff is rapid. Further erosion is a severe hazard if cultivated crops are grown without using practices that control erosion. This soil is moderately permeable and has a moderately thick or thick root zone. It is in generally poor tilth, however, because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. It puddles easily when wet and tends to form clods when dry. Tillage can be performed satisfactorily only within a narrow range of moisture content.

This soil is not suited to cultivated crops. It can be used for hay or other close-growing crops, and it is also suitable for pasture or trees. Most of the acreage is in trees or is reverting to woodland.

Gullied Land

Gullied land is a miscellaneous land type so cut by recent gullies that it is generally nonarable. Erosion has destroyed the original profile in most of the areas. In Clarke and Oconee Counties, Gullied land is not mapped separately but is mapped with the Pacolet soils.

Louisa Series

The Louisa series consists of somewhat excessively drained soils formed in material weathered from micaceous schist and gneiss. These soils are on small knolls and on the higher, steeper parts of the slopes in areas of undulating to hilly topography. The slopes range from 6 to 25 percent but most commonly are between 10 and 20 percent.

In many places the surface layer is dark-brown fine sandy loam 5 to 8 inches thick. It is underlain by micaceous clay loam that is mixed with fragments of schist and extends to a depth of about 12 to 18 inches. Bedrock is at some depth between 18 and 72 inches. The entire profile is very strongly acid.

Louisa soils occur mainly with Madison and Pacolet soils. They have a thinner, less clayey subsoil, however, than do those soils.

Originally, the Louisa soils had a cover consisting mainly of oaks and hickories but including some yellow-poplars. Some areas have been cleared for farming, but most have reverted to forests of loblolly and shortleaf pines. Only small areas are now cultivated or in pasture.

The Louisa soils in Clarke and Oconee Counties are not mapped separately but are mapped in complexes with Madison soils.

Representative profile of Louisa fine sandy loam, 10 to 15 percent slopes, eroded (reached by going 4½ miles north of Athens, then one-half mile north of U.S. Highway No. 29 on Highway No. 108, and east one-third mile, Clarke County):

Ap—0 to 8 inches, dark-brown (10YR 3/3) fine sandy loam; weak, fine, granular structure; very friable; very strongly acid; gradual, wavy boundary.

Bt—8 to 16 inches, red (2.5YR 4/6) micaceous clay loam containing common hard fragments of schist; massive; friable; very strongly acid; diffuse, wavy boundary.

C—16 to 40 inches, weathered red (2.5YR 5/8), strong-brown (7.5YR 5/8), and pale-brown (10YR 6/3) saprolite of mica schist and gneiss.

The A horizon ranges from grayish brown to dark brown or dark yellowish brown in color and from 5 to 8 inches in thickness. Depth to bedrock ranges from 18 to 72 inches.

Louisburg Series

The Louisburg series consists of soils that are somewhat excessively drained. These soils are shallow over material weathered from coarse-textured granite or granite and gneiss. They are on broken ridges and on hillsides in the uplands. The slopes range from 6 to more than 25 percent but most commonly are between 8 and 20 percent.

In many places these soils have a surface layer of brown or dark-brown loamy sand or stony loamy sand 8 to 18 inches thick. Their B horizon is brown to strong-brown sandy loam but is thin and discontinuous in places. Bedrock is at some depth between 3 and 6 feet. In places these soils contain boulders large enough to extend from below the C horizon upward into the A horizon. Their entire profile is strongly acid.

Louisburg soils are adjacent to Cecil and Appling soils, but they have a less well-developed subsoil than do those soils.

Originally, the Louisburg soils had a cover of hardwoods. The trees were mainly oaks and hickories, but yellow-poplars grew in places. Most of the areas have been cut over, but many of the fields that were formerly cleared have reverted to forests of loblolly and shortleaf pines. Cotton, corn, small grains, and lespedeza are still grown in some of the less sloping areas. Some of the steeper areas are used for pasture.

Representative profile of Louisburg loamy sand, 10 to 25 percent slopes (9 miles southeast of Watkinsville on Georgia Highway No. 15, 2¾ miles southeast of the Antioch Church, and one-fourth mile north of paved road, Oconee County):

0—½ to 0, very dark gray (N 3/0), decomposing leaves and twigs.

A11—0 to 2 inches, brown to dark-brown (10YR 4/3) loamy sand; fine and medium, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

A12—2 to 14 inches, brown (7.5YR 4/4) loamy sand; weak, coarse, granular structure; very friable; many roots; strongly acid; gradual, wavy boundary.

B—14 to 28 inches, brown (7.5YR 5/4) to strong-brown (7.5YR 5/6) sandy loam; structureless; very friable; contains decomposed gneiss and granite.

C—28 to 36 inches +, partly weathered, pinkish-white (5YR 8/2) to very dark gray, coarse-grained granite and gneiss. Bedrock at a depth of 3 to 6 feet.

The A horizons range from grayish brown or dark yellowish brown to brown or dark brown in color and from 8 to 18 inches in combined thickness. Their texture is loamy sand or stony loamy sand. The B horizon ranges from brown or strong brown to yellowish brown in color and from loamy sand to coarse sandy loam in texture. In some places it is thin and discontinuous, but in others it is as thick as 10 to 30 inches. The C horizon is hard to soft, coarse-grained granite and gneiss that ranges from pinkish white to very dark gray in color. Bedrock is at a depth of 3 to 6 feet.

Louisburg loamy sand, 6 to 10 percent slopes (LnC).—This soil has a surface layer that is 10 to 14 inches thick. The surface layer is underlain by a thin, discontinuous B horizon of sandy loam.

Included with this soil in mapping are small areas in which the B horizon is weakly defined but continuous. Also included are small areas in which the surface layer is eroded.

The root zone is moderately thin, and tilth is generally poor. Permeability is rapid, and the available water capacity is low.

This soil responds fairly well to good management but is not well suited to farming. It is too shallow for intensive cultivation. Most of the acreage is in cutover or second-growth loblolly pines or hardwoods.

Louisburg loamy sand, 10 to 25 percent slopes (LnE).—This soil has the profile described for the series. Included in the areas mapped, however, are a few patches in which the surface layer is yellowish red to yellowish brown.

This Louisburg soil contains fragments of rock. Permeability is rapid, and the available water capacity is low.

The slopes are too steep for cultivation, but limited amounts of hay, pasture, and timber are produced on this soil. Most of the acreage is in trees.

Louisburg stony loamy sand, 10 to 25 percent slopes (LDE).—The surface layer of this soil is 8 to 18 inches thick. It contains stones that interfere with tillage, but the machinery necessary for farming can be used to some extent. The B horizon is thin and discontinuous and has a texture of coarse sandy loam.

Included in areas mapped as this soil are small patches in which the subsoil is weakly defined but continuous. Also included are small areas in which erosion has removed all of the original surface layer and part of the subsoil.

This Louisburg soil contains fragments of rock. Its root zone is moderately thin. Permeability is rapid, and the available water capacity is low.

This soil is not well suited to farming. It responds fairly well to good management but is too shallow, stony, and steep for safe cultivation. Most of the acreage is in cutover or second-growth loblolly pines or hardwoods.

Madison Series

The Madison series consists of deep, well-drained soils on uplands. These soils have formed in material weathered from micaceous quartz and mica schist, mixed in places with gneiss or basic material. The slopes range from 2 to 25 percent but are mainly between 10 and 25 percent.

In many areas that are not severely eroded, the surface layer is yellowish-red sandy loam about 4 to 11 inches thick. The subsoil is red, micaceous sandy clay loam to clay. Mica, fragments of schist, and a few fragments of weathered gneiss are on the surface. Bedrock is at some depth between about 30 inches and 8 feet or more. The entire profile is strongly acid.

Madison soils are commonly adjacent to Cecil, Davidson, Louisa, and Appling soils. They are more micaceous than the Cecil soils, lighter colored than the Davidson, deeper than the Louisa, and redder than the Appling.

Originally, the Madison soils had a cover of hardwoods. The trees were mainly oaks and hickories, but poplars grew in places. Most of the areas have been cleared, but many of the fields, formerly used for cultivated crops, have reverted to forests of loblolly and shortleaf pines. These soils are still important for farming. Many of the areas are cultivated or in pasture, but a large acreage is in trees.

Representative profile of Madison sandy loam, 2 to 6 percent slopes, eroded (4 miles south of the line between Clarke and Madison Counties and 100 feet west of new U.S. Highway No. 29, Clarke County):

Ap—0 to 5 inches, yellowish-red (5YR 5/6) sandy loam; weak, fine, granular structure; very friable; many fine roots; strongly acid; clear, smooth boundary.

B1t—5 to 7 inches, red (2.5YR 4/8) sandy clay loam; mainly weak, medium and fine, subangular blocky structure but some angular blocky structure; friable; common fine roots; some mica flakes; strongly acid; diffuse, smooth boundary.

B2t—7 to 21 inches, red (2.5YR 4/8) clay loam to clay; moderate, medium and fine, angular blocky structure; friable to firm; many fine mica flakes; few roots; strongly acid; diffuse, wavy boundary.

B3t—21 to 46 inches, red (2.5YR 4/8) clay loam; moderate, medium and coarse, angular blocky structure; friable to firm; many fine mica flakes; strongly acid; diffuse, wavy to irregular boundary.

C—46 to 56 inches, mottled black, dark-gray, and light-gray micaceous quartz, mica schist, and muscovite, and some black, fine grains of mica; firm mineral soil interspersed between the tilted thin layers of weathered rock.

In areas of these soils that are not severely eroded, the Ap horizon is brown or dark yellowish-brown to yellowish-red sandy loam 4 to 11 inches thick. Where these soils are severely eroded, the Ap horizon is reddish-brown or yellowish-red sandy clay loam 4 to 7 inches thick. The B2t horizon is red or dark-red micaceous clay loam to clay that ranges from about 14 to 41 inches in thickness. The C horizon consists of saprolite mixed with mineral soil. In many places tilted thin layers of micaceous material extend upward from below the C horizon into the B horizons and, in places, into the A horizon.

Madison sandy loam, 2 to 6 percent slopes, eroded (MgB2).—In many places erosion has removed so much soil material from the surface layer of this soil that the plow layer now extends into the subsoil. The present surface layer is 6 to 10 inches thick. In other respects the profile is similar to the one described for the series.

Near Winterville, small patches in which the surface layer and the subsoil are somewhat lighter colored are included in areas mapped as this soil. Also included are small areas in which the soil is not eroded.

This Madison soil is in good tilth and has a moderately thick root zone. It has moderate permeability and moderate available water capacity. Surface runoff is medium. Erosion is a slight to moderate hazard if this soil is cultivated.

Although about half of the acreage is in trees, this soil is well suited to cultivated crops. It responds well to good management and is suited to a number of crops.

Madison sandy loam, 6 to 10 percent slopes, eroded (MgC2).—In most places erosion has removed so much soil material from the surface layer of this soil that the plow layer now extends into the subsoil. The present surface layer is 5 to 10 inches thick.

Included in areas mapped as this soil are small areas in which the surface layer is thinner or the subsoil is a darker red. Also included are small galled spots and areas that contain a few shallow gullies.

This Madison soil has a thick root zone and is generally in good tilth. Permeability and the available water capacity are both moderate. Surface runoff is medium. Further erosion is a severe hazard if this soil is cultivated and is not protected.

This soil responds well to good management and is suited to a number of crops. If practices are used to protect it from erosion, it is well suited to farming. Most of the acreage is in cultivated crops, pasture, or second-growth loblolly pines.

Madison sandy loam, 10 to 15 percent slopes, eroded (MgD2).—This soil has a surface layer that is 5 to 9 inches thick. In most places erosion has removed so much of the soil material that the plow layer extends into the subsoil.

Included in areas mapped as this soil are small areas in which the surface layer is thinner or the subsoil is a darker red. Also included are small galled spots and areas that contain a few shallow gullies.

This Madison soil has a thick root zone and is generally in good tilth. Permeability and the available water capacity are both moderate.

This soil is suitable for farming. It responds well to good management and is suited to a number of plants. Because of the strong slopes, however, it is not suited to intensive cultivation. Most of the acreage is in second-growth loblolly pines, pasture, and cultivated crops.

Madison sandy loam, 15 to 25 percent slopes, eroded (MgE2).—In many places erosion has removed so much soil material from this soil that normal tillage extends into the subsoil. The present surface layer is generally between 4 and 11 inches thick.

Included in areas mapped as this soil are small areas in which little or no erosion has taken place, other small areas in which the surface layer is thinner or the subsoil is dark red, and small galled spots and patches that contain a few shallow gullies. In the galled spots and gullied areas, the surface layer is red or yellowish-red sandy clay loam.

This Madison soil is generally in good tilth and has a thick root zone. Permeability and the available water capacity are both moderate.

This soil responds well to good management, but it is not well suited to farming. The strong slopes make cultivated crops unsuitable, but the soil can be used for a number of other crops. Most of the acreage is in second-growth loblolly pines, pasture, and cultivated crops.

Madison sandy clay loam, 2 to 6 percent slopes, severely eroded (MiB3).—This soil has a reddish-brown surface layer about 5 inches thick. In many places the present surface layer consists of remnants of the original surface layer and material from the upper part of the subsoil. In other places erosion has removed most or all of the original surface layer and, in some areas, part of the subsoil. Many areas contain small gullies or a few deep gullies.

This soil has a moderately thick root zone but is generally in poor tilth because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be done satisfactorily only within a narrow range of moisture content. Surface runoff is rapid, and the hazard of further erosion is severe if this soil is cultivated. The rate of infiltration is slower and the available water capacity is lower than in a less eroded Madison soil. Permeability is moderate.

This soil responds fairly well to good management and is suitable for farming. It is not well suited to cultivated crops, however, because of the hazard of further erosion. Hay can be grown, or the areas can be used for pasture or trees. Most of the acreage is in trees or is reverting to woodland.

Madison sandy clay loam, 6 to 10 percent slopes, severely eroded (MiC3).—Erosion has removed most or all of the original surface layer of this soil and in places part of the subsoil. The present surface layer is 4 to 7 inches thick, but the plow layer extends into the subsoil in much of the acreage. Most areas contain some shallow gullies and a few deep ones. Many areas of this soil contain quartz pebbles and fragments of schist. Locally, slightly basic schist influences the color of the subsoil.

Surface runoff is rapid, and erosion is a very severe hazard if this soil is cultivated and is not protected. Permeability is moderate, but the rate of infiltration is slower and the available water capacity is lower than in the less eroded Madison soils. The root zone is moderately thick. Tilth is generally poor because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, this soil can be cultivated only within a narrow range of moisture content.

This soil responds fairly well to good management. It is fairly well suited to farming but is not suitable for intensive cultivation. Hay or other close-growing crops can be grown, or this soil can be used for pasture or trees. Much of the acreage is in trees or is reverting to woodland.

Madison sandy clay loam, 10 to 25 percent slopes, severely eroded (MiE3).—Most or all of the original surface layer of this soil has been lost through erosion, and in places part of the subsoil has been removed. The present surface layer is a mixture of material from the subsoil and remnants of the original surface layer. It consists of reddish-brown sandy clay loam 4 to 6 inches thick. The subsoil is red micaceous clay loam 14 to 20 inches thick. In most places the areas contain small gullies or a few deep ones. Small areas of Pacolet soils are mapped with this soil.

Surface runoff is rapid, and further erosion is a very severe hazard if this soil is cultivated or left bare. The rate of infiltration is slower and the available water capacity is lower than in a less sloping Madison soil. Permeability is moderate. Because of the high content of clay in the surface layer, tilth is generally poor. The root zone is moderately thick, but the surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed only within a narrow range of moisture content.

This soil responds fairly well to proper management. It is not suited to cultivated crops but is suited to hay or other close-growing crops and can be used for pasture or trees. Most of the acreage is in trees or is reverting to woodland.

Madison-Louisa complex, 6 to 10 percent slopes, eroded (MmC2).—This soil complex consists of areas of deep, well-drained, strongly acid Madison soils and of shallow, somewhat excessively drained, very strongly acid Louisa soils so intermixed that it was not practical to map them separately (fig. 4). About 60 percent of the acreage is Madison soils, and about 30 percent is Louisa soils. The rest consists of severely eroded soils that have a surface layer of sandy clay loam and a thin subsoil of red, micaceous clay loam. The severely eroded areas contain a few

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Figure 4.—**A cut in an area of Madison-Louisa complex, 6 to 10 percent slopes, eroded. The shallow Louisa soils are on the right, and the deep Madison soils are on the left.**

shallow gullies. Individual areas of this complex are about the same size as individual areas of Madison and Louisa soils mapped separately.

The Madison soils have a brown surface layer about 7 inches thick, over a subsoil of red, micaceous clay loam about 28 inches thick. The subsoil is underlain by a layer of red, hard saprolite that is mixed with mica schist and gneiss and is 20 to 40 inches thick.

The Louisa soils have a surface layer of brown sandy loam, about 5 inches thick, over a thin layer of red, micaceous clay loam mixed wth fragments of rock. The lower part of their profile consists of red, hard mica schist that contains pockets of micaceous clay loam. A detailed profile of these soils is described under the Louisa series.

The Madison soils have moderate permeability and moderate available water capacity. The Louisa soils have moderately rapid permeability and low available water capacity. The content of organic matter and natural fertility are low. Fragments of rock are near the surface, and tilth is fair to poor.

The soils of this complex are generally not well suited to intensive cultivation but can be used for pasture or trees. Most of the acreage is in trees, mainly second-growth loblolly pines. A small acreage is cultivated or in pasture.

Madison-Louisa complex, 10 to 15 percent slopes, eroded (MmD2).—About 50 percent of this complex is Madison soils, and about 45 percent is Louisa soils. The rest of the acreage consists mainly of small areas of a soil that has a thin surface layer of sandy clay loam; other areas where the present surface layer consists of exposed weathered schist and gneiss; and areas that contain a few shallow gullies. The proportions of the different soils are generally nearly uniform throughout all the acreage. Individual areas are no larger than individual areas of Madison and Louisa soils mapped separately.

The Madison soils have a surface layer of brown, friable sandy loam, about 6 inches thick, over a subsoil of red, micaceous clay loam or clay about 24 inches thick. The lower part of their profile consists of red, hard saprolite mixed with mica schist and gneiss.

The Louisa soils have a surface layer of brown, very friable sandy loam about 8 inches thick. Their surface layer is underlain by a layer of red, micaceous clay loam, about 8 inches thick, mixed with fragments of rock. Beneath the clay loam is red, hard mica schist containing pockets of micaceous clay loam.

Permeability and the available water capacity are moderate in the Madison soil. Permeability is moderately rapid in the Louisa soil, and the available water capacity is low. This soil contains little organic matter. Tilth is generally fair to poor, and fragments of rock are near the surface. Surface runoff is rapid, and further erosion is a severe hazard.

These soils are not well suited to farming and should be kept in perennial vegetation that will protect them from erosion. Most of the acreage is in second-growth loblolly pines, but small areas are cultivated or in pasture.

Madison-Louisa complex, 15 to 25 percent slopes, eroded (MmE2).—About 35 percent of the acreage of this complex consists of Madison soils, and another 35 percent is Louisa soils. The rest of the acreage consists partly of small areas of included soils that have a surface layer of red clay loam mixed with fragments of schist and gneiss. Other inclusions are small areas of soils that have a stony subsoil. A few shallow gullies are scattered throughout the acreage.

The Madison soils have a surface layer of brown sandy loam, about 5 inches thick, underlain by a subsoil of red, micaceous clay loam or clay, about 30 inches thick. Beneath the subsoil is red, hard saprolite mixed with mica schist and gneiss.

The Louisa soils have a surface layer of brown, very friable sandy loam about 7 inches thick. Their surface layer is underlain by a layer of red, micaceous clay loam that is mixed with fragments of rock and is about 8 inches thick. Beneath the micaceous clay loam is a layer of red, hard mica schist, about 20 to 26 inches thick, that contains pockets of micaceous clay loam.

The Madison soils have moderate permeability and moderate available water capacity. The Louisa soils have moderately rapid permeability and low available water capacity. The content of organic matter is low. These soils are droughty. They are also generally in poor tilth and have fragments of rock scattered throughout the surface layer. The thickness of the root zone ranges from thick to thin and varies within an individual area. Runoff is rapid, and the hazard of further erosion is severe.

The soils of this complex should be kept in perennial vegetation that will protect them from erosion. Most of the acreage is in second-growth, cutover loblolly pines, but some small areas are in pasture.

Musella Series

The Musella series consists of soils that are well drained or somewhat excessively drained. These soils are on somewhat broken interstream divides and in areas of broken slopes in the southern part of Oconee County. They have formed mainly in dark-colored material weathered from basic igneous and metamorphic rocks, but partly in material weathered from acid igneous and metamorphic rocks. The slopes range from 15 to 25 percent.

The surface layer is red to strong-brown clay loam about 2 to 8 inches thick. The B horizon consists of red clay loam over dark-red clay, and it is thin and discontinuous in places. Slightly weathered bedrock is at a depth of about 25 to 35 inches. The profile is mostly strongly acid.

Musella soils occur with Davidson, Cecil, Madison, and Louisburg soils. They are shallower and have a thinner B horizon than the Davidson, Cecil, and Madison soils. They are much redder and have formed in a different kind of material than the Louisburg soils.

Originally, the Musella soils had a cover of oaks, hickories, pines, and poplars. Much of the acreage has been cleared and cultivated, but most of it is now in pines. The kinds of crops to which these soils are suited is limited by the strong slopes and the high content of stones.

Representative profile of Musella clay loam, 15 to 25 percent slopes, eroded [1] (4¼ miles southeast of Farmington and about a quarter of a mile east of Central of Georgia Railroad, Oconee County):

Ap—0 to 6 inches, red (2.5YR 4/8) clay loam; weak, fine, granular structure; very friable; medium to strongly acid; gradual, wavy boundary.

B1t—6 to 13 inches, red (2.5YR 4/6) clay loam; weak, fine and medium, granular structure; friable; strongly acid; diffuse, wavy boundary.

B2t—13 to 18 inches, dark-red (2.5YR 3/6) clay; moderate, medium, subangular blocky structure; firm; small and large fragments of rock scattered throughout; strongly acid; diffuse, irregular boundary.

C1—18 to 32 inches, dark-red sandy clay loam to sandy loam consisting of highly weathered material derived from gneiss and diorite; many, coarse, distinct, yellowish-brown and black mottles; massive; firm; many slightly weathered fragments of rock scattered throughout; contains a few mica flakes; strongly acid; diffuse, irregular boundary.

C2—32 to 40 inches +, slightly weathered (mafic) rocks consisting primarily of diorite and hornblende gneiss; strongly acid.

In places erosion has been less extensive than in the profile described for the series. In those areas the Ap horizon is dark brown or brown. The size of the fragments of diorite, andesite, and hornblende gneiss in the C horizons and, to some extent, in the B horizons ranges from large to small. Depth to slightly weathered bedrock is variable, but it ranges from about 25 to 35 inches.

Musella clay loam, 15 to 25 percent slopes, eroded (MvE2).—This is the only Musella soil mapped in Clarke and Oconee Counties. Its profile is the one described for the series.

Included in areas mapped as this soil are small patches of a soil that has a thinner surface layer or a thicker subsoil. Also included are small galled spots and areas that contain a few shallow gullies. In these severely eroded galled spots and gullied areas, the Ap horizon is reddish brown to red. The plow layer extends into the subsoil in much of the acreage.

This soil contains fragments of rock, and tilth is generally fair to poor. Permeability is moderate, and the available water capacity is low to moderate. The content of organic matter and the supply of available plant nutrients are low. Crops grown on this soil respond well to fertilizer, but yields are commonly low to moderate.

[1] The Musella soils mapped in the survey area are typical of the series in that the lithic contact is at a depth of about 30 inches.

This soil is not well suited to farming. Most of the acreage is in pines or hardwoods.

Pacolet Series

The Pacolet series consists of well-drained, sloping soils of the uplands. These soils have formed in material weathered from gneiss, schist, and granite. They occupy large areas throughout Clarke and Oconee Counties. The slopes range from about 6 to 25 percent.

In many places where these soils are not severely eroded, the surface layer is dark-brown, very friable sandy loam about 5 to 7 inches thick. In the severely eroded areas, the surface layer is red or reddish-brown sandy clay loam and is thinner. In most places the subsoil is red, clayey material about 20 to 30 inches thick. It is underlain by partly weathered material consisting of yellowish-red sandy clay loam that contains a few fine mica flakes. This layer ranges from only about 19 to as much as 80 inches in thickness. The profile is very strongly acid throughout.

Pacolet soils occur with Appling, Madison, and Cecil soils. They have a redder subsoil than the Appling soils; are less micaceous, especially in the surface layer, than the Madison soils; and have a thinner solum than the Cecil soils.

Some of the gently sloping areas of Pacolet soils are used for pasture or row crops, but most of the acreage is in trees. Many fields that formerly were cultivated are now in loblolly and shortleaf pines.

Representative profile of Pacolet sandy loam, 10 to 15 percent slopes, eroded (about 5½ miles southeast of Watkinsville and one-half mile northeast of Georgia State Highway No. 15, Oconee County):

Ap—0 to 5 inches, dark-brown (10YR 3/3) sandy loam; weak, fine, granular structure; very friable; many fine roots and pores; very strongly acid; gradual, smooth boundary.

B1t—5 to 12 inches, red (2.5YR 4/6) sandy clay loam; weak, fine, subangular blocky structure; friable to firm; very strongly acid; gradual, smooth boundary.

B2t—12 to 26 inches, red (2.5YR 4/6) clay; moderate, medium, subangular blocky structure; firm; very strongly acid; gradual, smooth boundary.

B3t—26 to 31 inches, red (2.5YR 5/6) and yellowish-red (5YR 4/6), mottled clay loam; contains common fine mica flakes; moderate, medium and coarse, subangular blocky structure; firm; very strongly acid; gradual, smooth boundary.

C—31 to 50 inches +, yellowish-red (5YR 4/6) sandy clay loam mottled with yellowish red (5YR 5/6); micaceous; massive; very strongly acid.

In areas that are not severely eroded, the A horizon has a texture of sandy loam. The A horizon ranges from dark grayish brown or grayish brown to dark brown, brown, or light yellowish brown in color and from 3 to 7 inches in thickness. In the severely eroded areas, the A horizon is red or reddish-brown sandy clay loam about 2 to 6 inches thick. The B2t horizon ranges from 10 to 15 inches in thickness. The solum is 25 to 40 inches thick.

Pacolet sandy loam, 10 to 15 percent slopes, eroded (PfD2).—This deep soil is in the steeper parts of Clarke and Oconee Counties, especially near the Oconee and Apalachee Rivers. Its profile is the one described for the series. In much of the acreage, the plow layer extends into the subsoil.

Included in areas mapped as this soil are areas of a soil that is not eroded, and other small areas in which the subsoil is dark red. Also included are a few patches that contain shallow gullies and small galled spots. In those areas the surface layer is red sandy clay loam.

This Pacolet soil is generally in good tilth and has a moderately thick root zone. Permeability and the available water capacity are moderate. The content of organic matter is low.

This soil responds well to good management and is suited to a number of crops. Its strong slopes makes it unsuitable for intensive cultivation. Most of the acreage is in second-growth loblolly pines, pasture, or cultivated crops.

Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded (PgC3).—This soil has lost most or all of its original surface layer through erosion, and in places part of the subsoil has been removed. In many areas the present surface layer is red sandy clay loam about 4 inches thick, and it is underlain by red clay about 25 inches thick. Most areas contain some small gullies or a few deep ones. Included in areas mapped as this soil are small patches of a soil that has a mottled subsoil.

Surface runoff is rapid, and further erosion is a severe hazard if this soil is cultivated. The rate of infiltration is slower and the available water capacity is slightly lower than in a less eroded Pacolet soil. Permeability is moderate. This soil has a moderately thick root zone. Tilth is generally poor because of the high content of clay in the surface layer. The surface layer is hard when dry and sticky when wet. Therefore, tillage can be performed satisfactorily only within a narrow range of moisture content.

This soil responds fairly well to good management, but it is not suited to intensive cultivation. Hay or other close-growing crops can be grown, and the areas are suitable for pasture or trees. Most of the acreage is in trees or is reverting to woodland (fig. 5).

Pacolet sandy clay loam, 10 to 15 percent slopes, severely eroded (PgD3).—Erosion has removed most or all of the original surface layer of this soil and in places part of the subsoil. The present surface layer is only about 2 to 6 inches thick over about 26 inches of red clay. Most areas contain some small gullies or a few deep ones.

The root zone is moderately thick, and permeability is moderate. Tilth is generally poor, however, because of the high content of clay in the surface layer. Surface runoff is rapid; further erosion is a very severe hazard if cultivated crops are grown.

This soil is not well suited to farming. It responds fairly well to good management but is not suitable for cultivated crops. Hay or other close-growing crops can be grown, or this soil can be used for pasture or trees. Most of the acreage is in trees or is reverting to woodland.

Pacolet stony sandy loam, 6 to 15 percent slopes, eroded (PiD2).—From 15 to 20 percent of the surface layer of this soil consists of stones and fragments of rock. The surface layer is 4 to 7 inches thick and is underlain by a clay loam subsoil about 25 inches thick. The stones in the surface layer make tillage impractical (fig. 6).

This soil has a thick root zone, but it is generally in poor tilth and contains stones. Permeability and the available water capacity are moderate.

This soil is well suited to trees and responds well to good woodland management. Most of the acreage is in second-growth loblolly pines.

Figure 5.—An area of Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded, that is reverting to woodland. Planting loblolly pine in this area will probably be more productive than waiting for natural reseeding.

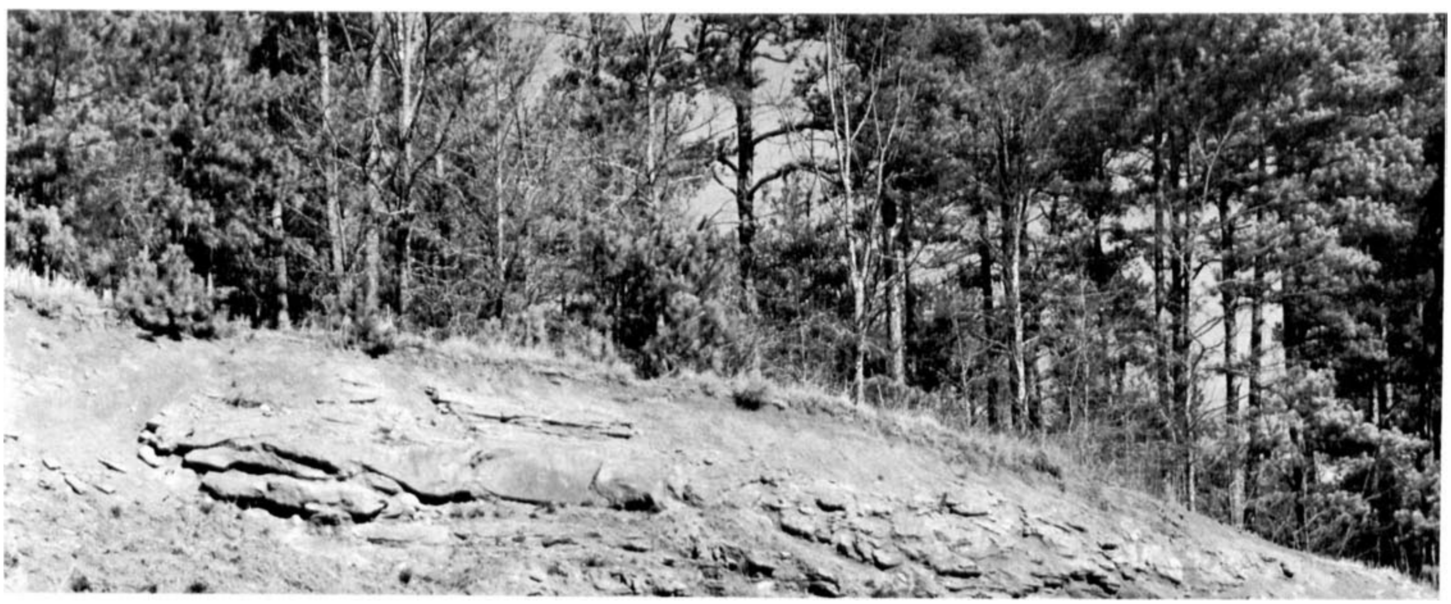

Figure 6.—A cut in an area of Pacolet stony sandy loam, 6 to 15 percent slopes, eroded. This soil is suitable for trees, but its surface layer is too stony for tillage.

Pacolet stony sandy loam, 15 to 25 percent slopes, eroded (PiE2).—About 15 percent of the surface layer of this soil consists of stones and fragments of rock. The surface layer is about 3 to 6 inches thick over a clay loam subsoil. The many stones and the moderately steep or steep slopes make tillage impractical.

Included in the areas mapped as this soil are small galled spots and areas that contain a few shallow gullies. In the galled spots and gullied areas, the surface layer is yellowish-red to red clay loam.

This Pacolet soil has a slightly lower rate of infiltration and lower available water capacity than the Pacolet sandy loams that do not contain stones. It has a thick root zone, but tilth is generally very poor and this soil contains stones and fragments of rock. Permeability and the available water capacity are moderate.

This soil is well suited to trees and responds well to good woodland management. Most of the acreage is in second-growth loblolly pines.

Pacolet-Gullied land complex, 6 to 10 percent slopes (PhC).—This soil complex consists of eroded and very severely eroded Pacolet soils intermixed with areas of Gullied land. The areas of Pacolet soils and Gullied land are so intermingled that mapping them separately was not feasible. About 50 percent of the acreage is Pacolet soils, and about 30 percent is Gullied land. The rest is mainly inclusions of well-drained, eroded and severely eroded Davidson and Madison soils. In each of the areas mapped, the proportions of the different soils are about the same. The areas are no larger than individual areas of these soils mapped separately.

In most places the Pacolet soils of this complex have a surface layer consisting of material from the subsoil mixed with remnants of the original surface layer. The surface layer is red to reddish-brown sandy clay loam 2 to 5 inches thick and is underlain by a subsoil of red clay about 23 inches thick.

Gullied land is made up of many shallow gullies that occur in an intricate pattern (fig. 7), and it also contains a few deep gullies. In most areas of Gullied land, the original soil profile has been destroyed as a result of erosion. The material at the bottom of the gullies is weathered gneiss in many places. The gullies are not so deep as those in Pacolet-Gullied land complex, 10 to 25 percent slopes.

Water enters the surface soil slowly. The available water capacity is variable, depending upon the thickness of the remaining soil material. The content of organic matter is low. Tilth is generally poor, and the hazard of further erosion is very severe.

The soils of this complex are not suitable for cultivation. They are suitable for hay and other close-growing crops, or they can be used for pasture or trees. Most of the acreage is in trees.

Pacolet-Gullied land complex, 10 to 25 percent slopes (PhE).—This soil complex consists of eroded and severely eroded Pacolet soils intermixed with areas of Gullied land. The areas mapped are no larger than individual tracts of these soils mapped separately. About 45 percent of the acreage is Pacolet soils, and about 30 percent is Gullied land. The rest is mainly inclusions of well-drained, severely eroded Madison and Davidson soils. Most areas mapped as this complex contain both of the dominant soils and one or more of the minor soils. Generally, the proportions of areas of these soils are fairly uniform.

Figure 7.—An area of Pacolet-Gullied land complex, 6 to 10 percent slopes, cut by many shallow gullies. Establishing vegetation is difficult on the hard, red clay and clay loam that remain.

The Pacolet soils have a surface layer of red or reddish-brown sandy clay loam or clay loam about 4 inches thick. Their subsoil is red clay about 20 inches thick. The present surface layer consists of remnants of the original surface layer mixed with material from the subsoil.

Gullied land is made up of many shallow gullies that occur in an intricate pattern, and it also includes a few deep gullies. In most areas of Gullied land, erosion has destroyed the original soil profile. In some places on narrow ridges between the gullies, however, part of a soil profile remains.

Infiltration is slow. The available water capacity is variable, depending upon the thickness of the remaining soil profile. Runoff is rapid, and the hazard of further erosion is very severe. The content of organic matter is low.

The soils of this complex should be kept in perennial vegetation that will protect them from erosion. They are suited to pines.

Rock Outcrop

Rock outcrop (Rok) is a miscellaneous land type that occupies small areas near the larger streams. In about three-fourths of the acreage, it consists of bare outcrops of gneiss or granite. In the rest, 15 to 18 inches of soil material covers the bedrock. Little or no profile development has taken place.

In many places where the soil material is shallow over bedrock, plants cannot survive. A few shrubs and grasses, however, do continue to grow. The areas could be developed to a limited extent to provide food and cover for wildlife. They can also be used for recreation.

Wehadkee Series

The Wehadkee series consists of nearly level, poorly drained soils on first bottoms along the major streams. These soils have formed in alluvium derived from gneiss, schist, and granite.

In many places the surface layer is gray loam about 8 inches thick. It is underlain by mottled loam to clay loam. Below is stratified sand, silt, and clay. The profile ranges from strongly acid to medium acid in reaction.

Wehadkee soils are generally adjacent to Chewacla and Congaree soils, and they are intermingled with areas of Alluvial land. They are grayer and more poorly drained than the Chewacla and Congaree soils and are much less variable in texture, color, and drainage than Alluvial land.

The original vegetation was chiefly sweetgum, willow, alder, elm, hickory, yellow-poplar, white oak, and water oak.

In Clarke and Oconee Counties, the Wehadkee soils are not mapped separately but are mapped in undifferentiated units with Alluvial land.

Representative profile of Wehadkee loam (on the flood plains of the Middle Oconee River, about 2 miles south of Whitehall and a quarter of a mile west of the Central of Georgia Railroad, Clarke County):

Ap—0 to 8 inches, gray to light-gray (10YF 6/1) loam; common, fine, faint, grayish-brown (10YR 5/2) mottles; weak, coarse and medium, granular structure; friable to slightly sticky; some mica flakes and many fine roots; strongly acid; diffuse, smooth boundary.

C1g—8 to 30 inches, light-gray (10YR 7/1) loam; many, medium and coarse, prominent, yellow, brown, and gray mottles that increase in size and contrast with increasing depth; weak, fine, subangular blocky structure; friable to firm; some mica flakes; strongly acid; diffuse, wavy boundary.

C2g—30 to 60 inches +, light-gray (N 7/0) clay loam; many, coarse, prominent, yellow, brown, red, and gray mottles; massive; firm; some mica flakes; strongly acid.

The A horizon ranges from gray to light gray in color and from loam to sandy clay loam in texture. The color of the mottles ranges from gray or grayish brown to yellow, brown, or red. In places the reaction is medium acid.

Wehadkee and Alluvial land, wet (Wos) (0 to 2 percent slopes).—About 65 percent of the acreage of this undifferentiated unit is poorly drained Wehadkee soils, and about 35 percent is wet Alluvial land. The soils are on flood plains that range from 20 to 50 yards in width. They are wet and have a water table near the surface for long periods. They are also subject to flooding.

The profile of the Wehadkee soils is the one described for the Wehadkee series. Alluvial land varies too greatly in texture, color, and depth for classifying as a soil series. The sandy clay loam to sandy loam that makes up the surface layer is dark grayish brown to very dark brown. Beneath the surface layer, the soil material ranges from dark gray to shades of grayish brown and is stratified and variable in characteristics. In most places the texture is loam to silty clay loam, but thin layers of sandy loam or loamy sand occur in places.

The available water capacity is variable. The Wehadkee soils are low in content of organic matter and have slow permeability. Alluvial land is variable in permeability.

Unless they are drained, the soils of this undifferentiated unit are too wet for cultivation. They are better suited to trees than to pasture or cultivated crops.

Worsham Series

The Worsham series consists of very poorly drained soils in depressions and around the heads of drainageways. These soils have formed in material weathered from granite, gneiss, and schist, in many places mixed with transported material. Their slopes range from 2 to 6 percent but are mainly between 2 and 4 percent.

In many places the surface layer is grayish-brown to dark-gray sandy loam to sandy clay loam 4 to 9 inches thick. The subsoil is light-gray or gray sandy clay loam to light clay. Bedrock is at some depth between 4 and 8 feet or more. The profile is very strongly acid throughout.

Worsham soils are commonly adjacent to Appling, Cecil, and Colfax soils. They have a more grayish color and are more poorly drained than any of those soils.

Originally, the Worsham soils were covered by hardwoods, mainly oaks, hickories, and poplars. Most of the acreage has been cleared. The areas have generally reverted to pines and scrub hardwoods, however, and most of the acreage is now in trees. Corn, hay, and small grains are grown to some extent, but the areas that have not reverted to trees are used primarily for pasture.

Representative profile of Worsham sandy loam, 2 to 6 percent slopes (1.1 miles southeast of Watkinsville on the south side of Georgia Highway No. 15, Oconee County):

Ap—0 to 2 inches, grayish-brown (10YR 5/2) sandy loam; weak, medium, granular structure; very friable when moist and slightly sticky when wet; many fine roots and pores; very strongly acid; diffuse, smooth boundary.

A2—2 to 6 inches, dark-gray (5Y 4/1) sandy clay loam; moderate, medium, granular structure; friable when moist and slightly sticky when wet; many fine roots and pores; very strongly acid; diffuse, smooth boundary.

B1g—6 to 18 inches, sandy clay loam that is light gray to gray (N 6/0) in upper part of horizon and light gray (N 7/0) in lower part; few, fine, distinct, yellowish-brown (10YR 5/6) mottles in upper part of horizon, and medium mottles in lower part; firm when moist and sticky when wet; few fine roots; few, coarse, sharp sand grains; very strongly acid; diffuse, smooth boundary.

B21tg—18 to 30 inches, light-gray (N 7/0) light clay; few, medium, prominent, red (2.5YR 5/6) and common, medium, prominent, brownish-yellow (10YR 6/6) mottles; firm when moist and sticky when wet; few fine roots; very strongly acid; diffuse, smooth boundary.

B22tg—30 to 60 inches +, gray (N 5/0) light clay; few, medium and coarse, prominent, red (2.5YR 5/6) mottles and common, coarse, brownish-yellow (10YR 6/6) mottles; firm when moist and sticky when wet; few fine roots; very strongly acid.

The A horizons range from dark gray in areas that have not been disturbed to gray, grayish brown, or light grayish brown in open areas. The combined thickness of the A horizons ranges from 4 to 9 inches. In areas that have not been disturbed, dark-brown stains surround the fine roots and are in channels. The B2 horizons are predominantly light clay, but they are sandy clay in some places. The profile ranges from 36 to 65 inches in thickness.

Worsham sandy loam, 2 to 6 percent slopes (WkB).—This is the only Worsham soil mapped in Clarke and Oconee Counties. It occurs in small, widely distributed areas. The profile is the one described for the series. Small areas of Colfax soils were included in areas mapped as this soil.

Permeability is slow, and available water capacity is moderate. Tilth is poor.

This soil is not well suited to cultivation. Small grains are grown to some extent, and some areas are in pasture. Most of the acreage is in trees.

Use of the Soils for Cultivated Crops and Pasture[2]

In this section the system of capability grouping used by the Soil Conservation Service is discussed, the soils in each capability unit are described, and management suited to the soils in each unit is suggested. Following this, estimated acre yields of the principal crops are given for all the soils in the county, and the management required to obtain these yields is described.

Capability Groups of Soils

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

Class VIII soils and landforms have limitations that preclude their use for commercial plant production and restrict their use to recreation, wildlife, or water supply or esthetic purposes.

[2] J. N. NASH, management agronomist, Soil Conservation Service, assisted with the preparation of this section.

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 United States, but not in Clarke and Oconee Counties, 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 subclasses indicated by *w*, *s*, and *c*, because the soils in it are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation.

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

In the following pages, the capability units in Clarke and Oconee Counties are described and suggestions for use and management of the soils are given. Refer to the "Guide to Mapping Units" at the back of this soil survey for the names of soils in any given unit. Where suggestions are made about applying lime and fertilizer, the amount of lime to apply and the kinds and amounts of fertilizer should be determined by testing the soils.

CAPABILITY UNIT I-1

Only the mapping unit, Cecil soils, 0 to 2 percent slopes, overwash, is in this capability unit. These soils are well drained or moderately well drained and are nearly level. They are in depressions and in drainageways in the uplands. The plow layer is very friable sandy loam 6 to 8 inches thick. The effective depth to which roots can penetrate is 36 inches or more.

These soils have moderate natural fertility and a low to moderate content of organic matter. The rate of infiltration is medium, runoff is slow, and the available water capacity is high. These soils are strongly acid or very strongly acid.

Most of the areas are too small to be managed separately and are managed with adjacent soils in cultivated fields and pastures. Many areas are well located for use as waterways.

These soils are well suited to truck crops, corn, small grains, soybeans, and peaches. They are also suited to tall fescue, bermudagrass, crimson clover, and cowpeas for hay and pasture. Row crops can be grown year after year if the crop residue is well managed. Nitrogen, phosphorus, and potassium should be applied annually or according to the needs of the crop to be grown, and lime is needed occasionally. These soils are well suited to sprinkler irrigation.

CAPABILITY UNIT IIe-1

This capability unit consists of well-drained, eroded soils on broad, very gently sloping interstream divides. These soils have a plow layer of very friable sandy loam 6 to 8 inches thick. Their subsoil is friable to firm sandy clay or clay to clay loam. The effective root depth is 36 to 58 inches or more. Depth to bedrock ranges from 6 to 15 feet.

These soils are moderate to low in natural fertility and contain little organic matter. Surface runoff and the rate of infiltration are both medium. The available water capacity is moderate. These soils are strongly acid. Further erosion is a slight to moderate hazard.

About 78 percent of the acreage is cultivated, and about 8 percent is in pasture. The rest is in trees.

These soils are well suited to cotton, corn, small grains, soybeans, peaches, pecans, truck crops, and nursery crops. Pasture and hay crops to which they are well suited are all the locally grown grasses; lespedeza; crimson, Amclo, and white clover; millet; and grain sorghum.

Erosion is the chief hazard if these soils are cultivated. The steepness and length of the slopes, and the practices used to control erosion, influence the kind of cropping system needed to keep losses of soil and water within tolerable limits. A suitable cropping system is one in which cotton or some other row crop is planted in parallel contour strips that alternate with strips of a small grain. With this system, the crops are rotated each year. The straw and stubble should be undisturbed after harvest.

Regular applications of nitrogen, phosphorus, and potassium are needed, and lime should be applied occasionally. An annual application of boron is needed for alfalfa. Practices that help to control erosion and conserve moisture are contour tillage, terracing, contour stripcropping, and vegetating of waterways. These soils are well suited to sprinkler irrigation.

CAPABILITY UNIT IIe-2

This capability unit consists of only one mapping unit, Appling coarse sandy loam, 2 to 6 percent slopes, eroded, on broad interstream divides. This soil is well drained. The surface layer is coarse sandy loam 4 to 11 inches thick. The subsoil is firm sandy clay loam or clay to clay loam. The effective depth to which roots can penetrate is 22 to 36 inches or more. Bedrock is at a depth of 6 to 10 feet.

This soil contains little organic matter and has low natural fertility. The rate of infiltration is medium, and the available water capacity is moderate. This soil is moderately susceptible to further erosion and is strongly acid.

About 85 percent of the acreage is cultivated, and 10 percent is in trees. The rest of the acreage is in pasture.

This soil is well suited to small grains, pimiento peppers, grain sorghum, soybeans, cowpeas, peaches, and pecans. It is slow to warm up in spring. Consequently, cotton, corn, and truck crops make poor growth if they are planted early. Grasses and clover are suitable for hay and pasture. Close-growing crops improve tilth. They also help to control erosion and to maintain the content of organic matter.

The steepness and length of the slopes, and the practices used to control erosion, influence the kind of cropping system needed to keep soil losses from erosion within tolerable limits. Where suitable practices are used to control erosion, row crops can be grown on this soil year after year. For example, if the field is terraced, a suitable cropping system is one in which corn or some other row crop is grown for 2 years and is followed by 1 year of cotton.

CAPABILITY UNIT IIw-1

This capability unit consists of only one mapping unit, Congaree soils and Alluvial land. These soils are nearly level and are moderately well drained or well drained. They are on first bottoms and are flooded occasionally. In places the floodwaters have deposited sand and silt on the surface. The present surface layer is very friable loamy sand to silt loam. The effective depth to which roots can penetrate is 36 to 48 inches or more.

The content of organic matter is moderate to low, and these soils are strongly acid. Runoff is slow, the rate of infiltration is rapid, and erosion is only a slight hazard. The available water capacity is moderate to high. Good tilth is easily maintained, and plant nutrients are not rapidly leached out.

About 50 percent of the acreage is in trees, about 30 percent is in pasture, and about 10 percent is in cultivated crops. The rest is idle.

These soils are well suited to corn, sorghum, and truck crops. Among the plants suitable for hay and pasture are crimson clover, tall fescue, annual lespedeza, ryegrass, and peas. A suitable cropping system is one that helps to maintain the content of organic matter and that improves the soil structure. An example of such a cropping system is corn or some other row crop grown each year, and all of the crop residue left on the surface. The crop residue should be worked into the soil when the seedbed is prepared in spring.

Regular applications of nitrogen, phosphorus, and potassium are needed, and lime should be applied occasionally. If row crops are grown intensively, it is important to maintain the supply of organic matter. These soils are well suited to sprinkler irrigation. Flooding is the chief limitation, but open drainage ditches that have a cover of grasses or legumes provide effective drainage.

CAPABILITY UNIT IIIe-1

This capability unit consists predominantly of well-drained, gently sloping, eroded soils on the crests of ridges. The soils that are only slightly to moderately eroded have a very friable surface layer, but the surface layer of the severely eroded soils is firm. The subsoil is red, firm sandy clay loam to clay. The effective depth to which roots can penetrate is 36 to 48 inches or more.

These soils are low in natural fertility and contain little organic matter. They are strongly acid. The rate of infiltration is medium to slow, permeability is moderate, and the available water capacity is moderate to moderately low.

About 65 percent of the acreage is cultivated, 18 percent is in trees, and 15 percent is in pasture. The rest is idle.

The soils that are no more than moderately eroded are suited to cotton, corn, and small grains, but the severely eroded soils are only fairly well suited to those crops. Millet, soybeans, peas, peaches, and pecans can also be grown. Clover, bermudagrass, alfalfa, dallisgrass, tall fescue, and orchardgrass are suitable plants for hay and pasture.

Erosion is the chief hazard if these soils are not well protected by a cover of plants. The steepness and length of the slopes, and the practices used to control erosion (fig. 8) influence the kind of cropping system that can be used. Where these soils are terraced, a suitable cropping system is corn or some other row crop grown for 1 year, and grass grown for 2 years.

Nitrogen, phosphorus, and potassium should be applied regularly, and lime is needed occasionally. An annual application of boron is needed for alfalfa. Crop residue turned under helps to replenish the supply of organic matter. Needed practices that retard runoff and help to control erosion are contour tillage, terracing, contour stripcropping, and establishing grassed waterways. These soils are suited to sprinkler irrigation. If a moldboard plow is used, a plowsole is likely to form directly under the plow layer. The plowsole can be broken up by deep tillage or by growing deep-rooted legumes. The severely eroded soils are difficult to till and can be worked only within a narrow range of moisture content.

CAPABILITY UNIT IIIe-2

This capability unit consists of only one mapping unit, Appling coarse sandy loam, 6 to 10 percent slopes, eroded. This soil is well drained. It is on broad, saddlelike interstream divides. The surface layer is very friable coarse sandy loam, and the subsoil is friable to firm clay loam to clay. The effective depth to which roots can penetrate is 22 to 36 inches.

Natural fertility and the content of organic matter are low. The rate of infiltration is medium, and the available water capacity is moderate. This soil is strongly acid.

About 43 percent of the acreage is in trees, and 30 percent is in pasture. The rest of the acreage is idle.

This soil is suited to cotton, corn, and truck crops. It is slow to warm up in spring, however, and these crops should not be planted early. Small grains, soybeans, peaches, and pecans are other suitable crops. Crimson clover, annual lespedeza, sericea lespedeza, Coastal bermudagrass, dallisgrass, tall fescue, and orchardgrass are among the plants suitable for hay and pasture. Close-growing crops improve tilth. They also help to control erosion and to maintain the content of organic matter.

Figure 8.—**Corn and sericea lespedeza growing in contour strips along a vegetated waterway in a field of Cecil sandy loam, 6 to 10 percent slopes, eroded.**

Erosion is the chief hazard if this soil is cultivated. The steepness and length of the slopes, and the practices used to control erosion, influence the kind of cropping system that can be used. Where stripcropping is done on the contour, a suitable cropping system is one in which cotton or some other row crop is planted in parallel contour strips that alternate with strips of a grass, such as fescue. With this system, the crops are rotated every 2 years.

Regular applications of nitrogen, phosphorus, and potassium are needed, and lime is needed occasionally. Tilling on the contour, terracing, and establishing grassed waterways help to retard runoff and to control erosion.

CAPABILITY UNIT IIIs-1

Only Buncombe loamy sand is in this capability unit. It is an excessively drained, frequently flooded soil on first bottoms along the larger streams. The loamy sand surface layer is underlain by loamy sand and sand.

Natural fertility and the content of organic matter are low. Surface runoff is slow or very slow, internal drainage is rapid, and the available water capacity is low. This soil is very strongly acid.

This is not an extensive soil. Most of the acreage is in trees, but part is in pasture or idle. The soil is not well suited to cultivated crops, but corn, velvetbeans, and watermelons can be rotated with close-growing crops. Sericea lespedeza and Coastal bermudagrass are suitable for pasture.

Erosion is not a hazard, but a cropping system is required that helps to maintain a large amount of organic matter in the soil. A suitable cropping system for this purpose is one in which a grass, such as Coastal bermudagrass or bahiagrass, is grown for 2 years and is followed by corn or some other row crop grown for 1 year.

This soil is droughty and is easily leached of plant nutrients. Frequent applications of lime, nitrogen, phosphorus, and potassium are required. Organic matter is also needed, and it can be supplied by turning under crop residue. This soil is not suited to sprinkler irrigation. It is well suited to pines if scrub oaks, briers, and sassafras sprouts are kept under control.

CAPABILITY UNIT IIIw-1

This capability unit consists of only one mapping unit, Chewacla soils and Alluvial land. These soils are somewhat poorly drained and are on first bottoms where they are flooded occasionally. The surface layer is very friable fine sandy loam to silt loam. It is underlain by soil material that ranges from firm silty clay to very friable, mottled loamy sand. There is no evidence of erosion, but in places floodwaters have left deposits of sand and silt on the surface. The effective depth to which roots can penetrate is 36 to 60 inches.

Natural fertility is moderately high, and the content of organic matter is moderate. Surface runoff is slow. The rate of infiltration is medium, permeability is moderate to moderately slow, and the available water capacity is moderate to high. These soils retain plant nutrients well. They are strongly acid or very strongly acid.

About 60 percent of the acreage is in pasture, 30 percent is in trees, and 5 percent is in cultivated crops. The rest is idle.

The soils of this unit are suited mainly to hay and pasture. Ryegrass, fescue, Coastal bermudagrass, dallisgrass, annual lespedeza, crimson clover, and ladino clover are among the plants suitable for forage. Corn, grain sorghum, soybeans, velvetbeans, and peas can be grown, but they are likely to be damaged by flooding. These soils are suited to row crops grown year after year if the crop residue is well managed. Crops should be planted that supply organic matter, and that help to maintain productivity and to preserve good tilth. Nitrogen, phosphorus, and potassium should be applied regularly, and lime is needed occasionally.

These soils are well suited to sprinkler irrigation. Open drainage ditches planted to grasses and legumes will provide drainage.

CAPABILITY UNIT IIIw-2

Only one soil, Colfax sandy loam, 2 to 6 percent slopes, is in this capability unit. It is somewhat poorly drained and occurs in depressions and gently sloping areas of the uplands. The surface layer is very friable sandy loam. In some places 6 to 10 inches of sandy material has been deposited on the surface. The subsoil is firm sandy clay loam in most places. In a few spots, however, it contains a layer of clay that resembles a pan. Except where the growth of roots is restricted by the clayey material or by the seasonal high water table, the effective depth to which roots can penetrate is 20 to 30 inches.

This soil is low in natural fertility and in content of organic matter. Surface runoff is medium, permeability is moderately slow, and the available water capacity is moderate to low. The profile is very strongely acid throughout.

About 50 percent of the acreage is in pasture, 25 percent is in cultivated crops, and the rest is in trees. Some areas are well located for use as waterways.

This soil is suited to summer pasture of annual lespedeza, bermudagrass, dallisgrass, clover, and small grains. Corn and truck crops can be grown, but they do not grow well if they are planted early, because this soil warms up slowly in spring. A suitable cropping system is one in which row crops are grown for 2 years and are followed by 2 years of legumes or grasses. If this soil is cultivated when wet, it tends to form clods and cracks as it dries. All crop residue should be retained, and nitrogen, phosphorus, and potassium ought to be applied regularly. Diversions are needed in some places to intercept runoff from higher areas. This soil is suited to sprinkler irrigation.

CAPABILITY UNIT IVe-1

This capability unit consists of well-drained, mostly severely eroded soils on the side slopes of interstream divides. The areas contain some shallow gullies and a few gullies 3 to 6 feet deep. The slopes range from 6 to about 15 percent.

These soils are low in natural fertility and in content of organic matter. The severely eroded soils are generally in poor tilth. The available water capacity is moderate to low. The soils are subject to further erosion and are strongly acid or very strongly acid.

About 35 percent of the acreage is cultivated, another 35 percent is in trees, and 25 percent is in pasture. The rest is idle.

These soils are poorly suited to cultivated crops but can be used for deep-rooted plants grown for hay or pasture. Sericea lespedeza and alfalfa are suitable for hay. Common bermudagrass, Coastal bermudagrass, fescue, crimson clover, and kudzu are suitable for pasture.

The steepness and length of the slopes, and the practices used to control erosion, influence the kind of cropping system that can be used. Where contour stripcropping is practiced, corn or some other row crop can be grown for 2 years and should be followed by fescue or another kind of grass for 4 years.

Regular applications of nitrogen, phosphorus, and potassium are needed. Lime should be added often enough to keep the reaction neutral or only slightly acid. An annual application of boron is needed for alfalfa. Practices that help to control erosion if row crops are grown are contour tillage, stripcropping, terracing, and establishing grassed waterways.

The severely eroded soils should be worked only within a narrow range of moisture content. If the soils are plowed when wet, clods tend to form and the soils become hard when they dry. The strong slopes and slow rate of infiltration make these soils unsuitable for sprinkler irrigation.

CAPABILITY UNIT IVe-2

This capability unit consists of soils that are well drained and somewhat excessively drained and have slopes of 6 to 10 percent. These soils are shallow to moderately deep over bedrock. In most places bedrock directly underlies the surface layer of loamy sand and is at a depth of less than 3 feet. The effective depth to which roots can penetrate is only about 12 to 24 inches.

Natural fertility and the content of organic matter are low, and tilth is generally poor. Permeability and the rate of infiltration are moderate to rapid, the available water capacity is moderate to low, and surface runoff is medium. These soils are strongly acid or very strongly acid. Erosion is a severe hazard.

About 75 percent of the acreage is wooded. A small acreage is cultivated or in pasture.

This soil is moderately well suited to cotton, corn, annual lespedeza, oats, bahiagrass, bermudagrass, ryegrass, crimson clover, and sericea lespedeza. The hazard of erosion makes the soils unsuitable for growing clean-cultivated crops year after year. Yields of all crops are limited by the low available water capacity. A suitable cropping system is 1 year of row crops followed by grasses or legumes for 3 years.

If annual crops are grown on these soils, all crop residue should be kept on the surface during periods when the soils are not protected by a cover of plants. While crops are growing, crop residue ought to be kept on or just below the surface if feasible. Lime ought to be added every 3 to 5 years and a complete fertilizer should be added regularly. Practices that control erosion are needed to protect these soils.

CAPABILITY UNIT IVw-1

This capability unit consists of only one mapping unit, Wehadkee and Alluvial land, wet, on first bottoms along the major streams. These soils are poorly drained and frequently flooded. They have a high water table, and many of the areas are under water most of the year (fig. 9). The surface layer is friable sandy loam or silt loam to sandy clay loam. It is underlain by friable to firm loam to silty clay loam.

These soils have moderate natural fertility and a low content of organic matter. They are strongly acid to medium acid. Surface runoff is slow or very slow, and the available water capacity is high. Draining the soils is difficult and not always economically feasible. In most places the soils support a mixture of undesirable hardwoods, mainly willow, alder, ash, blackgum, poplar, and water oak, and an undergrowth of marsh grasses.

Figure 9.—**Trees and brush on an area of Wehadkee and Alluvial land, wet, where the water table is at or near the surface for long periods.**

Ladino clover, tall fescue, bermudagrass, and dallisgrass are suitable plants for pasture on these soils. Corn and sorghum can be grown in areas that are drained and protected from flooding. In those areas a suitable cropping system is one in which row crops are grown for 2 years and are followed by 2 years of grass and clover. Lime and a complete fertilizer should be applied regularly.

CAPABILITY UNIT Vw-1

Worsham sandy loam, 2 to 6 percent slopes, is the only soil in this capability unit. It is very poorly drained and occurs in depressions, around the heads of drainageways, and at the base of slopes. In most areas the surface layer is sandy loam, but a layer of sand and clay 6 to 16 inches thick has been deposited on the surface in places. The subsoil is predominantly grayish, sticky light clay.

Natural fertility is moderately low, and the content of organic matter is low. The available water capacity is moderate, and surface runoff is slow. Permeability is moderate in the surface layer and slow in the subsoil. This soil is very strongly acid.

Most of the acreage is in trees. Areas that have been drained are used for summer pasture consisting of such plants as bermudagrass, dallisgrass, annual lespedeza, and ladino clover. Poplar, maple, blackgum, willow, pine, and an undergrowth of marsh grasses grow in the wooded areas.

Regular applications of lime, nitrogen, phosphorus, and potassium are needed on the pastures. Open ditches will generally provide adequate drainage, but diversions may be needed for protection against water that runs off higher areas. In areas that have not been drained, wetness makes the seeding and mowing of pastures difficult. These areas contain some good sites for farm ponds.

CAPABILITY UNIT VIe-1

This capability unit consists of deep, well-drained, moderately eroded and severely eroded soils on uplands. The slopes range from 6 to 25 percent. In most places the plow layer of the moderately eroded soils is friable sandy loam or coarse sandy loam and the plow layer of the severely eroded soils is friable clay loam or sandy clay loam. The subsoil is predominantly yellowish-red to dark-red sandy clay loam to clay. The effective depth to which plants can penetrate is generally about 36 inches, but it is greater in some places. Bedrock is at a depth of more than 6 feet.

Natural fertility and the content of organic matter are low. The moderately eroded soils are in fair to good tilth, and the severely eroded ones are in poor tilth. Permeability and the available water capacity are moderate, and the rate of infiltration is medium to slow. Surface runoff is medium to very rapid. The severely eroded soils can be tilled only within a narrow range of moisture content without becoming cloddy or puddled. The hazard of further erosion is severe.

Much of the acreage has been cultivated in the past, but about 70 percent is now wooded. About 15 percent is in pasture, 8 percent is cultivated, and the rest is idle.

The soils of this unit are suitable for pasture, hay, or trees, but they are generally not suitable for cultivation. All of the locally grown grasses and legumes, except alfalfa, are suitable. Establishing a stand is difficult, however, because of the strong slopes, severe hazard of further erosion, and heaving in winter.

If a hay crop is to be planted or a pasture established, these soils should be planted and tilled on the contour. A complete fertilizer should be applied every year and lime applied every 3 to 5 years. The stands of pasture or hay should be renewed in alternate strips to help check erosion. Controlling grazing prevents the cover of plants from deteriorating and thus minimizes the hazard of erosion.

CAPABILITY UNIT VIe-2

Only the mapping unit Madison-Louisa complex, 10 to 15 percent slopes, eroded, is in this capability unit. The soils are on narrow ridges or irregular slopes. They are well drained or somewhat excessively drained, strongly acid or very strongly acid, and shallow over bedrock. Weathered or hard rock limits the root zone to about 18 inches in about 50 percent of the acreage. In most places the surface layer is very friable sandy loam, and the subsoil is red, micaceous clay loam or clay. The underlying material is weathered micaceous or granitic rock. In some places hard granitic rock is within 18 inches of the surface.

Surface runoff is medium, and the rate of infiltration is medium to rapid. The available water capacity is moderate to low. The supply of available plant nutrients is also low, but crops grown on these soils respond fairly well if fertilizer is applied. These soils are in good tilth, but stones hinder cultivation in some places.

These soils are generally not suited to cultivated crops. They are only moderately well suited to hay crops and pasture but can be used for trees. The soils are moderately well suited to bermudagrass and sericea lespedeza, but yields are only low to moderate, even if the soils are well managed. Lime is needed every 3 to 5 years, and a complete fertilizer is needed annually for most hay crops or pasture.

CAPABILITY UNIT VIe-3

Musella clay loam, 15 to 25 percent slopes, eroded, is the only soil in this capability unit. This soil is well drained or somewhat excessively drained. The surface layer is clay loam about 6 inches thick. It is underlain by a subsoil of clay loam to clay about 12 inches thick. Beneath the subsoil is material weathered from gneiss and diorite.

Natural fertility is low, permeability is moderate, and the available water capacity is low to moderate. Surface runoff is rapid, and the hazard of further erosion is severe. This soil is generally strongly acid.

This soil is not suited to cultivated crops. It can be used for pasture or trees and is suited to all of the locally grown grasses and legumes. The severely eroded galled spots and gullied areas are better suited to pine trees than to hay or pasture. In the areas used for pasture, moderate to large applications of lime and a complete fertilizer are needed for good yields. Controlling grazing helps to prevent the cover of plants from deteriorating, and it thus helps to control erosion.

CAPABILITY UNIT VIIe-1

Madison sandy clay loam, 10 to 25 percent slopes, severely eroded, is the only soil in this capability unit. It is a deep soil that is well drained. The uppermost 5 inches of the soil material is friable sandy clay loam or clay loam. The subsoil is micaceous clay loam to clay. The effective depth to which roots can penetrate is 36 inches or more. Bedrock is commonly at a depth of more than 6 feet.

This soil is low in natural fertility and in content of organic matter. It is generally in poor tilth. Permeability is moderate, the rate of infiltration is slow, and the available water capacity is moderate to low. Surface runoff is rapid.

In the past much of the acreage was cultivated. Now, about 85 percent is wooded.

The strong slopes and severe or very severe hazard of further erosion make this soil unsuitable for cultivation. It is suitable for shortleaf and loblolly pines. Running logging roads and firebreaks across the slope and performing all forestry operations on the contour will reduce the risk of further erosion.

CAPABILITY UNIT VIIe-2

This capability unit consists of slightly eroded to moderately eroded, well-drained to somewhat excessively drained soils on uplands. These soils are shallow to deep over weathered material. Their slopes range from 10 to 25 percent. The soil material in the uppermost 6 to 8 inches of the profile ranges from friable sandy loam to loose loamy sand or stony loamy sand. The subsoil is variable but ranges from clay loam or clay to sandy loam or loose loamy sand. Normally, the depth to which roots can penetrate effectively is only 12 to 24 inches.

These soils are low in natural fertility and in content of organic matter. Tilth is poor in the stony soil and fairly good in the others. Permeability is moderate to rapid, and the rate of infiltration is medium to rapid. Surface runoff is moderately rapid to rapid, and the available water capacity is moderate to low. The hazard of further erosion is severe or very severe. These soils are strongly acid or very strongly acid.

About 90 percent of the acreage is in forest, and a small acreage is in pasture. Because of the strong slopes, the stones in the surface layer, and the hazard of further erosion, these soils are unsuitable for cultivated crops, but they are suited to shortleaf and loblolly pines. Running logging roads and firebreaks across the slope and performing all forestry operations on the contour will reduce the risk of further erosion.

CAPABILITY UNIT VIIe-3

This unit consists of areas of well-drained soils that have a clayey subsoil and of areas of Gullied land. The slopes range from 6 to 25 percent. Erosion is variable but ranges from moderate to very severe. It is very severe in about 70 percent of the acreage. In the areas of Gullied land, erosion has destroyed the original soil profile. Because of the strong slopes and the extensive intermingling of the areas, it was not practical to map the less eroded soils and Gullied land separately. In the areas of Gullied land, the soil material remaining between the gullies is mostly sandy clay loam that was originally the lower part of the B horizon.

The available water capacity is variable but is generally low, depending upon the thickness of the remaining soil material in the areas of Gullied land. Runoff is rapid. Natural fertility is very low, and the content of organic matter is low. The hazard of further erosion is very severe.

Much of the acreage is in volunteer scrub pines and in undesirable hardwoods. A small acreage is in kudzu.

The soils of this unit should be kept in perennial vegetation, chiefly trees. They are suited to shortleaf and loblolly pines, and those trees help to control erosion.

CAPABILITY UNIT VIIIs-1

Only the miscellaneous land type Rock outcrop is in this capability unit. Granite covers about 75 percent of the surface. The thickness of the soil material in the rest of the acreage ranges from a few inches to about 18 inches. This land type occupies only a small acreage in Clarke and Oconee Counties.

Generally, only a few shrubs and grasses grow on this land type. The areas can be managed so that they will provide protection for wildlife. To a limited extent, they can be developed for recreational use.

Estimated Yields

Table 2 gives estimated average acre yields of the principal crops grown on most of the soils of Clarke and Oconee Counties. The yields are those that might be expected under improved management, that is, management better than the management commonly followed. The estimates are based on records of actual yields on individual farms, on information obtained through experiments, and on estimates made by agronomists who have had experience with the crops and the soils. Where an estimate has not been entered in table 2, it can be assumed that yields would be so low as to make production of that crop impractical, or that such intensive management would be required that production would not be feasible. The estimates do not reflect losses caused by flooding, nor do they reflect increased yields resulting from irrigation.

Generally, the management required to obtain the yields shown in table 2 is of the kind described in the section "Capability Groups of Soils." It includes choosing carefully the kind of crop to be grown and the cropping

TABLE 2.—*Estimated average acre yields of the principal crops grown under an improved level of management*

[These estimates do not reflect losses caused by flooding, or increased yields resulting from irrigation. Absence of a yield figure indicates that the crop is not suited to the particular soil]

Soil	Cotton	Corn	Grain sorghum	Oats	Sericea lespedeza	Coastal bermudagrass and crimson clover for pasture	Tall fescue and white clover for pasture
	Lbs. of lint	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Animal-unit-days* [1]	*Animal-unit-days* [1]
Appling coarse sandy loam, 6 to 10 percent slopes, eroded	550	60	43	60	2.6	230	150
Appling coarse sandy loam, 2 to 6 percent slopes, eroded	675	68	45	72	2.8	240	175
Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	425	40	40	45	2.3	200	125
Buncombe loamy sand	------	40	33	------	1.5	100	------
Cecil sandy loam, 2 to 6 percent slopes, eroded	700	68	47	72	3.0	250	175
Cecil sandy loam, 6 to 10 percent slopes, eroded	525	60	40	60	2.8	250	160
Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded	450	45	38	45	2.6	225	140
Cecil soils, 0 to 2 percent slopes, overwash	700	80	55	75	3.3	260	200
Chewacla soils and Alluvial land:							
Chewacla soil	------	70	40	------	------	195	200
Alluvial land	------	------	------	------	------	------	150
Colfax sandy loam, 2 to 6 percent slopes	------	45	45	50	------	------	170
Congaree soils and Alluvial land:							
Congaree soil	------	90	60	60	3.0	235	200
Alluvial land	------	------	------	------	------	200	160
Davidson sandy loam, 2 to 6 percent slopes, eroded	550	60	50	55	3.2	255	175
Davidson sandy loam, 6 to 10 percent slopes, eroded	500	55	43	62	3.0	250	160
Davidson sandy loam, 15 to 25 percent slopes, eroded	------	------	------	------	2.2	180	130
Davidson clay loam, 2 to 6 percent slopes, severely eroded	450	50	40	55	2.5	225	150

See footnote at end of table.

TABLE 2.—*Estimated average acre yields of the principal crops grown under an improved level of management*—Continued

Soil	Cotton	Corn	Grain sorghum	Oats	Sericea lespedeza	Coastal bermudagrass and crimson clover for pasture	Tall fescue and white clover for pasture
	Lbs. of lint	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Animal-unit-days* [1]	*Animal-unit-days* [1]
Davidson clay loam, 6 to 10 percent slopes, severely eroded	400	45	35	50	2.6	225	145
Davidson clay loam, 10 to 15 percent slopes, severely eroded	350	35	------	40	2.2	200	130
Davidson clay loam, 15 to 25 percent slopes, severely eroded	------	------	------	------	2.0	160	------
Louisburg loamy sand, 6 to 10 percent slopes	300	27	------	40	1.4	130	100
Louisburg loamy sand, 10 to 25 percent slopes	------	------	------	------	1.2	120	75
Louisburg stony loamy sand, 10 to 25 percent slopes	------	------	------	------	------	------	------
Madison sandy loam, 2 to 6 percent slopes, eroded	625	65	45	65	3.0	250	170
Madison sandy loam, 6 to 10 percent slopes, eroded	550	55	40	58	2.8	250	160
Madison sandy loam, 10 to 15 percent slopes, eroded	450	45	37	55	2.4	200	140
Madison sandy loam, 15 to 25 percent slopes, eroded	------	------	------	------	1.6	180	120
Madison sandy clay loam, 2 to 6 percent slopes, severely eroded	425	50	37	55	2.8	225	140
Madison sandy clay loam, 6 to 10 percent slopes, severely eroded	400	40	38	45	2.4	225	130
Madison sandy clay loam, 10 to 25 percent slopes, severely eroded	------	------	------	------	------	160	120
Madison-Louisa complex, 6 to 10 percent slopes, eroded:							
Madison soil	500	55	45	55	2.4	250	150
Louisa soil	270	25	------	35	1.3	120	90
Madison-Louisa complex, 10 to 15 percent slopes, eroded:							
Madison soil	450	50	40	------	2.4	240	145
Louisa soil	------	------	------	------	1.0	100	70
Madison-Louisa complex, 15 to 25 percent slopes, eroded:							
Madison soil					2.2	150	140
Louisa soil	------	------	------	------	------	------	------
Musella clay loam, 15 to 25 percent slopes, eroded	------	------	------	------	------	------	90
Pacolet sandy loam, 10 to 15 percent slopes, eroded	450	45	37	45	2.5	200	155
Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	300	37	28	37	2.3	225	125
Pacolet sandy clay loam, 10 to 15 percent slopes, severely eroded	------	------	------	------	1.8	190	110
Pacolet stony sandy loam, 6 to 15 percent slopes, eroded	------	------	------	------	1.0	120	110
Pacolet stony sandy loam, 15 to 25 percent slopes, eroded	------	------	------	------	.8	100	100
Pacolet-Gullied land complex, 6 to 10 percent slopes:							
Pacolet soil	325	35	25	35	1.8	180	100
Gullied land	------	------	------	------	------	------	------
Pacolet-Gullied land complex, 10 to 25 percent slopes:							
Pacolet soil					1.8	120	95
Gullied land	------	------	------	------	------	------	------
Rock outcrop	------	------	------	------	------	------	------
Wehadkee and Alluvial land, wet:							
Wehadkee soil	------	------	------	------	------	------	160
Alluvial land, wet	------	------	------	------	------	------	100
Worsham sandy loam, 2 to 6 percent slopes	------	------	------	------	------	------	140

[1] Animal-unit-day is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during the year without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows, for example, has a carrying capacity of 60 animal-unit-days.

system to be used; preparing a suitable seedbed; using suitable methods for planting the seed, and planting at suitable rates and at appropriate times; controlling weeds and insect pests; inoculating the seed of legumes; planting high-yielding varieties; controlling water by means of a drainage system, terraces, vegetated waterways, and contour cultivation; and applying fertilizer and lime as indicated by the results of soil tests. In addition, special practices for particular crops are as follows:

Cotton: For soils on which the expected acre yield is 500 pounds or more, apply 80 to 120 pounds of nitrogen (N) per acre and 60 to 80 pounds each of phosphoric acid (P_2O_5) and potash (K_2O); plant enough seed to produce 25,000 to 30,000 plants per acre, drilled in rows; and turn under all crop residue, or grow a winter cover crop and turn it under.

Corn: For soils on which the expected acre yield is 75 bushels, apply 100 to 140 pounds of nitrogen (N) per acre and 60 to 80 pounds each of phosphoric acid (P_2O_5) and potash (K_2O); plant enough seed to produce 10,000 to 15,000 plants per acre; and turn under all crop residue, or grow a winter cover crop and turn it under.

Grain sorghum: For soils on which the expected acre yield is 75 bushels or more, apply 70 to 80 pounds of nitrogen (N) per acre and 40 to 60 pounds each of phosphoric acid (P_2O_5) and potash (K_2O); plant enough seed to produce 25,000 to 30,000 plants per acre, drilled in rows; and turn under all crop residue, or grow a winter cover crop and turn it under.

Oats: For soils on which the expected acre yield is 70 bushels or more, apply 40 to 60 pounds of nitrogen (N) per acre and 50 to 60 pounds each of phosphoric acid (P_2O_5) and potash (K_2O) at planting time; apply 32 to 64 pounds of nitrogen late in winter.

Wheat: For soils on which the expected acre yield is 35 bushels or more, apply 40 to 60 pounds of nitrogen (N) per acre and 50 to 60 pounds each of phosphoric acid (P_2O_5) and potash (K_2O) at planting time; apply 32 to 64 pounds of nitrogen late in winter.

Sericea lespedeza: For soils on which the expected acre yield is 2 tons or more of hay, apply 8 to 12 pounds of nitrogen (N) per acre, 40 to 50 pounds each of phosphoric acid (P_2O_5) and potash (K_2O), and 1 ton of lime at seeding time; thereafter, apply 48 to 72 pounds each of phosphoric acid (P_2O_5) and potash (K_2O) per acre annually; add 1 ton of lime every 4 or 5 years, or add lime in accordance with the needs indicated by the results of soil tests.

Coastal bermudagrass and crimson clover: For soils on which the expected acre yield is 150 to 250 animal-unit-days' grazing of bermudagrass and crimson clover, apply 32 to 96 pounds of nitrogen (N) per acre, depending on the effectiveness of the clover in furnishing nitrogen for the grass, and apply 48 to 96 pounds each of phosphoric acid (P_2O_5) and potash (K_2O); apply 1 ton of lime every 4 years, or apply lime in accordance with the needs indicated by the results of soil tests. Mow to control weeds and to prevent the plants from making excessive growth.

Tall fescue and white clover: For soils on which the expected acre yield is 100 to 150 animal-unit-days' grazing of fescue and white clover, apply 32 to 96 pounds of nitrogen (N) per acre, depending on the effectiveness of the clover in furnishing nitrogen for the grass, and apply 48 to 96 pounds each of phosphoric acid (P_2O_5) and potash (K_2O); apply 1 ton of lime every 4 years, or apply lime according to the needs indicated by the results of soil tests. Mow to control weeds and to prevent the plants from making excessive growth.

Use of the Soils for Woodland[3]

More than 53 percent of the acreage in Clarke and Oconee Counties is in trees that are important for pulp or lumber. The better grades of bottom-land hardwoods are sold for veneer, and the poorer grades are sold for lumber. Markets are available for all the wood products.

Loblolly pine is the principal species grown commercially on the uplands. Generally, a mixture of loblolly pine and shortleaf pine grow on the ridgetops and upper slopes. Loblolly pine, yellow-poplar, sweetgum, blackgum, oak, and a mixture of minor species grow on the bottoms along streams. Some of the stands are well stocked, but the trees in other stands are scattered. Within the past few years, much progress has been made in conserving the woodland in these two counties. Many owners of woodland conserve their wooded tracts by carefully regulating the cutting cycle and harvest.

[3] NORMAN E. SANDS, forester, Soil Conservation Service, assisted in writing this section.

Woodland Suitability Groups

Management of woodland can be planned more effectively if the soils are grouped according to those characteristics that affect the growth of trees and the management of the stands. For this reason the soils of Clarke and Oconee Counties have been placed in six woodland suitability groups. 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.

In the discussion of each woodland suitability group, the productivity of the soils for trees and the limitations when used for trees are indicated. More detailed information about the soils is given in the section "Descriptions of the Soils." The "Guide to Mapping Units" at the back of the survey lists the soils in the county and gives the woodland suitability group for each. Not shown is a woodland suitability group for Rock outcrop, because that land type is not suited to trees. Terms used in discussing the soils of each group, and the chief limitations of the soils, are explained in the paragraphs that follow.

In this section productivity is expressed as the *site index*, which is the average height, in feet, that the most desirable (dominant and codominant) trees of a given species, growing on a specified soil, will reach in 50 years. The discussion of each woodland suitability group gives the average site index and the average yearly growth rate for the principal kinds of trees growing on the soils of that group. The average site indexes given are based on measurements of trees of different species and on published and unpublished records (*6, 8, 9, 10*).[4] The average yearly growth rate per acre is expressed in standard rough cords to age 35 in a fully stocked, natural stand, without intensive management.

Plant competition refers to the rate of invasion by undesirable trees, shrubs, and vines when an opening is made in the canopy as a result of fire, cutting, grazing, or other means. The invading plants compete with the desirable trees and hinder their establishment and growth.

Competition is *slight* if it does not prevent adequate natural regeneration and early growth of desirable trees, or interfere with the normal development of planted seedlings. It is *moderate* if the invaders delay but do not prevent the establishment of a normal, fully stocked stand, either naturally occurring or planted. Competition is *severe* if it prevents adequate restocking, either natural or artificial, without intensive preparation of the site, and without special maintenance practices, including weeding.

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

[4] Italic numbers in parentheses refer to Literature Cited, p. 54.

is severely restricted by one or more unfavorable soil characteristics.

Seedling mortality refers to the expected loss of seedlings as a result of unfavorable soil characteristics or topographic features, but not as a result of plant competition. Even if healthy seedlings of suitable species are correctly planted or occur naturally in adequate numbers, some will not survive if conditions are unfavorable. Ratings are based on the mortality of seedlings among the number normally planted for adequate stocking. Mortality is *slight* if not more than 25 percent of the planted seedlings is lost, *moderate* if 25 to 50 percent is lost, and *severe* if more than 50 percent is lost.

Species suitability refers to the kinds of trees that should be favored in managing existing stands, and also to trees that should be used for planting.

Erosion hazard refers to the degree of limitation placed on the production of wood crops as a result of potential erosion if the soils are used as woodland and if normal management and harvesting practices are used. The erosion hazard is considered *slight* if control of erosion does not require any special practices. It is *moderate* if some attention is needed to prevent unnecessary soil erosion, and *severe* if intensive management, specialized equipment, and methods of operation must be planned to protect the soils.

WOODLAND SUITABILITY GROUP 1

This woodland group consists of moderately well drained to excessively drained soils that formed in alluvial material. These soils are on flood plains, in upland depressions, and at the heads of drainageways. The water table is generally deep, but the available water for plant growth is moderate to high. The soils on flood plains are subject to occasional flooding of short duration.

The soils of this group are highly productive of wood crops, and about half of the acreage is now in trees. Suitable trees include yellow-poplar, loblolly pine, sweetgum, white oak, red oak, cottonwood, and sycamore. The stocking rate, rate of growth, and quality and vigor of these bottom-land hardwoods vary, depending on past management. Wood of good quality for veneer is obtained, however, wherever there is a good stand of yellow-poplar, loblolly pine, sweetgum, or blackgum.

For yellow-poplar growing on these soils, the average site index is 110 and the average yearly growth rate per acre is 2.1 cords. For loblolly pine, the average site index is 102 and the average yearly growth rate per acre is 2.1 cords. For sweetgum, the average site index is 100 and the average yearly growth rate per acre is 1.6 cords.

Competition from unwanted trees, shrubs, and vines is severe when an opening is made in the canopy. Several weedings are needed when an opening is made. Unwanted plants must be controlled if a new stand is to be established.

Conventional logging equipment generally can be used on these soils when the weather is fairly dry. During the rainy season in winter, however, the soils are likely to be too wet for logging for periods of several days. Seedling mortality is slight.

WOODLAND SUITABILITY GROUP 2

This woodland group consists of deep, productive, well-drained, moderately permeable soils of uplands that are only slightly to moderately eroded. These soils have a surface layer of sandy loam, and a subsoil of sandy clay loam to clay. They have slopes of 2 to 25 percent. The available water capacity is generally moderate.

Productivity of these soils is moderate for loblolly and shortleaf pines and moderately high for yellow-poplar. Loblolly pine is predominant on sites that receive the most moisture, and shortleaf pine is predominant on the drier sites. Because of the greater economic returns, more loblolly pines than shortleaf pines are planted.

For loblolly pine growing on these soils, the average site index is 78 and the average yearly growth rate per acre is 1.3 cords. For shortleaf pine, the average site index is 68 and the average yearly growth rate per acre is 1.4 cords. For yellow-poplar, the average site index is 80 and the average yearly growth rate per acre is 1.3 cords.

Many hazards can prevent young pines from succeeding (fig. 10), but hazards that affect management are practically lacking for the soils of this group. On some of the lower slopes, however, competition from undesirable plants is extensive enough to restrict the growth of favored species. One or more weedings are needed when openings are made in the canopy.

WOODLAND SUITABILITY GROUP 3

Well-drained, mostly severely eroded or gullied soils on ridges and side slopes are in this woodland group. In many places these soils have lost most of their original surface layer and part of their subsoil through erosion. Their pres-

***Figure 10.*—A young pine growing on Cecil sandy loam, 2 to 6 percent slopes, eroded. This tree has overcome the competition from other plants but is subject to damage from fire.**

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ent surface layer is sandy clay loam or clay loam, and their subsoil is sandy clay loam to clay. Permeability is generally moderate. The available water capacity ranges from moderate to low.

Soils of this group occupy about two-thirds of all the wooded acreage in Clarke and Oconee Counties. The site index is rather low, however, both for loblolly and shortleaf pine. For loblolly pine, the average site index is 75 and the average yearly growth rate per acre is 1.2 cords. For shortleaf pine, the average site index is 64 and the average yearly growth rate per acre is 1.3 cords.

Severe erosion has caused other limitations. After trees are planted or have seeded naturally, seedling mortality is moderate, that is, a loss of 25 to 50 percent of the seedlings can generally be expected. Where gullying prevents moisture from penetrating the soil uniformly, seedling mortality is severe, or more than half the stand is lost. Careful planning and management of logging operations are necessary to keep from causing additional erosion. Because of the clayey texture of the soil material, conventional logging is restricted in the steep, gullied areas after a rainy period. Competition from brush and other undesirable plants is slight.

WOODLAND SUITABILITY GROUP 4

This woodland group consists of well-drained to somewhat excessively drained soils that have a coarse-textured surface layer. These soils are on uplands. Their slopes range from 2 to 25 percent. Permeability is moderate to rapid, and the surface layer is low in available water capacity. Stones are common on the steeper slopes.

For loblolly pine growing on these soils, the average site index is 80 and the average yearly growth rate per acre is 1.3 cords. For shortleaf pine, the average site index is 73 and the average yearly growth rate per acre is 1.4 cords. In some places upland oaks that have an average site index of about 87 grow in mixed stands.

Because of the low available water capacity in the surface layer, seedling mortality is as high as 50 percent if a drought occurs following planting or seeding. Equipment limitations and competition from other plants are slight.

WOODLAND SUITABILITY GROUP 5

Colfax sandy loam, 2 to 6 percent slopes, is the only soil in this woodland group. It is in upland depressions and gently sloping areas and is deep and somewhat poorly drained. The surface layer is sandy loam, and the subsoil is firm sandy clay loam to clay. Erosion has been only slight. Permeability is moderately slow, and the available water capacity is moderate to low.

For yellow-poplar growing on this soil, the average site index is 100 and the average yearly growth rate per acre is 1.8 cords. For loblolly pine, the average site index is 90 and the average yearly growth rate per acre is 1.5 cords. For shortleaf pine, the average site index is 70 and the average yearly growth rate per acre is 0.9 cord. Sweetgum germinates during wet periods, but the trees do not reach a size suitable for veneer or similar wood products.

Plant competition is moderate because the somewhat poor drainage encourages the invasion of undesirable plants. Unless the invaders are controlled, they delay restocking and retard the growth of desirable trees.

Equipment limitations are moderate on this soil. The fluctuating water table causes moderate seedling mortality. Natural regeneration cannot always be relied upon to restock the stand.

WOODLAND SUITABILITY GROUP 6

Soils that are frequently flooded and that formed in alluvial material are in this woodland group. The water table is near the surface throughout most of the year.

The soils of this group are excellent for bottom-land hardwoods, and the higher sites produce loblolly pines. For yellow-poplar, the average site index is 98 and the average yearly growth rate per acre is 1.8 cords. For sweetgum, the average site index is 100 and the average yearly growth rate per acre is 1.6 cords. For loblolly pine, the average site index is 85 and the average yearly growth rate per acre is 1.4 cords. Several species of oak are suitable, but yield data are not available at the present time.

Seedling mortality is moderate on these soils. Excessive water keeps a well-stocked stand from becoming established.

Plant competition is severe. After the canopy is opened, undesirable species invade.

Equipment limitations are severe. During wet seasons, the use of conventional logging equipment is restricted for periods of several weeks.

Use of the Soils for Wildlife[5]

Most of the soils in Clarke and Oconee Counties are suited to, and support, one or more kinds of wildlife. Some species frequent woodland; others prefer farmland; and many require a water habitat.

Bobwhites, mourning doves, rabbits, squirrels, foxes, opossums, raccoons, and many nongame birds are common in the two counties. Deer and wild turkeys require extensive tracts of woodland where water is abundant, such as the southeastern part of the survey area and the large, wooded tracts on and adjacent to flood plains. The long, narrow bottom lands along streams are well suited to wild ducks and beavers. Beaver dams are common in many of those areas. Following is a summary of the food and habitat needs of the more important kinds of wildlife in Clarke and Oconee Counties.

BEAVER.—Beaver eat only vegetation, mainly bark, roots, and green plants. Their principal foods from trees are the tender bark, or cambium, of alder, ash, birch, cottonwood, maple, pine, sweetgum, and willow. Beavers also eat acorns and the tender shoots of elder, honeysuckle, grass, and weeds. The chief feeding areas are within 150 feet of water.

BOBWHITE.—Choice foods for bobwhite are acorns, beechnuts, blackberries, browntop millet, wild black cherries, corn, cowpeas, dewberries, flowering dogwood, annual and bicolor lespedeza, mulberries, pecans, pine seeds, common ragweed, sweetgum seeds, and tickclover. Bobwhite also eat many insects. Their food must be close to vegetation that provides shade and protection from predators and adverse weather.

DEER.—Choice foods for deer are acorns, bahiagrass, clover, cowpeas, greenbrier, honeysuckle, annual and bicolor lespedeza, oats, fescue, ryegrass, and wheat. A

[5] PAUL D. SCHUMACHER, biologist, Soil Conservation Service, assisted in writing this section.

wooded tract at least 500 acres in size generally provides adequate cover.

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

DUCKS.—Choice foods for ducks are acorns, beechnuts, browntop millet, corn, Japanese millet, and smartweed seeds. These foods must be covered with water to be readily available to ducks. Occasionally, ducks eat acorns and corn on dryland.

RABBIT.—These animals require blackberry thickets, plum thickets, or similar cover. Choice foods are clover, winter grasses, and other succulent plants.

SQUIRREL.—Acorns, beechnuts, blackgum seeds, black cherries, corn, flowering dogwood, hickory nuts, mulberries, pecans, and pine seeds are choice foods for squirrel.

TURKEY, WILD.—Generally, wild turkey survive only in wooded areas that are at least 1,000 acres in size. They need surface water to drink each day, and they often roost in large trees over or near water. Choice foods are insects, acorns, bahiagrass seeds, beechnuts, blackberries, dewberries, browntop millet, clover leaves, corn, cowpeas, flowering dogwood, wild grapes, hackberries, mulberries, oats, pecans, pine seeds, rescuegrass, ryegrass for forage, and wheat.

NONGAME BIRDS.—Different species of nongame birds have different food requirements. Several species eat only insects; a few eat insects and fruit; and others eat insects, fruit, and acorns.

FISH.—Bluegill, bass, and channel catfish are the principal game fish in Clarke and Oconee Counties. The choice foods of bluegill are aquatic worms and insects and their larvae. Bass and channel catfish feed on small fish. The supply of food depends on the fertility of the water, on the kinds of soils in the watershed, and, to some extent, on the characteristics of the soils at the bottom of the pond. Because most of the soils are low in natural fertility and are strongly acid, fertilizer and lime are needed in most ponds so that enough food will be produced to insure an adequate supply for fish.

Wildlife Suitability Groups

The soils in Clarke and Oconee Counties have been placed in wildlife suitability groups on the basis of their potential productivity for plants that provide food and cover for wildlife. The soils in each group are somewhat similar and generally produce the same kinds of food plants and protective cover for wildlife. Additional information about the soils is given in the section "Descriptions of the Soils." The soils in each wildlife suitability group are shown in the "Guide to Mapping Units" at the back of this survey.

The reader can not only obtain facts about managing the soils for wildlife from the descriptions of wildlife suitability groups, but he can also obtain information from the county unit of the Soil Conservation Service, which maintains up-to-date technical guides for each important kind of wildlife and fish, and for each significant plant that provides food or cover for wildlife. It also has specifications for establishing and maintaining soil and water conservation practices that can be adapted to the soils and waters of the survey area. Thus, any landowner can obtain practical help in planning and establishing a supply of food and a suitable habitat for the kinds of wildlife or fish he wishes to favor.

WILDLIFE SUITABILITY GROUP 1

This wildlife group consists of deep, well-drained soils on uplands and stream terraces. These soils have a surface layer of loam to coarse sandy loam and a subsoil of clay to sandy clay loam. The slopes range from 2 to 10 percent.

These soils are in good tilth. Roots can penetrate to a depth of 36 inches or more. Permeability is moderate. The available water capacity is moderate to high.

The soils of this group occupy about one-fourth of the survey area. About 65 percent of the acreage is cultivated or used for pasture. The soils are suited to lespedeza, ragweed, tickclover, dogwood, millet, pecan, and other plants that provide choice food for bobwhite, dove, rabbit and other kinds of wildlife. Because the soils are not flooded, they do not provide feeding places suitable for ducks. The many drainageways, however, make sites suitable for ponds.

WILDLIFE SUITABILITY GROUP 2

This wildlife group consists of deep, well-drained soils on uplands. The slopes range from 10 to 25 percent. The soils have a surface layer of sandy loam and a subsoil of clay to sandy clay loam. Most of them are eroded.

These soils are highly susceptible to further erosion, and their strong slopes make them difficult to work. Permeability and the available water capacity are both moderate. The effective depth to which roots can penetrate is 36 inches or more.

The soils of this group are extensive and occur throughout the survey area. Most of the acreage is wooded. The strong slopes make the soils unsuitable for annual plants, and their suitability for perennial grasses, lespedeza, and some woody plants is only marginal. The soils are suited to blackgum, wild black cherry, flowering dogwood, hickory, and pine, and they provide some food and cover for squirrel, rabbit, deer and turkey. The many drainageways also make sites suitable for ponds.

WILDLIFE SUITABILITY GROUP 3

This wildlife group consists of deep, well-drained, severely eroded soils on uplands. The slopes range from 2 to 10 percent. The surface layer is sandy clay loam to clay 5 to 7 inches thick. It is underlain by a subsoil of sandy clay loam to clay.

These soils are generally in poor tilth. They have moderate permeability and moderate available water capacity. The effective depth to which roots can penetrate is 36 inches or more.

These are extensive soils, and most of the acreage has been cultivated. The soils do not produce an abundant supply of plants suitable for food for wildlife. Much preparation of the site would be needed, and it would be necessary to add plant nutrients, before enough plants could be produced to provide food and cover for wildlife. The poor tilth and the severe erosion make plants difficult to establish, and the cover is difficult to maintain. The soils are suited to plants such as dewberry, lespedeza, pine, and tickclover but are only marginal in suitability for cultivated crops, clover, grass, small grains, and most shrubs and hardwoods. The many drainageways, however, make sites suitable for ponds.

WILDLIFE SUITABILITY GROUP 4

Dominantly well-drained, severely eroded soils on uplands are in this wildlife group. Gullies have formed in places. The slopes range from 6 to 25 percent. The surface layer of these soils ranges from sandy clay loam to clay and is 4 to 7 inches thick. Except in the gullied areas or in areas where erosion has been very severe, roots can penetrate effectively to a depth of 36 inches or more.

Because of the strong slopes and rapid rate of runoff, water moves slowly into these soils. The available water capacity is low to moderate, and permeability of the subsoil is moderate to moderately slow. Tilth is poor.

The soils of this group are not especially extensive but occur throughout the survey area. Most of the acreage has been cultivated, but much of it is now reverting to pine forests. The severe erosion and the moderate to steep slopes make vegetation difficult to establish, and an adequate cover is hard to maintain. Generally, the soils are not suited to plants that would provide enough food for wildlife, and they are only marginal for lespedeza, pine, and tickclover. The many drainageways, however, make sites suitable for ponds.

WILDLIFE SUITABILITY GROUP 5

This wildlife group consists of somewhat excessively drained or well-drained soils on uplands. The surface layer is loamy sand or sandy loam. The subsoil, or B horizon, is thin and discontinuous in many places, but it is somewhat thicker in others. The bedrock underlying these soils is at depths ranging from only a few inches to about 4 feet.

These soils are easily worked, but roots can penetrate effectively to a depth of only about 24 inches or less. The available water capacity and productivity are low.

These soils are only marginal or poor for most plants that provide food for wildlife. They are better suited to pine and flowering dogwood than to most plants, and the pine and dogwood provide some food and protection for squirrels. The limited depth over bedrock makes these soils poorly suited to ponds.

WILDLIFE SUITABILITY GROUP 6

This wildlife group consists of shallow or stony soils. The slopes range from 6 to 25 percent. The soils are not extensive but occupy small areas throughout the two counties.

The available water capacity is low, and these soils are low in productivity. The soils are too stony, steep, or low in productivity to be suitable for cultivation. They are suited only to hickory, oak, and a few other plants that provide some food and protection for upland species of wildlife. Permanent streams and springs are scarce in some areas, and the soils are too stony and shallow to be suitable as sites for ponds.

WILDLIFE SUITABILITY GROUP 7

This wildlife group consists of deep, well drained and moderately well drained soils around the heads of drainageways and on first bottoms along streams. The areas on first bottoms are flooded occasionally for short periods, usually for periods of less than 2 days. The surface layer is loamy sand to silt loam and is 5 to 10 inches thick. The underlying material is predominantly sandy loam.

These soils are easily worked. The profile of the Buncombe soil is sandy throughout. Roots can penetrate effectively to a depth of 30 inches or more.

Small areas of these soils are scattered throughout Clarke and Oconee Counties. Much of the acreage is wooded, but some areas are in pasture. The soils are suited to most of the plants that provide food for turkey, deer, and squirrel, and some areas could be flooded for use as duck fields. Sites suitable for ponds are common.

WILDLIFE SUITABILITY GROUP 8

This wildlife group consists of deep, somewhat poorly drained soils on first bottoms, around the heads of drainageways, and on low stream terraces. The water table is high, and the soils on first bottoms are flooded frequently for periods of 1 to 5 days.

If these soils are adequately drained, they are easy to work. Roots can penetrate effectively to a depth of 22 to 30 inches.

A large part of the acreage of these soils is wooded, and most of the rest is idle. Because of the somewhat poor drainage, high water table, and susceptibility to flooding, the soils are suited to only a few plants that provide food for squirrel, turkey, and deer. Browntop millet, white clover, tall fescue, Japanese millet, and smartweed can be grown. Many of the areas could be flooded for use as duck fields. In some areas water could be impounded or ponds could be dug.

WILDLIFE SUITABILITY GROUP 9

Poorly drained soils on first bottoms and in depressions make up this wildlife group. The soils on first bottoms are flooded each year for periods ranging from a few days to several weeks. The surface layer of these soils is loamy sand, silt loam, or sandy clay loam, and the underlying layers consist of grayish loamy to clayey material.

These soils have a high water table and, therefore, a shallow root zone. Tilth ranges from poor to good.

The soils of this group are suited to only a few plants that are considered choice food for wildlife. Japanese millet and smartweed provide choice food for ducks, and woody plants are eaten by beavers. Most of the areas could be flooded for use as duck fields. Also, water could be impounded or ponds could be dug.

Use of the Soils for Engineering [6]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, foundations, facilities for storing water, structures for controlling erosion, systems for draining and irrigating soils, and leaching fields for disposal of sewage. The properties most important to the engineer are permeability, shear strength, compaction characteristics, soil drainage, shrink-swell characteristics, grain size, plasticity, and soil reaction, or pH. Depth to the water table, depth to bedrock, and topography also are important.

This section contains information about the soils of Clarke and Oconee Counties that will be helpful to engi-

[6] ED HELMEY, engineering specialist, Soil Conservation Service, assisted in the preparation of this section.

neers. Special emphasis has been placed on the engineering properties as related to agriculture, especially those that affect irrigation, farm ponds, and structures that control and conserve soil and water.

The information in this soil survey can be used to—

1. Make soil and land use studies that will aid in selecting and developing sites for industries, businesses, residences, and recreational areas.
2. Make preliminary estimates of the engineering properties of soils for use in planning agricultural drainage systems, farm ponds, irrigation systems, terraces and diversions, waterways, and other structures for conserving soil and water.
3. Make preliminary evaluations of soil and ground conditions that will aid in selecting locations for highways, airports, pipelines, cables, and sewage disposal fields and in planning detailed surveys of the soils at selected locations.
4. Locate probable sources of sand and other material for use in construction.
5. Correlate performance of engineering structures with the soil mapping units and thus develop information that will be useful in designing and maintaining certain engineering practices and structures.
6. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement the information obtained from other published maps, reports, and aerial photographs for the purpose of making reports that can be used readily by engineers.
8. Develop other preliminary estimates for construction purposes pertinent to the particular area.

Used with the soil map to identify the soils, the engineering interpretations in this section are useful for many purposes. It should be emphasized, however, that these interpretations may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads or where the excavations are deeper than the depth of layers here reported. Nevertheless, even in such situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that can be expected.

Engineers of the State Highway Department of Georgia and the Soil Conservation Service collaborated with soil scientists of the Soil Conservation Service in preparing this part of the survey. These engineers used their knowledge of soils to interpret laboratory tests and information obtained in the field.

At many construction sites, the soils vary greatly within the depth of the proposed excavation and within short distances. The maps, soil descriptions, and other data in this survey should be used in planning detailed investigations necessary at the construction site. Then, only a minimum number of soil samples are needed for testing in the laboratory. After the soils have been tested and their behavior in place has been observed under varying conditions, the engineer should be able to judge the properties of individual soil units at other sites throughout the county.

Information of value in planning engineering work is given throughout the text, especially in the section "Descriptions of the Soils." Some terms used by soil scientists may be unfamiliar to engineers, and many words have special meaning in soil science. These and other special terms are defined in the Glossary at the back of this survey.

Engineering Classification Systems

Agricultural scientists of the U.S. Department of Agriculture classify soils according to texture. In some ways this system of naming textural classes is comparable to the two systems used by engineers for classifying soils; that is, the system of the American Association of State Highway Officials (AASHO) and the Unified system.

Most highway engineers classify soil materials in accordance with the classification developed by the American Association of State Highway Officials (*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 that have low strength when wet. Within each group, the relative engineering value of the soil material is indicated by a group index number. Group index numbers range from zero for the best material to 20 for the poorest. In this soil survey, group index numbers are assigned only to soils on which tests have been performed. They are shown in parentheses after the soil group symbols in table 3.

Some engineers prefer to use the Unified soil classification system (*11*). In this system soil materials are identified as coarse grained, eight classes; fine grained, six classes; and highly organic. Some soil materials have characteristics that are borderline between the major classes, and they are given a borderline classification, such as MH–CH. The last two columns of table 3 give the engineering classifications of the soils tested. The classifications are based on the results of mechanical analysis and on determinations of the liquid limit and plasticity index.

Test Data and Engineering Properties of the Soils

Soil engineering data and interpretations for engineering uses are given in tables 3, 4, and 5. Table 3 contains engineering test data for representative soils of Clarke and Oconee Counties. The data given in this table are the results of tests made by the State Highway Department of Georgia under a cooperative agreement with the U.S. Department of Commerce, Bureau of Public Roads.

In table 3 soil samples from seven soil profiles representing three series were tested in accordance with standard procedures to help evaluate the soils for engineering purposes. The samples are from different locations. The test data from different locations show some variation in characteristics but probably do not show the maximum variations in the B and C horizons. All samples were obtained at a depth of 100 inches or less. The test data therefore may not be adequate for estimating the properties of soils in deep cuts. These samples were tested for moisture-density relationships, volume change, grain-size distribution, liquid limit, and plasticity index.

The results of mechanical analysis, obtained by combined sieve and hydrometer methods, may be used to determine the relative proportions of the different size particles in the soil sample. The percentage of fine-grained material obtained by the hydrometer method generally used by engineers should not be used in determining textural classes of soils.

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TABLE 3.—*Engineering test data [1] for soil*

Soil name and location	Parent material	SCS report No.	Depth	Horizon	Moisture-density [2]: Maximum dry density	Moisture-density [2]: Optimum moisture	Volume change [3]: Shrinkage	Volume change [3]: Swell	Volume change [3]: Total volume change
			Inches		*Lb. per cu. ft.*	*Percent*	*Percent*	*Percent*	*Percent*
Appling coarse sandy loam:		*S-63-Ga-29:*							
In eastern part of Winterville.	Granite and gneiss.	5-1	0-7	Ap	123	9	0.5	0.9	1.4
		5-4	15-29	B2t	90	28	10.9	5.0	15.9
		5-6	35-55	C	88	29	8.8	9.8	18.6
1.3 miles NE. of White's Store off Lexington Road.	Granite and gneiss.	4-1	0-8	Ap	118	10	.6	4.0	4.6
		4-3	13-25	B2t	101	21	14.0	.2	14.2
		4-5	33-60	C	88	29	24.0	.5	24.5
200 ft. SE. of New Grove Church on road to Winterville.	Granite and gneiss.	2-1	0-9	Ap	120	10	.2	.2	.4
		2-3	11-21	B1t	97	24	10.1	4.3	14.4
		2-4	21-35	B2t	88	29	14.1	.4	14.5
Cecil sandy loan:									
0.6 mile S. of Winterville on road to Whitehall.	Gneiss.	3-2	3-8	A2	122	10	.8	.01	.9
		3-4	14-26	B2t	103	21	11.9	.9	12.8
		3-5	26-46	B3t	96	23	13.9	2.2	16.1
On Lavender Road, 0.2 mile of intersection of that road with Jefferson Road.	Gneiss.	1-1	0-6	Ap	119	11	1.7	.5	2.2
		1-3	10-40	B2t	95	24	10.4	5.1	15.5
		1-4	40-60	B3t	94	25	15.5	5.0	20.5
0.4 mile S. of Seaboard R.R. on Pittard Road.	Gneiss.	6-1	0-7	Ap	118	11	.5	.1	.6
		6-4	18-34	B2t	103	20	12.4	.0	12.4
		6-6	44-62	C	97	24	13.3	1.7	15.0
Pacolet stony sandy loam:		*S-64-Ga-108:*							
Near bridge over Wildcat Creek, 1.5 miles N. of Georgia State Highway No. 15 and 7 miles SE. of Watkinsville.	Coarse-grained and fine-grained (contains a large amount of feldspar).	2-1	0-7	Ap	104	18	3.5	6.0	9.5
		2-2	7-31	B2t	94	22	5.2	7.0	12.2
		2-4	41-59	C	109	16	.6	.1	.7

[1] Tests performed by the State Highway Department of Georgia in cooperation with the U.S. Department of Commerce, Bureau of Public Roads (BPR). The tests were performed in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*2*).
[2] Based on AASHO Designation T 99-57, Methods A and C (*2*).
[3] Based on "A System of Soil Classification" by W. F. Abercrombie (*1*).
[4] According to AASHO Designation T 88-57 (*2*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is

TABLE 4.—*Soils and their estimated*

[Alluvial land (Coa, Cob, Wos), Gullied land (PhC, PhE), Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded (PgC3), Pacolet properties to

Map symbol	Soil	Depth from surface	Classification: USDA dominant texture	Classification: Unified	Classification: AASHO
		Inches			
AxB2	Appling coarse sandy loam, 2 to 6 percent slopes, eroded.	0-11	Coarse sandy loam	SM	A-2
		11-35	Sandy clay	ML, CL, MH, CH.	A-7
AxC2	Appling coarse sandy loam, 6 to 10 percent slopes, eroded.	35-55	Clay loam saprolite	MH	A-7
AnC3	Appling sandy clay loam, 6 to 10 percent slopes, severely eroded.	0-3	Sandy clay loam	SC, CL	A-4
		3-42	Sandy clay	ML, CL	A-7
		42-60	Sandy clay loam saprolite.	SC, CL	A-4
Bfs	Buncombe loamy sand.	0-22	Loamy sand	SM	A-2
		22-65	Sand to loamy sand	SP, SM	A-2
CYB2	Cecil sandy loam, 2 to 6 percent slopes, eroded.	0-8	Sandy loam	SM	A-2

samples taken from 7 soil profiles

Mechanical analysis[4]										Liquid limit	Plasticity index	Classification	
Percentage passing sieve—						Percentage smaller than—						AASHO	Unified[5]
3-in.	¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
100	91	86	80	45	16	14	10	5	3	[6] NP	[6] NP	A-1-b(0)	SM.
-------	------	100	98	84	73	72	69	63	58	58	28	A-7-5(18)	MH-CH.
-------	------	100	98	82	65	64	58	50	46	66	30	A-7-5(17)	MH.
-------	100	97	91	60	24	20	15	9	6	NP	NP	A-2-4(0)	SM.
-------	------	100	97	79	57	57	52	44	37	23	2	A-4(4)	ML-CL.
-------	100	99	97	86	72	72	70	57	47	66	30	A-7-5(19)	MH.
100	99	98	93	55	23	19	13	8	6	NP	NP	A-2-4(0)	SM.
-------	------	100	98	81	67	65	61	52	46	46	21	A-7-6(12)	ML-CL.
-------	------	100	99	82	73	71	66	55	51	70	31	A-7-5(20)	MH.
100	89	84	79	45	24	21	16	9	5	NP	NP	A-1-b(0)	SM.
-------	100	99	92	72	56	53	47	37	32	39	16	A-6(7)	CL.
-------	100	99	93	74	60	54	47	42	36	48	19	A-7-6(10)	ML-CL.
100	99	96	91	67	29	25	21	15	11	NP	NP	A-2-4(0)	SM.
-------	------	100	99	86	67	65	62	54	48	55	27	A-7-6(16)	MH-CH.
-------	------	100	99	87	62	62	55	44	38	54	24	A-7-5(13)	MH-CH.
-------	100	99	98	77	26	22	16	9	5	NP	NP	A-2-4(0)	SM.
-------	------	100	99	83	56	55	52	46	42	41	17	A-7-6(7)	ML-CL.
-------	------	------	100	81	54	52	48	42	39	51	21	A-7-5(9)	MH-CH.
95	92	90	86	49	28	28	23	16	13	NP	NP	A-2-4(0)	SM.
95	95	95	93	63	47	47	44	37	34	47	18	A-7-6(6)	SM-SC.
90	90	90	87	48	25	25	20	14	13	33	9	A-2-4(0)	SM-SC.

analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soils.

[5] Based on the Unified Soil Classification System (*11*). SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points from A-line are to be given a borderline classification, for example, MH-CH or ML-CL.

[6] NP=Nonplastic.

properties significant in engineering

sandy clay loam, 10 to 15 percent slopes, severely eroded (PgD3), and Rock outcrop (Rok) are too variable in characteristics for their be estimated]

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 200				
			Inches per hour	*Inches per inch of soil depth*	*pH*	
80–100	80–100	15–30	2. 0–6. 3	0. 08	5. 1–5. 5	Low
90–100	90–100	60–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
90–100	90–100	50–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
90–100	90–100	40–55	0. 63–2. 0	. 13	5. 1–5. 5	Low to moderate.
90–100	90–100	55–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
90–100	90–100	40–55	0. 63–2. 0	. 13	5. 1–5. 5	Low.
90–100	90–100	20–35	6. 3	. 07	5. 1–5. 5	Low.
90–100	90–100	15–30	6. 3	. 07	4. 5–5. 5	Low.
80–100	75–100	20–30	2. 0–6. 3	. 10	5. 1–5. 5	Low.

TABLE 4.—*Soils and their estimated*

Map symbol	Soil	Depth from surface	Classification: USDA dominant texture	Classification: Unified	Classification: AASHO
		Inches			
CYC2	Cecil sandy loam, 6 to 10 percent slopes, eroded.	8–14	Sandy clay loam	CL	A-6
		14–46	Clay	ML or CL	A-7
		46–52	Clay loam	MH or CH	A-6, A-7
CZB3	Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded.	0–3	Sandy clay loam	SC, CL	A-4
		3–41	Clay	MH or CH	A-7
		41–60	Clay loam	CL, ML	A-6, A-7
CbA	Cecil soils, 0 to 2 percent slopes, overwash.	0–20	Sandy loam to loam [1]	SM	A-2, A-4
		20–60	Clay to clay loam	CL, MH	A-7
Cob	Chewacla soils and Alluvial land (Chewacla part only).	0–10	Fine sandy loam	SM	A-2, A-4
		10–40	Sandy clay loam	ML or CL	A-6
CiB	Colfax sandy loam, 2 to 6 percent slopes.	0–11	Sandy loam	SM	A-2, A-4
		11–50	Sandy clay loam	CL	A-6
Coa	Congaree soils and Alluvial land (Congaree part only).	0–8	Loam	SM	A-2
		18–60	Sandy clay loam	SC, CL	A-4, A-6
DqB2	Davidson sandy loam, 2 to 6 percent slopes, eroded.	0–7	Sandy loam	SM	A-2, A-4
DqC2	Davidson sandy loam, 6 to 10 percent slopes, eroded.	7–51	Clay to clay loam	CL, MH	A-7
DqE2	Davidson sandy loam, 15 to 25 percent slopes, eroded.	51–66	Loam	CL	A-6
DhB3	Davidson clay loam, 2 to 6 percent slopes, severely eroded.	0–7	Clay loam	CL	A-6
DhC3	Davidson clay loam, 6 to 10 percent slopes, severely eroded.	7–60	Clay to clay loam	CL, MH, CH	A-6, A-7
DhD3	Davidson clay loam, 10 to 15 percent slopes, severely eroded.				
DhE3	Davidson clay loam, 15 to 25 percent slopes, severely eroded.				
LnC	Louisburg loamy sand, 6 to 10 percent slopes.	0–14	Loamy sand	SM	A-2
LnE	Louisburg loamy sand, 10 to 25 percent slopes.	14–28	Sandy saprolite	SM	A-2
		28–36	Rock	(2)	(2)
LDE	Louisburg stony loamy sand, 10 to 25 percent slopes.	0–14	Stony loamy sand	SM	A-1
		14–28	Sandy saprolite	SM, SC	A-2
		28–36	Rock	(2)	(2)
MmC2	Madison-Louisa complex, 6 to 10 percent slopes, eroded.	0–8	Sandy loam	SM	A-2, A-4
MmD2	Madison-Louisa complex, 10 to 15 percent slopes, eroded.	8–16	Clay loam and fragments of rock.	(1)	(1)
MmE2	Madison-Louisa complex, 15 to 25 percent slopes, eroded. (Louisa part only; for Madison part, see the Madison series).	16–40	Micaceous saprolite	(1)	(1)
MgB2	Madison sandy loam, 2 to 6 percent slopes, eroded.	0–10	Sandy loam	SM	A-2, A-4
MgC2	Madison sandy loam, 6 to 10 percent slopes, eroded.	10–34	Clay loam to clay	ML, CL	A-7
MgD2	Madison sandy loam, 10 to 15 percent slopes, eroded.	34–60	Micaceous saprolite	ML	A-4
MgE2	Madison-sandy loam, 15 to 25 percent slopes, eroded.				
MiB3	Madison sandy clay loam, 2 to 6 percent slopes, severely eroded.	0–5	Sandy clay loam	SC, CL	A-4
MiC3	Madison sandy clay loam, 6 to 10 percent slopes, severely eroded.	5–31	Clay loam to clay	ML,CL	A-7
MiE3	Madison sandy clay loam, 10 to 25 percent slopes, severely eroded.	31–47	Clay loam saprolite	ML	A-4
MvE2	Musella clay loam, 15 to 25 percent slopes, eroded.	0–6	Clay loam	CL	A-6
		6–13	Clay to clay loam	MH, CH	A-6, A-7
		13–32	Sandy clay loam	SC, CL	A-4
		32–40	Rock	(2)	(2)
PfD2	Pacolet sandy loam, 10 to 15 percent slopes, eroded.	0–5	Sandy loam	SM	A-2
		5–12	Sandy clay loam	CL	A-6
		12–26	Clay	MH or CH	A-7
		26–50	Clay loam	SM, ML, or CL	A-2, A-6, or A-7

See footnotes at end of table.

properties significant in engineering—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 200				
			Inches per hour	*Inches per inch of soil depth*	*pH*	
90–100	90–100	50–60	0. 63–2. 0	. 14	5. 1–5. 5	Low to moderate.
90–100	90–100	55–75	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	50–65	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	45–55	0. 63–2. 0	. 14	5. 1–5. 5	Low to moderate.
90–100	90–100	55–70	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	50–65	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	30–40	2. 0–6. 3	. 18	5. 1–5. 5	Low.
90–100	90–100	55–70	0. 63–2. 0	. 16	5. 1–5. 5	Moderate.
95–100	95–100	30–45	0. 63–2. 0	. 15	5. 1–5. 5	Low.
95–100	95–100	50–60	0. 63–2. 0	. 15	5. 1–5. 5	Moderate to low.
90–100	90–100	30–40	2. 0–6. 3	. 10	5. 1–5. 5	Low.
90–100	90–100	50–60	0. 2–0. 63	. 12	5. 1–5. 5	Moderate to low.
95–100	95–100	25–40	0. 63–2. 0	. 15	5. 1–5. 5	Low.
95–100	95–100	45–60	0. 63–2. 0	. 17	5. 1–5. 5	Moderate to low.
90–100	90–100	30–45	2. 0–6. 3	. 10	5. 1–5. 5	Low.
90–100	90–100	60–75	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	50–70	0. 63–2. 0	. 13	5. 1–5. 5	Moderate to low.
90–100	90–100	50–65	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
90–100	90–100	50–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
85–100	85–100	15–25	6. 3	. 08	5. 1–5. 5	Low.
85–100	85–100	15–25	6. 3	. 08	5. 1–5. 5	Low.
(2)	(2)	(2)	(2)	(1)	(2)	(2).
75–85	65–75	15–25	6. 3	. 05	5. 1–5. 5	Low.
75–85	65–75	15–25	6. 3	. 05	5. 1–5. 5	Low.
(2)	(2)	(2)	(2)	(2)	(2)	(2).
90–100	75–95	30–50	2. 0–6. 3	. 10	5. 1–5. 5	Low.
(1)	(1)	(1)	(1)	(1)	(1)	(1).
(1)	(1)	(1)	(1)	(1)	(1)	(1).
90–100	80–100	30–50	2. 0–6. 3	. 11	5. 1–5. 5	Low.
90–100	80–100	60–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
50–80	50–80	50–65	0. 63–2. 0	. 11	5. 1–5. 5	Low.
90–100	80–100	45–55	0. 63–2. 0	. 13	5. 1–5. 5	Low.
90–100	80–100	55–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
50–80	50–80	50–65	0. 63–2. 0	. 11	5. 1–5. 5	Low.
90–100	90–100	50–65	0. 63–2. 0	. 13	5. 1–6. 0	Moderate to low.
90–100	90–100	50–75	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
90–100	90–100	40–60	0. 63–2. 0	. 13	5. 1–5. 5	Low.
(2)	(2)	(2)	(2)	(2)	(2)	(2).
80–100	75–100	20–30	2. 0–6. 3	. 10	5. 1–5. 5	Low.
90–100	90–100	50–60	0. 63–2. 0	. 13	5. 1–5. 5	Low to moderate.
90–100	90–100	55–70	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	25–65	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.

TABLE 4.—*Soils and their estimated*

Map symbol	Soil	Depth from surface	Classification: USDA dominant texture	Unified	AASHO
		Inches			
PiD2	Pacolet stony sandy loam, 6 to 15 percent slopes, eroded.	0–5	Stony sandy loam	SM	A–4
PiE2	Pacolet stony sandy loam, 15 to 25 percent slopes, eroded.	5–30	Stony clay loam	SM, ML	A–4
		30–50	Stony saprolite	SM	A–4
PhC	Pacolet-Gullied land complex, 6 to 10 percent slopes.	0–5	Sandy clay loam	SC, CL	A–6
PhE	Pacolet-Gullied land complex, 10 to 25 percent slopes (Pacolet part only).	5–27	Clay	MH or CH	A–7
		27–54	Clay loam	SM, ML, or CL	A–2, A–6, or A–7
Wos	Wehadkee and Alluvial land, wet (Wehadkee part only).	0–30	Loam	ML	A–4
		30–60	Clay loam	CL	A–6
WkB	Worsham sandy loam, 2 to 6 percent slopes.	0–2	Sandy loam	SM	A–2, A–4
		2–18	Sandy clay loam	SC, CL	A–4, A–6
		18–60	Clay loam	CL	A–6

[1] Variable.

TABLE 5.—*Engineering*

[Engineering interpretations are not given for Alluvial land (CoA, Cob, Wos), Gullied land (PhC, PhE), and

Soil series and map symbols	Suitability as source of— Topsoil	Road fill	Soil features adversely affecting— Highway location	Farm ponds: Reservoir area	Embankment
Appling (AxB2, AxC2, AnC3).	Good in surface layer, except where severely eroded.	Good	Shallow to bedrock in places.	Soil properties favorable.	Moderate strength and moderate stability.
Buncombe (Bfs)	Poor	Fair to good	Seasonal high water table at a depth of 15 to 30 inches; subject to flooding.	Rapid permeability	Soil material poorly graded; has low strength and stability.
Cecil:					
(CYB2, CYC2, CZB3)	Good in surface layer, except where severely eroded.	Fair	Sloping soils easily eroded in deep cuts.	Soil properties favorable.	Moderate strength and moderate stability.
(CbA)	Good	Good	Seasonal high water table at a depth of about 2 feet for short periods of time.	Soil properties favorable.	Moderate strength and moderate stability.
Chewacla (Cob) (Chewacla part only).	Good	Fair, except in places where the water table is high.	Seasonal high water table at a depth of less than 1 foot; subject to flooding.	Soil properties favorable.	Moderate strength and moderate stability; generally high content of moisture.

properties significant in engineering—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
No. 4	No. 10	No. 200				
			Inches per hour	*Inches per inch of soil depth*	*pH*	
70–90	70–90	20–35	2. 0–6. 3	. 10	5. 1–5. 5	Low.
80–95	70–95	40–55	0. 63–2. 0	. 12	5. 1–5. 5	Moderate to low.
80–95	70–95	25–45	0. 63–2. 0	. 12	5. 1–5. 5	Low.
90–100	90–100	50–60	0. 63–2. 0	. 13	5. 1–5. 5	Low to moderate.
90–100	90–100	55–70	0. 63–2. 0	. 14	5. 1–5. 5	Moderate.
90–100	90–100	25–65	0. 63–2. 0	. 13	5. 1–5. 5	Moderate.
95–100	95–100	50–60	0. 63–2. 0	. 15	5. 1–5. 5	Low.
95–100	95–100	55–65	0. 63–2. 0	. 17	5. 1–5. 5	Low to moderate.
90–100	90–100	30–45	0. 63–2. 0	. 10	4. 5–5. 0	Low.
90–100	90–100	40–60	0. 63–2. 0	. 12	4. 5–5. 0	Moderate.
90–100	90–100	50–70	0. 2–0. 63	. 15	4. 5–5. 0	Moderate.

[2] Bedrock.

interpretations

Rock outcrop (Rok), because those land types are too variable or are not suitable for engineering purposes]

Soil features adversely affecting—Continued				Degree of limitation for—	
Agricultural drainage	Irrigation	Terraces	Waterways	Septic tank filter fields	Sewage lagoons
Not needed	Moderate permeability; slow intake rate in severely eroded areas.	Soil properties favorable where slopes are less than 10 percent; unsuitable where slopes are steeper.	Moderate to high erodibility.	Moderate; moderate permeability.	Moderate where slopes are 2 to 6 percent; severe where slopes are steeper.
Not needed	Very rapid permeability.	Terraces not needed.	Seasonal high water table at a depth of about 15 to 30 inches.	Severe; subject to flooding.	Severe; flooding; seepage.
Not needed	Slow intake rate in severely eroded areas.	Soil properties favorable where slopes are less than 10 percent; unsuitable where slopes are steeper.	Moderate to high erodibility.	Moderate; moderate permeability.	Moderate.
Not needed	Soil properties favorable.	Terraces generally not feasible; areas small and irregular in shape.	Soil properties favorable.	Moderate; seasonal high water table at a depth of about 2 feet for short periods of time.	Moderate; seepage.
Moderate to moderately slow permeability; seasonal high water table at a depth of less than 1 foot; needs surface and subsurface drainage.	Somewhat poor drainage; seasonal high water table at a depth of less than 1 foot.	Not needed; soil is nearly level.	Seasonal high water table at a depth of less than 1 foot.	Severe; somewhat poor drainage; seasonal high water table at a depth of less than 1 foot; subject to flooding.	Severe; flooding.

TABLE 5.—*Engineering*

Soil series and map symbols	Suitability as source of—		Soil features adversely affecting—		
	Topsoil	Road fill	Highway location	Farm ponds: Reservoir area	Farm ponds: Embankment
Colfax (CiB)	Good in surface layer.	Poor to fair	Seasonal high water table at a depth of 0 to 3 feet.	Soil properties favorable.	Generally high moisture content.
Congaree (Coa) (Congaree part only).	Good	Fair to good	Seasonal high water table at a depth of 15 to 30 inches; subject to flooding.	Moderate permeability.	Poorly graded material.
Davidson (DhB3, DhC3, DhD3, DhE3, DqB2, DqC2, DqE2).	Poor	Fair	Slopes easily eroded in deep cuts.	Soil properties favorable.	Moderate strength and moderate stability.
Louisa (MmC2, MmD2, MmE2) (For Madison part, see the Madison series).	Good	Fair; erodible	Sloping areas easily eroded.	Moderately rapid permeability; excessive seepage likely where cuts reach into underlying material.	Low strength and low stability.
Louisburg (LnC, LnE, LDE).	Good, except in stony areas.	Good, except where soils are shallow to bed-bedrock.	Bedrock at a depth somewhere between 3 and 6 feet.	Rapid permeability; seepage.	Moderate strength and moderate stability; shallow to bedrock; some areas stony.
Madison (MgB2, MgC2, MgD2, MgE2, MiB3, MiC3, MiE3.	Poor	Fair to good	Sloping areas in deep cuts easily eroded.	Soil properties favorable.	Moderate strength and moderate stability.
Musella (MvE2)	Poor	Poor	Moderate shrink-swell potential; shallow to bedrock.	Moderate seepage and moderate permeability.	Moderate permeability where compacted.
Pacolet (PfD2, PgC3, PgD3, PiD2, PiE2; also PhC, PhE, Pacolet part only).	Fair	Good	Soil properties favorable.	Soil properties favorable.	Moderate strength and moderate stability.
Wehadkee (Wos) (Wehadkee part only).	Poor	Poor; excess moisture.	Seasonal high water table at a depth of less than 1 foot; subject to flooding.	Soil properties favorable.	Low strength and stability; generally high content of moisture.
Worsham (WkB)	Unsuitable	Poor	Seasonal high water table at a depth of less than 1 foot; shallow to bedrock in places.	Soil properties favorable.	Moderate strength and moderate stability; high content of moisture.

interpretations—Continued

Soil features adversely affecting—Continued				Degree of limitation for—	
Agricultural drainage	Irrigation	Terraces	Waterways	Septic tank filter fields	Sewage lagoons
Moderately slow permeability; seasonal high water table at a depth of 0 to 3 feet; needs surface and subsurface drainage.	Somewhat poor drainage; moderately slow permeability.	Terraces generally not feasible; areas small and irregular in shape.	Soil properties favorable.	Severe; somewhat poor drainage; seasonal high water table at a depth of 0 to 5 feet; moderately slow permeability.	Moderate.
Subject to flooding	Soil properties favorable.	Not needed; soil is nearly level.	Soil properties favorable.	Severe; subject to flooding.	Moderate; seepage; flooding.
Not needed	Slow intake rate in severely eroded areas.	Soil properties favorable where slope is less than 10 percent; steeper slopes unsuitable.	Moderate to high erodibility.	Moderate; moderate permeability.	Moderate where slopes are less than 6 percent; severe where slopes are steeper.
Not needed	Low available water capacity; strongly sloping to steep.	Not suitable for terraces; steep slopes.	Low available water capacity; high erodibility; steep slopes.	Moderate; low available water capacity; 15 to 45 percent slopes.	Severe; shallow to bedrock.
Not needed	Low available water capacity; shallow to bedrock; poorly suited to agricultural use.	Stony or shallow areas, or areas where slope is more than 10 percent; not suitable for terraces.	Low available water capacity; bedrock at a depth of 13 to 48 inches; in some areas soils are stony throughout profile.	Severe; low available water capacity; bedrock at a depth of 3 to 6 feet; 15 to 45 percent slopes in some places.	Severe; seepage.
Not needed	Slopes are generally too steep.	Soil properties favorable where slope is less than 10 percent; steeper areas unsuitable.	High erodibility	Moderate; soil properties mostly favorable.	Moderate where slopes are less than 6 percent; severe where slopes are steeper.
Not needed	Generally too steep for cultivation.	Erodible; shallow to bedrock.	Moderate erodibility; shallow to bedrock.	Severe; shallow to bedrock.	Severe; steep slopes.
Not needed	Slow intake rate in severely eroded areas; otherwise, soil properties favorable where slopes are less than 10 percent.	Soil properties favorable where slopes are less than 10 percent; steeper slopes unsuitable.	Moderate to high erodibility.	Moderate to severe; moderate to steep slopes.	Severe; very severe erosion; slopes greater than 6 percent.
Slow permeability; seasonal high water table at a depth of less than 1 foot; needs surface and subsurface drainage.	Poor drainage; seasonal high water table at a depth of less than 1 foot; slow intake rate; slow permeability.	Not needed; soil is nearly level.	Poor drainage; seasonal high water table at a depth of less than 1 foot.	Severe; seasonal high water table at a depth of less than 1 foot; subject to flooding.	Severe; damage from flooding likely.
Slow permeability; seasonal high water table at a depth of less than 1 foot; needs surface and subsurface drainage; subsurface drainage difficult.	Irrigation not feasible; poorly drained; poorly suited to agricultural use.	Not needed; soil unsuitable for row crops.	Poor drainage; seasonal high water table at a depth of less than 1 foot.	Severe; seasonal high water table at a depth of less than 1 foot; poor drainage.	Moderate to slight.

The values shown for liquid limit and plasticity index indicate the effect of water on the consistence of the soil material. As the content of moisture in a clayey soil increases from a very dry state, the material changes from a semisolid to a plastic state. As the moisture content is further increased, the material changes from a plastic to a liquid state. The liquid limit is the moisture content at which the material passes from a plastic state to a liquid state. The plasticity index is a numerical rating of the ability of the material to be molded.

Table 4 gives brief estimates of the properties of the soils that are significant to engineering. It also gives the textural classification of the U.S. Department of Agriculture and estimates of the Unified classification and of the classification used by the American Association of State Highway Officials. In addition, it gives estimates of the grain-size distribution, permeability, available water capacity, reaction, and shrink-swell potential. The estimates are based partly on test data that have been generalized from table 3, on examinations made in the field, and on experience with soils within the survey area or with similar soils from adjoining counties. These estimates apply only to the soils of Clarke and Oconee Counties.

The information in the column showing depth from surface is based on the descriptions of typical profiles given in the section "Descriptions of the Soils."

Permeability is that quality of the soil that enables it to transmit water and gases. It is measured quantitatively in terms of rate of flow of water through a cross section of saturated soil in a specified time. The rate is usually expressed as inches per hour.

Available water capacity is the amount of water a soil can hold and make available to plants. It is the numerical difference between the percentage of water held at field capacity (approximated at 1/3 atmosphere of tension for silty and clayey soils and at 1/10 atmosphere of tension for sandy soils) and the percentage of water at the time plants wilt (approximated at 15 atmospheres of tension). The rate is expressed as inches of water per inch of soil depth.

The pH values shown in the column headed "Reaction" indicate the degree of soil acidity.

The ratings for shrink-swell potential indicate how much the soil material changes in volume when the content of moisture changes. It is estimated primarily on the basis of the amount and type of clay in the soil layers.

The suitability ratings, comments, and indicated degree of limitations given in table 5 are for modal soil profiles and are to be used only as a guide. They are not intended to replace field tests or laboratory analyses for specific uses where exacting determinations are required.

Table 5 rates the soils according to their suitability as a source of topsoil or road fill. It also names soil features that affect the location of highways and the construction of farm ponds, agricultural drainage and irrigation systems, terraces, and waterways. In addition, it indicates the degree of limitation of the soils if they are used as a filter field for septic tanks or for sewage lagoons. These interpretations are for a normal, undisturbed soil profile. They are determined partly by studying the properties of the soils, partly by studying test data, and partly by using the results of actual field experience, where the performance and predictable behavior of the soils have been studied.

Three ratings—*good*, *fair*, and *poor*—are used to express the suitability of the soils as a source of topsoil or road fill. A soil must be friable, easily worked, and more than 20 inches thick to be given a rating of *good* as a source of topsoil for resurfacing yards, gardens, and other sites used for establishing and growing plants. If the soil material is not easily worked and is less than 6 inches thick, it is rated *poor* as a source of topsoil.

A soil that has a rating of *good* as a source of material for road fill must be thicker than 6 feet at the undisturbed source, must have low shrink-swell potential, and must have good or excellent ability to support traffic. Soils that have less desirable properties are given a rating of *fair* or *poor* as a source of road fill, depending upon the extent of the adverse properties.

Several soil features adversely influence the construction of highways. Among these are bedrock near the surface, a seasonally high water table, erodibility of the steep soils, and an unfavorable shrink-swell potential. The roadbanks that border the highway need to be properly sloped and to have an adequate cover of plants (fig. 11).

Properties of the soils that were considered in determining the suitability of the soils for farm ponds or small reservoirs are soil texture, permeability, and the strength, stability, compactability, and erodibility of the soils when used for embankments. Soil properties for both the reservoir area and the embankment are given in table 5.

Among the limiting factors that affect agricultural drainage are fine soil texture and a water table near the surface. Also, some soils have a restrictive layer in the lower part of the subsoil that affects permeability. Others are easily eroded.

Soil features that affect suitability for irrigation are the rate of permeability, slope, intake rate, available water capacity, internal drainage, and erodibility. In table 5 these factors were considered in determining suitability for irrigation. Irrigation water can be applied by using one of several different methods. The most suitable method for a particular soil is governed by the properties of the soil.

Terraces are used to remove excess runoff at a rate slow enough so that soil erosion is reduced to an allowable amount and runoff is reduced to an allowable velocity. Whether or not a soil is suitable for terraces is determined by the steepness and length of the slopes and by the permeability and erodibility of the soil material.

Soils differ in their suitability for waterways. For example, some soils are easily eroded, but others are not; some soils tend to cave, and others tend to stand as vertical banks; still other soils have bedrock near the surface. All of these properties affect the construction, function, and maintenance of waterways.

Suitable soils for septic tank filter fields are those that absorb the effluent at about the same rate that it is introduced into the filter field; yet, the soil should not be so porous that shallow wells and the supplies of underground water are contaminated. Suitability as a field for septic tanks is determined by the soil texture, percolation rate, internal drainage, depth to bedrock, slope, and susceptibility to flooding. Whether or not a soil has only slight limitations for filter fields or has more serious limitations depends upon these properties.

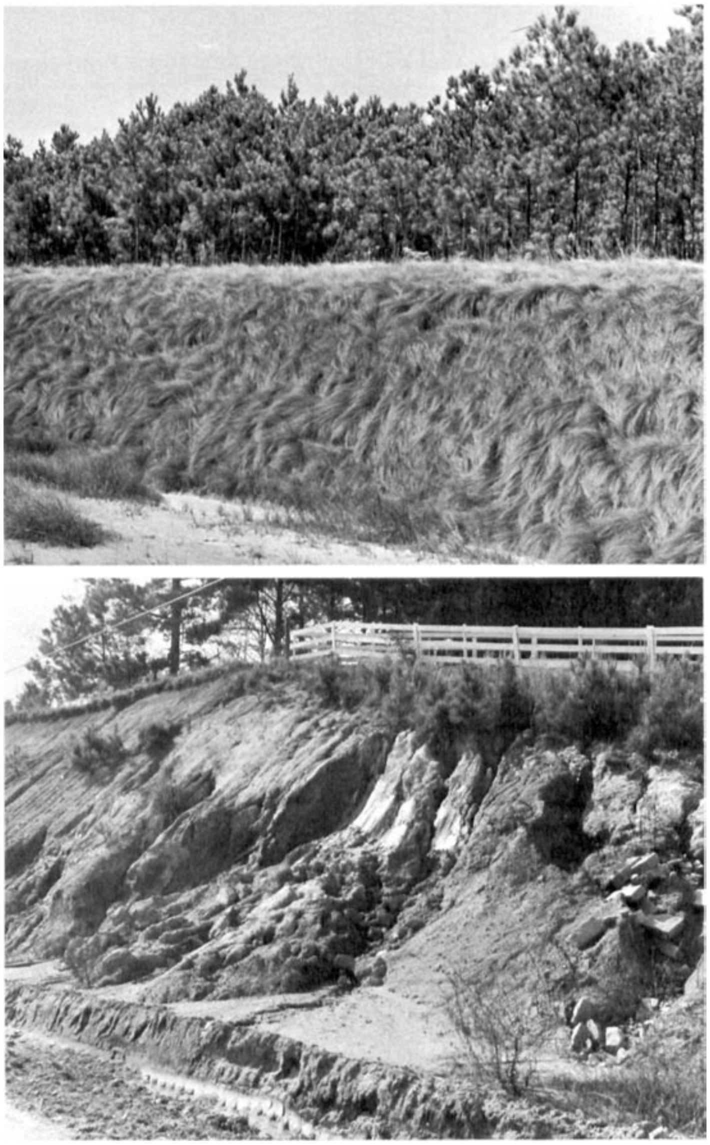

Figure 11.—**Two roadbanks in the survey area. The roadbank in the upper picture consists of Madison soils that have been protected by a dense cover of lovegrass. Loblolly pines at the top of the slope provide cover and prevent runoff from damaging the roadbank. The eroded roadbank in the lower picture consists of Cecil and Pacolet soils. It has not been protected by a cover of plants and was not properly sloped when it was constructed.**

The percolation rate is one of the more critical evaluations used in determining limitations for use as a filter field. If other features are favorable, soils that have a percolation rate of 45 minutes per inch have only *slight* limitations and are suitable as a filter field for septic tanks. Soils that have a percolation rate slower than 75 minutes per inch, on the other hand, have *severe* limitations and are not suitable. Use of soils that have *moderate* limitations is questionable. If the amount of effluent introduced into the field is small, and if the material is introduced at a slow rate, soils that have moderate limitations will likely function satisfactorily. The ratings given in table 5 are only guides, however, and are not intended to replace percolation tests.

Nearly level soils that impound water well and that are not subject to flooding generally have only slight limitations for sewage lagoons. In Clarke and Oconee Counties, slope is one of the limiting soil properties for sewage lagoons. If other soil properties are favorable, soils that have slopes of less than 2 percent have only *slight* limitations. Soils that have slopes greater than 7 percent have *severe* limitations.

Use of the Soils for Residential, Industrial, Recreational, and Related Nonfarm Uses

This section was prepared chiefly for planners, developers, builders, zoning officials, realtors, private and potential landowners, and others interested in use of the soils in Clarke and Oconee Counties for purposes other than farming. In selecting a site for a home, a highway, an industry, recreational use, or other nonfarm purposes, the suitability of the soils at each site 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 basis of these and related characteristics, soil scientists and engineers have rated soils of the two counties for specific nonfarm purposes. The ratings, and the nature of the soil limitations that influenced the ratings, are shown in table 6.

The ratings used are slight, moderate, and severe, and they are applied as the soils occur naturally. If the rating is *slight*, little or no adjustment is needed in use, and the limitations, if any, are easily overcome. A rating of *moderate* means that some adjustment is needed in use but that the limitations can generally be overcome. A rating of *severe* means that extensive adjustments are needed before the soil is suitable for a specific use, that the limitations are difficult to overcome, and that use of the soil for the purpose indicated is questionable.

The following paragraphs briefly discuss use of the soils for residential, industrial, recreational, and related nonfarm uses. The reader can obtain a better concept of the soil limitations by reading the detailed description of the mapping unit in the section "Descriptions of the Soils."

DWELLINGS.—In this soil survey, dwellings refer to houses of three stories or less. In table 6 the limitations are rated for soils used only as sites for dwellings served by a public or community sewage system. The degree of limitation for septic tank filter fields is given in table 5. The soil properties that most affect use for dwellings are bearing capacity,[7] shrink-swell potential, depth to a seasonally high water table, the hazard of flooding, slope, and depth to hard rock. The hazard of flooding is a major limiting factor. A high water table and a slow rate of percolation severely limit the use of the soils for septic tank filter fields.

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[7] In considering ratings for bearing capacity, engineers and others should not apply specific values to any estimates given in this soil survey.

TABLE 6.—*Limitations of the soils for residential,*

[A rating of *slight* means that the limitations, if any, are easily overcome; *moderate* indicates that overcoming the limitations is generally

Soil and symbol	Dwellings that have a public or community sewage system [1]	Light industries
Appling coarse sandy loam, 2 to 6 percent slopes, eroded (AxB2).	Slight	Moderate; moderate shrink-swell potential.
Appling coarse sandy loam, 6 to 10 percent slopes, eroded (AxC2).	Slight	Moderate; moderate shrink-swell potential; slope.
Appling sandy clay loam, 6 to 10 percent slopes, severely eroded (AnC3).	Slight	Moderate; moderate shrink-swell potential; slope.
Buncombe loamy sand (0 to 6 percent slopes) (Bfs)	Severe; frequent flooding	Severe; frequent flooding
Cecil sandy loam, 2 to 6 percent slopes, eroded (CYB2)	Slight	Moderate; moderate shrink-swell potential.
Cecil sandy loam, 6 to 10 percent slopes, eroded (CYC2).	Slight	Moderate; moderate shrink-swell potential; slope.
Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded (CZB3).	Slight	Moderate; moderate shrink-swell potential.
Cecil soils, 0 to 2 percent slopes, overwash (CbA)	Moderate; occasional shallow flooding	Moderate; occasional shallow flooding
Chewacla soils and Alluvial land (0 to 2 percent slopes) (Cob).	Severe; frequent flooding	Severe; frequent flooding
Colfax sandy loam, 2 to 6 percent slopes (CiB)	Severe; seasonal high water table	Severe; seasonal high water table
Congaree soils and Alluvial land (0 to 2 percent slopes) (Coa).	Severe; frequent flooding	Severe; frequent flooding
Davidson sandy loam, 2 to 6 percent slopes, eroded (DqB2).	Slight	Moderate; moderate shrink-swell potential.
Davidson sandy loam, 6 to 10 percent slopes, eroded (DqC2).	Slight	Moderate; moderate shrink-swell potential; slope.
Davidson sandy loam, 15 to 25 percent slopes, eroded (DqE2).	Moderate; slope	Severe; slope
Davidson clay loam, 2 to 6 percent slopes, severely eroded (DhB3).	Slight	Moderate; moderate shrink-swell potential.
Davidson clay loam, 6 to 10 percent slopes, severely eroded (DhC3).	Slight	Moderate; moderate shrink-swell potential.
Davidson clay loam, 10 to 15 percent slopes, severely eroded (DhD3).	Moderate; slope	Severe; slope
Davidson clay loam, 15 to 25 percent slopes, severely eroded (DhE3).	Moderate; slope	Severe; slope
Louisburg loamy sand, 6 to 10 percent slopes (LnC)	Moderate; shallowness to rock	Moderate; shallowness to rock; slope
Louisburg loamy sand, 10 to 25 percent slopes (LnE)	Moderate; shallowness to rock; slope	Severe; slope
Louisburg stony loamy sand, 10 to 25 percent slopes (LDE).	Severe; stoniness; shallowness to rock; slope.	Severe; slope
Madison sandy loam, 2 to 6 percent slopes, eroded (MgB2).	Slight	Moderate; moderate shrink-swell potential.
Madison sandy loam, 6 to 10 percent slopes, eroded (MgC2).	Slight	Moderate; moderate shrink-swell potential.
Madison sandy loam, 10 to 15 percent slopes, eroded (MgD2).	Moderate; slope	Severe; slope
Madison sandy loam, 15 to 25 percent slopes, eroded (MgE2).	Moderate; slope	Severe; slope
Madison sandy clay loam, 2 to 6 percent slopes, severely eroded (MiB3).	Slight	Moderate; moderate shrink-swell potential.
Madison sandy clay loam, 6 to 10 percent slopes, severely eroded (MiC3).	Slight	Moderate; moderate shrink-swell potential; slope.
Madison sandy clay loam, 10 to 25 percent slopes, severely eroded (MiE3)	Moderate; slope	Severe; slope
Madison-Louisa complex, 6 to 10 percent slopes, eroded (MmC2)	Moderate; shallowness to rock	Moderate; slope or shallowness to rock.
Madison-Louisa complex, 10 to 15 percent slopes, eroded (MmD2).	Moderate; slope; shallowness to rock	Severe; slope
Madison-Louisa complex, 15 to 25 percent slopes, eroded (MmE2).	Moderate; slope; shallowness to rock	Severe; slope
Musella clay loam, 15 to 25 percent slopes, eroded (MvE2).	Moderate; slope; shallowness to rock	Severe; slope
Pacolet sandy loam, 10 to 15 percent slopes, eroded (PfD2).	Moderate; slope	Severe; slope
Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded (PgC3).	Slight	Moderate; moderate shrink-swell potential; slope.
Pacolet sandy clay loam, 10 to 15 percent slopes, severely eroded (PgD3).	Moderate; slope	Severe; slope
Pacolet stony sandy loam, 6 to 15 percent slopes, eroded (PiD2).	Severe; stoniness	Severe; stoniness; slope
Pacolet stony sandy loam, 15 to 25 percent slopes, eroded (PiE2).	Severe; stoniness	Severe; stoniness; slope

See footnotes at end of table.

industrial, recreational, and related nonfarm uses

feasible; *severe* indicates that the limitations are difficult to overcome and that the use of the soil for this purpose is questionable]

Recreational facilities		Trafficways [2]
Campsites and intensive play areas	Picnic grounds	
Slight	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Moderate; slope	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; trafficability;[3] slope	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; frequent flooding	Severe; frequent flooding	Severe; frequent flooding.
Slight	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Moderate; slope	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Moderate; trafficability	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; occasional shallow flooding	Severe; occasional shallow flooding	Moderate; occasional shallow flooding.
Severe; frequent flooding	Severe; frequent flooding	Severe; frequent flooding.
Severe; trafficability	Severe; trafficability	Severe; traffic-supporting capacity.
Severe; frequent flooding	Moderate; frequent flooding	Severe; frequent flooding.
Slight	Slight	Moderate; traffic-supporting capacity.
Moderate; slope	Slight	Moderate; traffic-supporting capacity.
Severe; slope	Moderate; slope	Severe; traffic-supporting capacity; slope.
Moderate; trafficability	Moderate; trafficability	Moderate; traffic-supporting capacity.
Severe; trafficability; slope; topography	Severe; topography; trafficability	Moderate; traffic-supporting capacity.
Severe; slope	Severe; slope; trafficability	Severe; traffic-supporting capacity.
Severe; slope	Severe; slope; trafficability	Severe; traffic-supporting capacity.
Moderate; slope	Slight	Moderate; shallowness to rock.
Severe; slope	Moderate; slope	Moderate; slope; shallowness to rock.
Severe; slope	Severe; slope; stoniness	Moderate; slope; shallowness to rock.
Slight	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Moderate; slope	Slight	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; slope	Moderate; slope	Moderate; traffic-supporting capacity; inherent erodibility; slope.
Severe; slope	Moderate; slope	Moderate; traffic-supporting capacity; inherent erodibility; slope.
Moderate; trafficability	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility; slope.
Severe; slope; trafficability	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; slope	Severe; slope; trafficability	Moderate; traffic-supporting capacity; inherent erodibility; slope.
Moderate; slope	Slight	Moderate; shallowness to rock.
Severe; slope	Moderate; slope	Moderate; slope; shallowness to rock.
Severe; slope	Moderate; slope	Moderate; slope; shallowness to rock.
Severe; slope	Moderate; slope; trafficability	Moderate; slope; shallowness to rock.
Severe; slope	Moderate; slope	Moderate; traffic-supporting capacity; inherent erodibility; slope.
Moderate; slope; trafficability	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; slope	Severe; slope; trafficability	Moderate; slope; traffic-supporting capacity; inherent erodibility.
Severe; stoniness; slope	Moderate; stoniness; slope	Severe; stoniness; slope.
Severe; stoniness; slope	Severe; stoniness; slope	Severe; stoniness; slope.

TABLE 6.—*Limitations of the soils for residential, industrial,*

Soil and symbol	Dwellings that have a public or community sewage system [1]	Light industries
Pacolet-Gullied land complex, 6 to 10 percent slopes (PhC).	Severe; topography	Moderate; moderate shrink-swell potential; slope.
Pacolet-Gullied land complex, 10 to 25 percent slopes (PhE).	Severe; slope	Severe; slope
Rock outcrop (Rok)	Severe; shallowness to rock	Moderate to severe; rock fragments; slope.
Wehadkee and Alluvial land, wet (0 to 2 percent slopes) (Wos).	Severe; very frequent flooding	Severe; very frequent flooding
Worsham sandy loam, 2 to 6 percent slopes (WkB)	Severe; high water table	Severe; high water table

[1] See table 5 for ratings for septic tank filter fields.
[2] Traffic-supporting capacity refers to the ability of the undisturbed soil to support a moving load.

STRUCTURES FOR LIGHT INDUSTRIES.—These structures include buildings that are used for stores, offices, and small industries (fig. 12). The buildings are not more than three stories high, and it is assumed that sewage-disposal facilities are available for them. The properties important in evaluating soils for this use are slope, depth to the water table, hazard of flooding, bearing capacity, shrink-swell potential, and corrosion potential.

RECREATION.—The recreational facilities considered in table 6 are campsites, intensive play areas, and picnic grounds. Campsites should be suitable, without much preparation of the site, for tents and for outdoor living for at least a week. Suitability for septic tanks is not a requirement. Intensive play areas include playgrounds, baseball diamonds, tennis courts, and other areas used for organized games. These areas are subject to much foot traffic and generally require a nearly level, firm surface and good drainage. They should be free of coarse fragments and outcrops of rock.

The properties important in evaluating soils for campsites, intensive play areas, and picnic areas are slope, erodibility, and trafficability. Trafficability is affected by the water table and the hazard of flooding. In intensive play areas, the depth to hard rock is also important.

Figure 12.—An area of Cecil sandy loam, 2 to 6 percent slopes, eroded, used as a site for a building needed for light industry. This soil is good to fair for such structures, but it is easily eroded if the sides of cuts are not protected.

Table 6 does not give ratings for suitability for golf fairways, because most fairways are manmade. Suitability for fairways depends mainly on ease of foot travel; ability of the soils to withstand foot and cart travel, especially soon after rains; and freedom from obstacles to golf-ball travel. The properties important in evaluating suitability for a fairway are trafficability, productivity of the soil material, slope, and content of coarse fragments.

TRAFFICWAYS.—This term refers to low-cost roads and residential streets that can be built without much cutting, filling, and preparation of the subgrade. The properties important in evaluating the soils for trafficways are slope, depth to hard rock, depth to the water table, the hazard of flooding, erodibility, and traffic-supporting capacity.

Formation, Morphology, and Classification of Soils [8]

This section tells how the factors of soil formation have affected the development of soils in Clarke and Oconee Counties. It also explains the current system of soil classification and places the soil series in higher categories. In the section "Descriptions of the Soils," the soil series represented in the survey area are discussed and a representative profile is described for each.

Formation of Soils

Soils are produced when climate, plants and animals, parent material, and topography, or relief, interact for a long period of time. These factors, plus time, largely determine the properties of the soil that forms at any given point on the earth. All of them affect the formation of each soil, but the relative importance of each differs from place to place.

Climate and vegetation are the active forces that gradually alter the parent material to form a soil. Topography, a latent factor, mainly influences soil drainage and runoff but also influences soil temperature. Hence, climate, plant and animal life, and topography act through long periods of time to bring about changes in the parent material.

[8] HUBERT J. BYRD, soil correlator, Soil Conservation Service, assisted in preparing this section.

recreational, and related nonfarm uses—Continued

Recreational facilities		Trafficways [2]
Campsites and intensive play areas	Picnic grounds	
Severe; slope; trafficability; topography.	Moderate; trafficability	Moderate; traffic-supporting capacity; inherent erodibility.
Severe; slope	Severe; slope; trafficability	Moderate; slope; traffic-supporting capacity; inherent erodibility.
Severe; rock fragments; slope	Moderate to severe; rock fragments; slope.	Severe; shallowness to rock; slope.
Severe; very frequent flooding	Severe; very frequent flooding	Severe; very frequent flooding.
Severe; trafficability	Severe; trafficability	Severe; high water table; traffic-supporting capacity.

[3] Trafficability refers to the ease with which people can move about over the soil on foot, on horseback, or in small vehicles, such as golf carts.

Climate

Climate affects the formation of soils through its influence on the rate of weathering of rocks and on the decomposition of minerals and organic matter. It also affects biological activity in the soils, and the leaching and movement of weathered materials.

Clarke and Oconee Counties have a moist, temperate climate that is presumed to be similar to that under which the soils formed. The average annual temperature is about 62° F.; the average temperature for January is about 44°; and the average temperature for July is about 80°. The warm, moist climate promotes rapid weathering of hard rock. Consequently, the soils in much of the survey area are 3 to 6 feet thick over a thick layer of loose, disintegrated, weathered material (saprolite), which blankets the hard rock underlying the two counties.

About 48 inches of water falls annually, and much of this percolates downward through the soils. As this water moves through the soil profile, it carries dissolved or suspended material downward and out of the profile. As a result, most of the bases are generally leached out of the soils in the survey area. Plant remains decay rapidly in this climate, and they produce organic acids that help to hasten the breakdown of minerals in the underlying rock. In soils that have good drainage, much of the organic matter from the remains of plants has leached out and the surface layer is now low in content of organic matter.

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 kinds of life processes peculiar to each. The kinds of plants and animals that live on and in the soil are affected, in turn, by the climate, parent material, relief, and age of the soil.

The soils along the numerous small streambeds in the survey area have supported a more luxurious and mixed stand of trees and a thicker cover of undergrowth than areas that do not receive so much water.

Most of the soils, however, formed under a forest consisting of a mixture of oaks and pines. The oaks contributed ample plant material for the worms, insects, fungi, and bacteria that inhabit soils. Both the oaks and pines sank deep roots into the soils and moved part of the soluble bases upward into the soil material nearer the surface. These gains in organic matter near the surface produced marked changes in the structure and porosity of the soil material.

Parent material

Parent material is the loose mass of rock from which a soil forms. In Clarke and Oconee Counties, it generally consists of saprolite of biotite gneiss, schist, and granite gneiss. The proportions of felsic and mafic minerals in the parent rock, and the amount of quartz, which is highly resistant to weathering, limit the amount of clay that will result from weathering. To illustrate, Louisburg soils formed in material weathered from siliceous rock and quartz sands, which are highly resistant to weathering. These soils, as a result, are sandy, have only faint horizons, and contain small, scattered areas where hard bedrock is exposed. In contrast, the Appling, Cecil, and Davidson soils have formed in parent material not so highly resistant to weathering. They contain a fairly large amount of clay weathered chiefly from feldspars. The Madison and Louisa soils also contain an appreciable amount of clay, but the material in which they formed contains considerable muscovite, a mineral that is resistant to weathering and that is retained in the soil profile.

Topography

Topography, or the shape of the landscape, modifies the effects of climate and vegetation. It influences the formation of soils through its effects on drainage, erosion, temperature, and the cover of plants. The survey area, a part of a plateau that is moderately dissected by streams, is generally moderately to strongly sloping. Near stream channels, however, some areas are nearly level, and others have short, steep slopes. There are also a few escarpments.

The streams that dissect the plateau have cut into the land surface in a dendritic pattern that provides good drainage. Except for areas near stream channels and in seepage areas near the foot of ridges, most of the soils are well drained.

In the strongly sloping to steep areas, the soils are shallower to bedrock than soils on broad, sloping ridges. In those places the soils contain many stones, boulders, and outcrops of rock.

Time

A long period of time is generally required for the formation of a soil. Differences in the length of time the parent material has been in place are reflected in the characteristics of the soil profile. The soils of the two counties range widely in development of their genetic horizons. Where the soil material has been in place for a long time, the soils generally have more distinct horizons than where the soil material has been deposited fairly recently. Cecil and Davidson soils are examples of ones formed in material that has been in place for a long period of time. They are considered to be old soils.

Most soils in the survey area have distinct horizons. The surface soil contains an accumulation of organic matter, and silicate clay minerals have formed and moved downward to produce horizons that are relatively high in content of clay. Also, oxidation or reduction of iron has had its effect in such soils. The extent to which the soils are affected depends on the natural drainage. Many of the soils are well enough drained that they have a red or dark-red subsoil and 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 products has caused a resulting increase in exchangeable hydrogen.

Buncombe, Congaree, and Chewacla soils of the flood plains are examples of young soils. Their parent material has not been in place long enough for a distinct profile to have formed. Their profile shows little development other than darkening of the surface layer with organic matter. Many of the soils of uplands, on the other hand, have strongly contrasting horizons of an ABC sequence, indicating relative maturity.

Classification of 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 performing 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.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*3*) and later revised (*5*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study (*4*, *7*). Therefore, readers interested in developments of this system should search the latest literature available.

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 State, regional, and national levels of responsibility for soil classification result in a judgment that the new series should be established. All but one of the soil series described in this publication have been established earlier. The Pacolet series had tentative status when the survey was sent to the printer.

In table 7 some of the classes in the current system (*7*) are given for each soil series. 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 groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Table 7 shows the three soil orders in Clarke and Oconee Counties—Entisols, Inceptisols, and Ultisols. Entisols are recent mineral soils that do not have genetic horizons or have only the beginnings of such horizons. Because Inceptisols generally form on young but not recent land surfaces, their name is derived from the Latin *inceptum*, for beginning. Ultisols have a clay-enriched B horizon that has less than 35 percent base saturation. In those soils the base saturation decreases with increasing depth.

TABLE 7.—*Classification of soil series in Clarke and Oconee Counties, Ga.*

Series	Family	Subgroup	Order
Appling	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Buncombe	Mixed, thermic	Typic Udipsamments	Entisols.
Cecil	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Chewacla	Fine-loamy, mixed, thermic	Aquic Fluventic Dystrochrepts	Inceptisols.
Colfax	Fine-loamy, mixed, thermic	Aquic Fragiudults	Ultisols.
Congaree	Fine-loamy, mixed, nonacid, thermic	Typic Udifluvents	Entisols.
Davidson	Clayey, kaolinitic, thermic	Humic Paleudults	Ultisols.
Louisa	Loamy, micaceous, thermic, shallow	Ruptic-Ultic Dystrochrepts	Inceptisols.
Louisburg	Coarse-loamy, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Madison	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Musella	Fine-loamy, mixed, thermic	Typic Rhodudults	Ultisols.
Pacolet	Clayey, kaolinitic, thermic	Typic Hapludults	Ultisols.
Wehadkee	Fine-loamy, mixed, nonacid, thermic	Fluventic Haplaquepts	Inceptisols.
Worsham	Clayey, mixed, thermic	Typic Ochraquults	Ultisols.

SUBORDER: Each order is subdivided into suborders, primarily on the basis of those soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders narrow the broad climatic range permitted in the orders. The soil properties used to separate suborders mainly reflect either the presence or absence of waterlogging or soil differences resulting from the climate or vegetation.

GREAT GROUP: Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have a pan interfering with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 7, because it is the last word in the name of the subgroup.

SUBGROUP: Great groups are subdivided into subgroups, one representing the central (typic) segment of the group and others, called intergrades, that have properties of one great group and also one or more properties of another great group, suborder, or order. Subgroups may also be made in those instances where soil properties intergrade outside of the range of any other great group, suborder, or order. The names of subgroups are derived by placing one or more adjectives before the name of the great group. An example is Fluventic Haplaquepts.

FAMILY: Families are separated within a subgroup primarily on the basis of properties important to the growth of plants or behavior of soils where used for engineering. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence. An example is the fine-loamy, mixed, nonacid, thermic family of Fluventic Haplaquepts.

Additional Facts About Clarke and Oconee Counties

This section tells about the climate, physiography, drainage, and water supply in the survey area. It also gives facts about the industries, transportation, and markets, and briefly describes the agriculture. The agricultural statistics used are mainly from records of the U.S. Bureau of the Census.

Originally, Clarke County was somewhat larger than it is today, but part of it was used to form Oconee County in 1875. Clarke County was named for General Elijah Clarke, a leader in the Revolutionary War. Oconee County was named for the Oconee River, which forms most of its eastern boundary. Athens, the home of the University of Georgia, is the county seat of Clarke County. Watkinsville is the county seat of Oconee County.

The total population of the two counties was about 53,000 in 1960. Athens had a population of 41,059 in 1960, exclusive of college students.

Climate [9]

The climate of Clarke and Oconee Counties is modified by the Atlantic Ocean 200 miles to the southeast and by the Gulf of Mexico 275 miles to the south. It is also modified, to some extent, by the southern Appalachian Mountains to the north and northwest. These mountains serve as a partial barrier to the masses of cold air that flow from the north and northwest in winter. Table 8 gives facts about temperature and precipitation for these two counties. Table 9, 10, and 11 provide supplementary information about the amount and distribution of rainfall, and table 12 gives the probabilities of the last freezing temperatures in spring and the first in fall.

[9] By HORACE S. CARTER, State climatologist, U.S. Weather Bureau, Athens, Ga.

TABLE 8.—*Temperature and precipitation data for Clarke and Oconee Counties, Ga.*

[Based on records for 10-year period 1954 through 1963]

Month	Temperature				Precipitation		
	Average daily maximum	Average daily minimum	2 years in 10 will have at least 4 days with—		Average	1 year in 10 will have—	
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—
	°F.	°F.	°F.	°F.	Inches	Inches	Inches
January	54.6	34.5	70	20	4.89	2.3	9.2
February	57.0	35.1	73	20	4.70	1.7	8.3
March	63.4	39.7	79	28	5.10	2.8	9.1
April	73.3	48.9	86	35	4.39	1.3	8.0
May	82.2	57.9	92	46	3.61	.7	6.0
June	89.2	65.9	96	59	3.88	1.4	7.8
July	90.2	69.2	96	64	4.99	1.8	7.9
August	89.6	68.4	96	62	3.63	1.0	7.3
September	84.4	62.6	94	51	3.02	.8	6.5
October	75.1	50.8	85	39	2.86	.3	5.9
November	63.3	39.6	78	26	2.93	.8	8.0
December	54.8	34.4	69	20	4.53	1.6	7.9
Year	73.1	50.6	99	15	48.53	40.0	63.0

TABLE 9.—*Average number of days per year (by months) that have rainfall equal to or greater than the stated amounts*

[Based on records for 10-year period 1954 through 1963]

Rainfall equal to or greater than—	Average number of days in—												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
Inches													
0.10	7	8	8	6	6	6	8	5	4	4	6	6	74
.25	5	5	6	5	4	4	6	3	3	2	4	4	51
.50	3	4	4	4	3	3	4	2	2	2	3	3	37

TABLE 10.—*Total number of days in 10 years (by months) that have rainfall equal to or greater than the stated amounts*

[Based on records for 10-year period 1954 through 1963]

Rainfall equal to or greater than—	Total number of days in—												
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	10-year period
Inches													
1	16	17	11	13	12	10	16	7	12	5	9	9	137
2	1	3	2	3	3	1	5	3	6	2	1	1	31
3	0	0	0	0	1	1	1	0	2	0	0	0	5
4	0	0	0	0	0	1	0	0	1	0	0	0	2

TABLE 11.—*Total number of 2-week, 4-week, and 6-week periods in 10 years (by months) with no day having 0.25 inch or more of precipitation*

[Based on records for 10-year period 1954 through 1963]

Periods equal to or greater than— [1]	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total in 10-year period
2 weeks	3	5	1	3	5	10	3	8	10	8	7	10	73
4 weeks	1	0	0	0	3	2	0	3	0	5	0	1	15
6 weeks	0	0	0	0	0	1	0	0	0	2	0	0	3

[1] Periods are listed in the month during which the greater part of the precipitation occurred.

TABLE 12.—*Probabilities of the last freezing temperatures in spring and the first in fall*

Probability	Dates for given probability and temperature		
	24° F. or lower	28° F. or lower	32° F. or lower
Spring:			
1 year in 10 later than	March 16	March 30	April 15
2 years in 10 later than	March 7	March 22	April 10
5 years in 10 later than	February 21	March 14	March 29
Fall:			
1 year in 10 earlier than	November 20	November 5	October 28
2 years in 10 earlier than	November 25	November 10	November 3
5 years in 10 earlier than	December 2	November 20	November 10

Summers are moderately warm and somewhat humid, but there is a noticeable absence of extended periods of hot weather. A temperature of 90° F. or higher can be expected on about half the days during June, July, and August, but a temperature of 100° or higher occurs only about 1 year in 3. The hottest weather usually occurs in several short spells rather than in one long, continuous period. In summer the nights are mild, but the temperature usually drops to the sixties by early morning.

Winters are generally rather mild. The cold spells that do occur usually persist for only a few days, even in midwinter. A temperature of 32° or below occurs on an average of about 50 days each winter. In more than half the months in winter, the temperature drops below 20° at least once, and it drops as low as 10° about 1 year in 4.

The rolling hills and valleys are conducive to large local variations in winter temperatures. On clear, calm mornings in winter, temperatures are likely to be several degrees colder in low areas than on adjacent slopes. A knowledge of the variations in temperature in different areas can be useful in selecting crops for a specific area and in planning a schedule for planting in spring.

The average freeze-free season is about 225 days in length. Normally, it extends from near the end of March to about November 10. Differences in terrain may cause rather large local variations, however, in the length of the growing season.

Spring is usually wetter than fall in these two counties. It is normally more windy and slighty cooler than fall, although both seasons are generally mild. Several periods of stormy weather can be expected in most springs, and the frequency of thunderstorms gradually increases as summer approaches. Fall is characterized by long periods of fine weather, when the days are mild and sunny and the nights are crisp and clear.

Precipitation is well distributed. The average amount received annually is nearly 49 inches (see table 8). March and July are normally the wettest months, and October and November are the driest. Much of the cool-season precipitation occurs as rainfall that lasts for several hours and covers a large area. Most of the precipitation in cool seasons results from the interaction between masses of warm, moist air from the south and masses of cold air from the north. The low-pressure systems and weather fronts associated with these masses of air are generally extensive and may result in rainfall that covers a large area and lasts for several hours. In summer, rainfall occurs primarily as local showers, normally of short duration. During these brief showers, rainfall is sometimes very intensive.

The total amounts of monthly and annual rainfall vary greatly from year to year. The total annual rainfall in Athens, for example, has ranged from 75.80 inches, received in 1929, to only 28.61 inches, received in 1954. Also the total monthly precipitation has ranged from 19.07 inches in June 1963 to none in October 1963. The annual total is between 40 and 60 inches in about 4 out of 5 years. Thunderstorms are to be expected on about 50 days each year. About half of this number of days occurs in June, July, and August. Occasionally, the more intense storms are accompanied by damaging winds and hail. Tornadoes are infrequent, but three or four have been reported in the two counties.

Traces of snow occur nearly every year, but a measurable amount has been reported in less than half the total number of years of record. In about 1 year out of 4, some accumulation of snow is to be expected. The heaviest snowfall of record occurred in March 1942, when 10 inches was measured.

The average relative humidity ranges from 80 to 90 percent early in the morning and from 50 to 60 percent early in the afternoon. Dense fog occurs on an average of about 30 days each year. Fog generally occurs early in the morning but normally lasts for only a few hours.

The average hourly windspeed ranges from about 6.5 miles per hour in August to slightly more than 10 miles per hour in February and March. In summer the direction of the prevailing winds is southwesterly. During other months, the prevailing direction ranges from west-northwest, through north, to east-northeast.

Physiography, Drainage, and Water Supply

Clarke and Oconee Counties are entirely within the Piedmont Plateau. Formerly, the area appears to have been a broad, fairly smooth plain. During a long period of erosion, however, the larger streams cut valleys that have strongly sloping walls. The smaller streams have not dissected the area nearly so deeply as the larger ones. Between the drainageways, there are still large areas of fairly smooth plains.

A large part of the survey area is drained by the Oconee River and its tributaries. Sandy Creek is the main tributary that drains the northern part of the survey area. Barber and McNutt Creeks are the main ones that drain the western part. Drainage is also provided by the Apalachee River, which forms the southwestern boundary of Oconee County. In these two counties, the water table is usually high in April and May and low in October and November.

Water for the city of Athens is taken from Sandy Creek. Water is also piped to other towns in Clarke County and to towns in the northern part of Oconee County. Water for Watkinsville is taken from a drilled well that is about 450 feet deep and yields about 120 gallons per minute. On many farms water for kitchen use is pumped from dug or drilled wells that yield about 4 gallons per minute. These wells are generally 40 to 60 feet deep, but a few are more than 100 feet deep. Streams and farm ponds supply most of the water for livestock.

Industries, Transportation, and Markets

Many small industries and other industries of moderate size are located in Clarke and Oconee Counties. The industries include several sewing plants, two textile mills, a plant where paper milk cartons are manufactured, a factory where electrical transformers are fabricated, and machine shops. Families on almost every farm have at least one member who is employed at a factory or plant.

The two counties are served by U.S. Highway Nos. 29, 78, 441, and 129, and State Highway Nos. 8, 10, 15, 24, 53, and 106. All of these highways and most of the county roads are paved. In addition, two railways and several motor freight lines pass through the area.

Cotton and other farm products are marketed at Athens. Chickens and other kinds of livestock are also marketed there.

Agriculture

Before white settlers arrived in the area that is now Clarke and Oconee Counties, Indians grew corn, beans, and potatoes on some of the bottom lands. After the settlers came, the land was cleared for farms, and by 1900 most of the acreage was cultivated. Since that time, however, much of the land that was formerly used for cultivated crops has reverted to woodland. Cotton, corn, and small grains are the crops now grown the most extensively.

Clarke County had a total of 279 farms in 1959, a much smaller number than were in the county in 1910. Oconee County had a total of 478, also a considerably smaller number than were in the county in 1910. The reduction in the number of farms has resulted partly because a large acreage has been taken out of production for use for residences and industries, and partly because the size of farms has increased. The average size of farms in the two counties increased from about 75 acres in 1900 to about 157 acres in 1959.

The total amount of harvested cropland declined from 53,116 acres in 1949 to 26,769 acres in 1959. The amount of acreage in wheat did not change greatly in the years between 1949 and 1959, but the acreage in cotton and corn declined somewhat during that period.

In 1959 income from the sale of poultry and poultry products in Clarke County accounted for more than half the total income derived from the sale of farm products. In the same year, income from the sale of field crops in Oconee County accounted for more than half the farm income.

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Glossary

Acidity, soil. See Reaction, soil.

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

Available water capacity. The capacity of a soil to hold water in a form available to plants. The amount of moisture held in a soil between field capacity, or about one-third atmosphere of tension, and the wilting coefficient, or about 15 atmospheres of tension.

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

Colluvium. Soil material, fragments of rock, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

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

Loose.—Noncoherent; will not hold together in a mass.

Friable.—When moist, crushes easily under gentle to moderate 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, is 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 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, soil. The rapidity and extent of the removal of water from the soil, in relation to additions, especially by runoff, by flow through the soil to underground spaces, or by a combination of both processes.

Felsic rock. A term applied to light-colored rocks containing an abundance of feldspar, lenads or feldspathoids, and silica, or any one of these rocks alone. Contrasted with mafic rock.

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

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 residue.

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 it is therefore 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 by (1) accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. The 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 layer is presumed to be like that from which the overlying horizons were formed. If the underlying 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 soil material.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Mafic rock. A term applied to rocks composed dominantly of the magnesian rock-forming silicates; applied to some dark-colored igneous rocks and their constituent minerals. Contrasted with felsic rock.

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

Parent material. The 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, soil. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *Very slow, slow, moderately slow, 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. See also Horizon, soil.

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. In words the degrees of acidity or alkalinity are expressed thus:

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

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

Sand. Individual rock or mineral fragments in soils having diameters ranging from 0.5 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.

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

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting upon 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 course sand* (2.0 to 1.0 millimeters); *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 millimeters); II (0.2 to 0.05 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 a mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying parent material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. Structureless soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

Substratum. Any layer lying beneath the solum, or true soil; the C horizon.

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. (See also Clay, Sand, and Silt). The basic textural classes, in order of increasing proportions of fine particles, are as follows: 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 (geological). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

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GUIDE TO MAPPING UNITS

[For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs.

[See table 1, p. 6, for the approximate acreage and proportionate extent of the soils; table 2, p. 29, for estimated average acre yields; tables 3, 4, and 5, on pages 36, 36, and 40, for information significant to engineering; and p. 32 for facts about wildlife]

Map symbol	Mapping unit	Page	Capability unit		Woodland group		Wildlife group
			Symbol	Page	Number	Page	Number
AnC3	Appling sandy clay loam, 6 to 10 percent slopes, severely eroded	7	IVe-1	25	3	31	3
AxB2	Appling coarse sandy loam, 2 to 6 percent slopes, eroded	7	IIe-2	23	2	31	1
AxC2	Appling coarse sandy loam, 6 to 10 percent slopes, eroded	7	IIIe-2	24	2	31	1
Bfs	Buncombe loamy sand	8	IIIs-1	25	1	31	7
CbA	Cecil soils, 0 to 2 percent slopes, overwash	9	I-1	22	1	31	7
CiB	Colfax sandy loam, 2 to 6 percent slopes	10	IIIw-2	25	5	32	8
Coa	Congaree soils and Alluvial land	11	IIw-1	23	1	31	7
Cob	Chewacla soils and Alluvial land	10	IIIw-1	25	6	32	8
CYB2	Cecil sandy loam, 2 to 6 percent slopes, eroded	8	IIe-1	23	2	31	1
CYC2	Cecil sandy loam, 6 to 10 percent slopes, eroded	9	IIIe-1	23	2	31	1
CZB3	Cecil sandy clay loam, 2 to 6 percent slopes, severely eroded	9	IIIe-1	23	3	31	3
DhB3	Davidson clay loam, 2 to 6 percent slopes, severely eroded	12	IIIe-1	23	3	31	3
DhC3	Davidson clay loam, 6 to 10 percent slopes, severely eroded	12	IVe-1	25	3	31	3
DhD3	Davidson clay loam, 10 to 15 percent slopes, severely eroded	12	IVe-1	25	3	31	4
DhE3	Davidson clay loam, 15 to 25 percent slopes, severely eroded	13	VIe-1	27	3	31	4
DqB2	Davidson sandy loam, 2 to 6 percent slopes, eroded	12	IIe-1	23	2	31	1
DqC2	Davidson sandy loam, 6 to 10 percent slopes, eroded	12	IIIe-1	23	2	31	1
DqE2	Davidson sandy loam, 15 to 25 percent slopes, eroded	12	VIe-1	27	2	31	2
LDE	Louisburg stony loamy sand, 10 to 25 percent slopes	14	VIIe-2	27	4	32	6
LnC	Louisburg loamy sand, 6 to 10 percent slopes	14	IVe-2	26	4	32	5
LnE	Louisburg loamy sand, 10 to 25 percent slopes	14	VIIe-2	27	4	32	6
MgB2	Madison sandy loam, 2 to 6 percent slopes, eroded	14	IIe-1	23	2	31	1
MgC2	Madison sandy loam, 6 to 10 percent slopes, eroded	14	IIIe-1	23	2	31	1
MgD2	Madison sandy loam, 10 to 15 percent slopes, eroded	15	IVe-1	25	2	31	2
MgE2	Madison sandy loam, 15 to 25 percent slopes, eroded	15	VIe-1	27	2	31	2
MiB3	Madison sandy clay loam, 2 to 6 percent slopes, severely eroded	15	IIIe-1	23	3	31	3
MiC3	Madison sandy clay loam, 6 to 10 percent slopes, severely eroded	15	IVe-1	25	3	31	3
MiE3	Madison sandy clay loam, 10 to 25 percent slopes, severely eroded	15	VIIe-1	27	3	31	4
MmC2	Madison-Louisa complex, 6 to 10 percent slopes, eroded	15	IVe-2	26	2	31	5
MmD2	Madison-Louisa complex, 10 to 15 percent slopes, eroded	16	VIe-2	27	2	31	6
MmE2	Madison-Louisa complex, 15 to 25 percent slopes, eroded	17	VIIe-2	27	2	31	6
MvE2	Musella clay loam, 15 to 25 percent slopes, eroded	17	VIe-3	27	3	31	4
PfD2	Pacolet sandy loam, 10 to 15 percent slopes, eroded	18	IVe-1	25	2	31	2
PgC3	Pacolet sandy clay loam, 6 to 10 percent slopes, severely eroded	18	IVe-1	25	3	31	3
PgD3	Pacolet sandy clay loam, 10 to 15 percent slopes, severely eroded	18	VIe-1	27	3	31	4
PhC	Pacolet-Gullied land complex, 6 to 10 percent slopes	20	VIIe-3	28	3	31	4
PhE	Pacolet-Gullied land complex, 10 to 25 percent slopes	20	VIIe-3	28	3	31	4
PiD2	Pacolet stony sandy loam, 6 to 15 percent slopes, eroded	18	VIe-1	27	2	31	2
PiE2	Pacolet stony sandy loam, 15 to 25 percent slopes, eroded	20	VIe-1	27	2	31	2
RoK	Rock outcrop	20	VIIIs-1	28	--	32	6
WkB	Worsham sandy loam, 2 to 6 percent slopes	21	Vw-1	26	6	32	9
Wos	Wehadkee and Alluvial land, wet	21	IVw-1	26	6	32	9

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