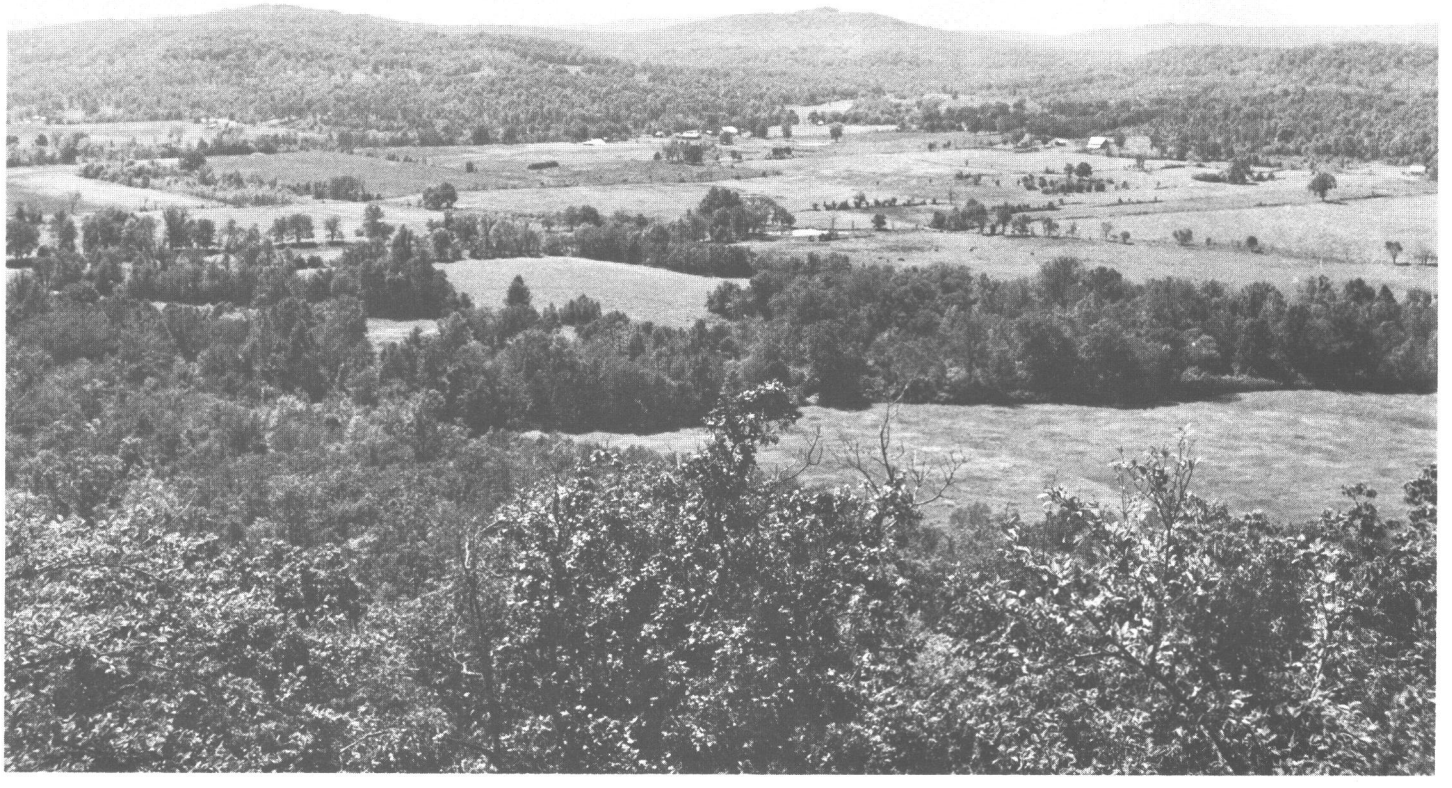
SOIL SURVEY

Washington County, Arkansas



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service and Forest Service
In cooperation with
ARKANSAS AGRICULTURAL EXPERIMENT STATION

Issued March 1969

Major fieldwork for this soil survey was done in the period 1958–64. Soil names and descriptions were approved in 1966. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1966. This survey was made cooperatively by the Soil Conservation Service and Forest Service and the Arkansas Agricultural Experiment Station. It is part of the technical assistance furnished to the Washington County Soil and Water Conservation District.

HOW TO USE THIS SOIL SURVEY

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

Locating Soils

All of the soils of Washington County 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 this publication. This guide lists all of the soils of the county 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, range site, and wildlife 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 from the soil descriptions and from the discussions of the capability units, the woodland groups, the range sites, and the wildlife groups.

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

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

Ranchers and others can find under "Use of the Soils for Range" groupings of the soils according to their suitability for range and descriptions of the vegetation on each range site.

Community planners and others concerned with nonfarm development can read about the soil properties that affect the choice of homesites, industrial sites, and recreational sites in the section "Nonfarm Uses of the Soils."

Engineers and builders can find under "Use of the Soils in Engineering" tables that give engineering descriptions of the soils in the county and that name soil features that affect engineering practices and structures.

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

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

Cover picture

Pastured valley and wooded mountainsides in foothills of Boston Mountains. Savannah, Cleora, and Razort soils in valley. Enders and Allegheny soils on mountainsides.

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Contents

	Page
How this survey was made	1
General soil map	2
Soils of the Boston Mountains	2
1. Allen-Hector-Enders association	2
2. Enders-Allegheny-Hector association	3
3. Linker-Apison-Hector association	4
4. Fayetteville-Hector-Mountainburg association	4
5. Savannah-Cleora-Razort association	5
Soils of the Springfield Plateau	5
6. Clarksville-Nixa-Baxter association	5
7. Captina-Nixa-Pickwick association	6
8. Razort-Captina-Pembroke association	7
Descriptions of the soils	7
Allegheny series	9
Allen series	11
Apison series	13
Baxter series	14
Captina series	15
Cherokee series	16
Clarksville series	17
Cleora series	18
Elsah series	19
Enders series	19
Fayetteville series	22
Guin series	23
Hector series	24
Jay series	25
Johnsburg series	25
Leaf series	26
Linker series	27
Montevallo series	29
Mountainburg series	30
Nixa series	30
Pembroke series	31
Pickwick series	32
Razort series	33
Rock land	34
Samba series	35
Savannah series	35
Sloan series	36
Sogn series	37
Summit series	37
Taloka series	39
Use of the soils for crops and pasture	40
Capability groups of soils	41
Predicted yields	47
Use of the soils in engineering	47
Engineering classification systems	50
Engineering test data	51
Estimated properties	51
Engineering interpretations	51
Clay mineralogy of selected soils	51
Nonfarm uses of the soils	65
Use of the soils for woodland	74
Production of wood crops	74
Production of forage	75
Use of the soils for range	80
Range sites and condition classes	81
Descriptions of range sites	81
Use of the soils for wildlife	83
Formation and classification of the soils	85
Factors of soil formation	86
Climate	86
Living organisms	86
Parent material	86
Relief	87
Time	87
Processes of soil formation	87
Classification of the soils	88
General nature of the county	90
Physiography and drainage	90
Geology	90
Climate	91
Water supply	92
Farming	92
Literature cited	92
Glossary	92
Guide to mapping units	following 94

Issued March 1969

SOIL SURVEY OF WASHINGTON COUNTY, ARKANSAS

BY M. DEAN HARPER, WILLIAM W. PHILLIPS, AND GEORGE J. HALEY, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, IN COOPERATION WITH THE ARKANSAS AGRICULTURAL EXPERIMENT STATION

WASHINGTON COUNTY is in the northwestern part of Arkansas (fig. 1). It is about 32 miles from north to south and about 32 miles from east to west. The total area is 616,320 acres, or 963 square miles. In 1960, the population totaled 55,797. Fayetteville, the county seat, is on the northern edge of the Boston Mountains. It is about 1,250 to 1,720 feet above sea level.

The southern two-thirds of the county is in the Boston Mountains. A large part of this area consists of steep, stony mountainsides covered with hardwoods. The more nearly level parts are mostly pasture and meadow. Farm enterprises are based mainly on timber, beef cattle, and broiler production.

The northern third of the county is on the Springfield Plateau. It consists mainly of broad areas of deep, nearly level to gently sloping soils dissected by steep V-shaped draws. Farm enterprises here are based mainly on beef cattle and broilers. Truck crops, vineyards, and orchards are important also.

About 48,000 acres of the county is within the boundary of the Ozark National Forest. About 22,750 acres of this tract is Federally owned. The rest is mainly in small, private holdings. Most of the Federally owned land is in the southernmost part of the county.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Washington County, 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.

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 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, the major horizons of all the soils of one series 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. Enders and Razort, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that affect their behavior in the natural, undisturbed 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 series contain soils that differ in the 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. Razort loam and Razort silt loam are two soil types in the Razort series. The difference in the texture of their surface layers is apparent from their names.

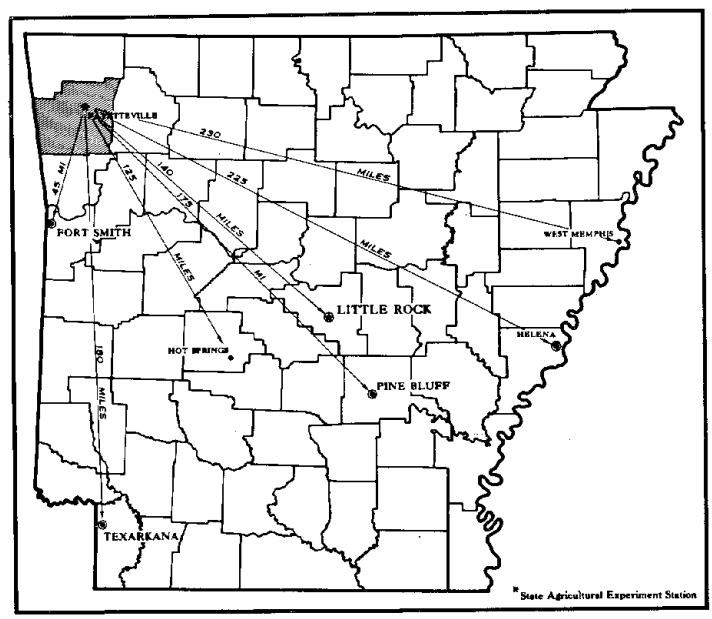

Figure 1.—**Location of Washington County in Arkansas.**

Some soil 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 soil phases. The name of a soil phase indicates a feature that affects management. For example, Enders gravelly loam, 3 to 8 percent slopes, is one of several phases of a soil type that has a slope range of 3 to 12 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map in the back of this 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 or occur in such small individual tracts that it is not practical to show them separately on the map. 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 soils in it, for example, Enders-Allegheny complex, 20 to 40 percent slopes.

Another kind of mapping unit is the undifferentiated group, which consists of two or more soils that may occur together without regularity in pattern or relative proportion. The individual tracts of the component soils could be shown separately on the map, but the differences between the soils are so slight that the separation is not important for the objectives of the soil survey. An example is Allen soils, 8 to 20 percent slopes.

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. Such an area is shown on the map like other mapping units, but it is given a descriptive name, such as Rock land, and is called a land type.

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 and 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 such a way that it is readily useful to different groups of readers, among them farmers, ranchers, 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. The soil scientists set up trial groups based on the yield and practice tables and other data. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under present methods of use and management.

General Soil Map

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

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

The eight soil associations of Washington County are described in the paragraphs that follow.

Soils of the Boston Mountains

Soil associations 1, 2, 3, 4, and 5 are in the Boston Mountains. These soils formed under hardwoods. They are underlain mainly by acid sandstone, siltstone, and shale, or by alluvium derived from these rocks (fig. 2).

1. Allen-Hector-Enders association

Stony, deep and shallow, moderately well drained to somewhat excessively drained, gently sloping to steep soils on mountainsides

This association is characterized by steep, wooded mountainsides and stream valleys. The valleys are long and winding, no more than a fourth of a mile wide, and about 1,400 feet above sea level. The mountainsides rise from the valleys in a series of steep slopes and gently sloping benches. Their gradient is predominantly 12 to 65 percent. Locally they have vertical cliffs. They are gravelly and stony and are strongly dissected. The ridgetops are long and winding and are less than a fourth of a mile to no more than half a mile wide. Most are about 1,800 to 2,000 feet above sea level. A few are as much as 2,300 feet high. The rock formations consist of alternate layers of acid shale and sandstone. The caprock is hard sandstone. This association occupies about 8 percent of the county. It is in the southern part.

Allen and Enders soils are on the mountainsides. Hector soils are on the steepest parts of the mountainsides and on narrow ridgetops.

Allen soils make up about 50 percent of this association. They formed in deposits, 4 to 15 feet thick, of material that weathered from sandstone and shale and then washed or

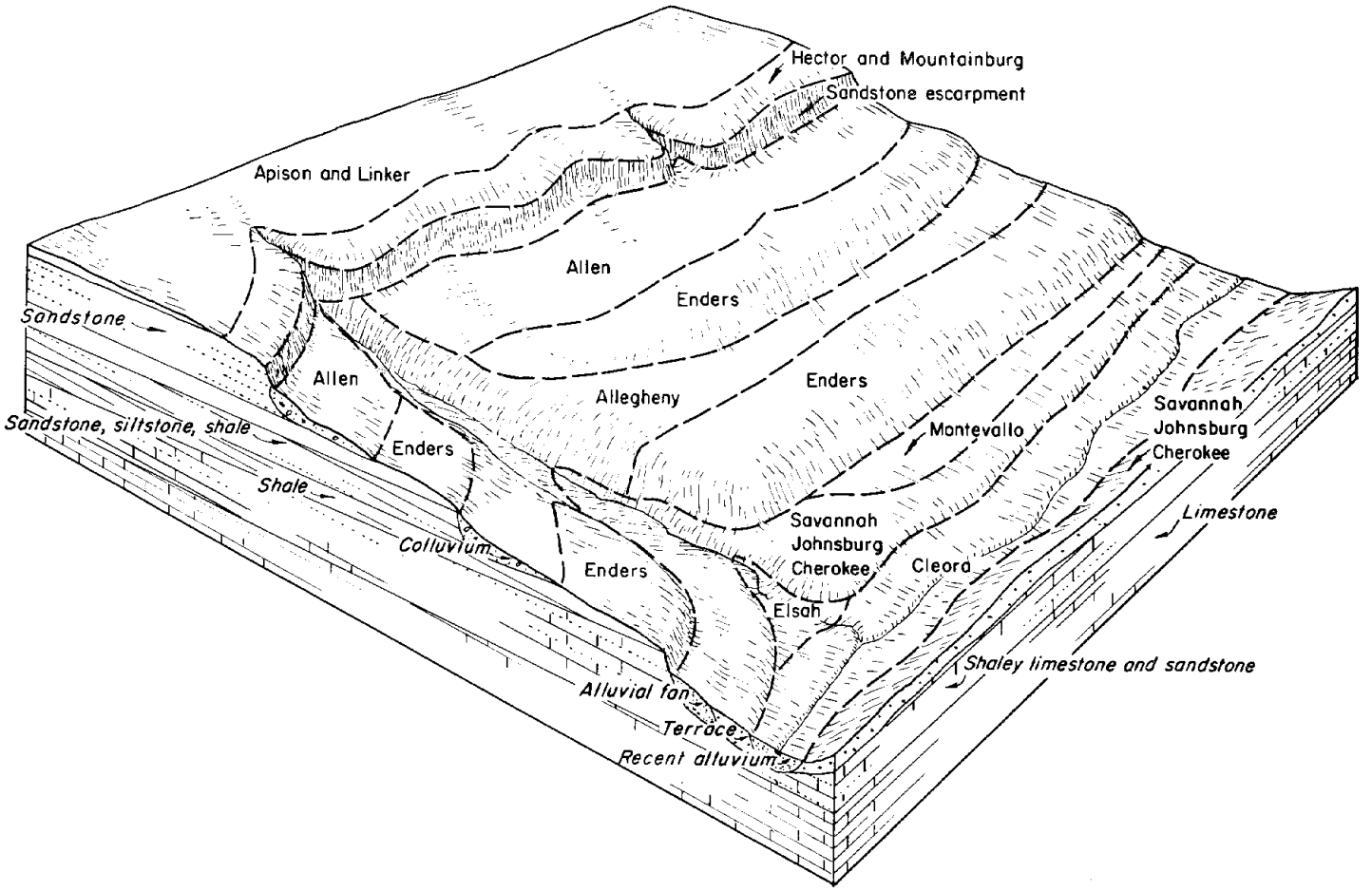

Figure 2.—**Typical pattern of soils and underlying material in associations 1, 2, 3, 4, and 5.**

rolled downhill from higher lying slopes. Their surface layer is dark-brown or dark yellowish-brown loam, and their subsoil is red, friable loam to clay loam. These soils contain varying amounts of sandstone gravel and stones.

Hector soils make up about 20 percent of the association. They are 10 to 20 inches thick over sandstone. Their surface layer is brown or dark-brown fine sandy loam, and their subsoil is yellowish-brown or strong-brown loam or fine sandy loam. These soils are gravelly and stony.

Enders soils make up about 15 percent of the association. Their surface layer is weathered material brought down from higher lying slopes. It is gravelly or stony, brown loam and is about 8 to 12 inches thick. The subsoil is mottled red and gray, plastic clay. This layer is 3 to 6 feet thick.

The rest of the association consists of Cleora, Elsah, Pickwick, Linker, and Mountainburg soils and rock outcrops.

More than 95 percent of this association is wooded. Practically all of the cleared acreage is on ridgetops and mountain benches and in the stream valleys. The cleared areas are parts of farms that range from 80 to 300 acres in size. Some are cultivated to feed crops for livestock, some are pastured, some fallowed, and some planted to pine trees. A few are used for truck crops. Almost every farm has a few beef cattle. Most of the farms are owned by people who are retired or who work off the farm.

Except for the benches, the middle parts of the narrow ridgetops, and the parts of stream valleys that are above the level of frequent overflow, this association is not suited to farming. The mountainsides are steep, stony, difficult to till, and moderate to low in fertility. The erosion hazard is very severe in cleared areas.

This association also has very severe limitations for intensive nonfarm development. Highway construction as well as other construction is difficult. If cuts are made in hillsides, the soils, particularly the Enders soils, are likely to slip and slide.

This association is well suited to vegetation that provides wildlife food and cover. It is also well suited to use for recreational activities, such as hunting, camping, and hiking.

2. *Enders-Allegheny-Hector association*

Deep and shallow, moderately well drained to somewhat excessively drained, gently sloping to steep soils on mountainsides

This association is characterized by steep mountainsides and stream valleys. The valleys are no more than half a mile wide and are about 1,100 to 1,400 feet above sea level. The mountainsides rise from the valleys in a series of steep slopes and gently sloping benches. They have a gradient of 12 to 65 percent. They are gravelly and stony and are strongly dissected. The ridgetops are long and winding

and are less than a fourth of a mile to no more than half a mile wide. Most are about 1,700 to 1,900 feet above sea level. A few are as much as 2,300 feet high. The rock formations consist of alternate layers of acid shale and sandstone. The caprock is hard sandstone. This association occupies about 39 percent of the county. It is mainly in the southern half.

Enders and Allegheny soils are on the mountainsides. Hector soils are on ridgetops.

Enders soils make up about 30 percent of this association. Their surface layer, which is weathered material brought down from higher slopes, is brown gravelly or stony loam 8 to 12 inches thick. Their subsoil is mottled red and gray, plastic clay 3 to 6 feet thick.

Allegheny soils make up about 25 percent of the association. They formed mainly in deposits 3 to 15 feet thick of material that weathered from sandstone and shale and then washed or rolled downhill from higher lying slopes. They contain few to many sandstone pebbles and stones. Their surface layer is dark-brown loam, and their subsoil is strong-brown or yellowish-brown, friable loam to clay loam.

Hector soils make up about 10 percent of the association. They are gravelly or stony and are only 10 to 20 inches thick over sandstone. Their surface layer is brown or dark-brown fine sandy loam, and their subsoil is yellowish-brown or strong-brown loam or fine sandy loam.

The rest of the association consists of Cleora, Razort, and Pickwick soils, all of which are in the stream valleys; and Mountainburg, Linker, and Fayetteville soils and rock outcrops, which are on the mountainsides and mountaintops.

More than 90 percent of this association is wooded. Practically all of the cleared acreage is on mountaintops and in stream valleys. These cleared areas are parts of farms that range from 80 to 300 acres in size. Some are cultivated to feed crops for livestock, some are pastured, some fallowed, and some planted to pine trees. A few are used for truck crops. Almost every farm has a few beef cattle. Most of the farms are occupied by part-time farmers or by people who are retired. Some farms are abandoned.

Except for the middle parts of the narrow ridgetops and the parts of stream valleys that are above the level of frequent overflow, this association is not suited to farming. On the steep mountainsides and the mountaintops, the soils are stony, shallow, low to moderate in fertility, and very difficult to till. The erosion hazard is very severe in cleared areas.

This association also has serious limitations for intensive nonfarm development. Highway construction as well as other construction is difficult. If cuts are made in hillsides, the soils, particularly the Enders soils, are likely to slip and slide.

This association is well suited to wildlife habitat. It is also well suited to use for recreational activities, such as hunting, camping, and hiking.

3. *Linker-Apison-Hector association*

Moderately deep and shallow, well-drained to somewhat excessively drained, nearly level to rolling soils on mountaintops

This association occurs as insular areas within the large areas of heavily wooded mountainsides described in associations 1 and 2. Most areas are long and winding and half a mile to 3 miles wide. They are about 1,600 to 2,000 feet above sea level; a few are as much as 2,400 feet high. The gradient is 3 to 12 percent. This association occupies about 8 percent of the county. It is in the southern half. The largest area is near Lincoln.

Linker and Apison soils are generally on the middle parts of the mountaintops, and Hector soils are along the margins and on knobs. All developed in material weathered from sandstone and shale.

Linker soils make up about 35 percent of this association. Their surface layer is brown loam. Their subsoil is red or yellowish-red, friable loam or sandy clay loam that is 2 to 3 feet thick over sandstone. In places these soils are gravelly.

Apison soils make up about 15 percent of the association. Their surface layer is brown or dark grayish-brown loam. Their subsoil is strong-brown to yellowish-brown, friable loam to clay loam that is 2 to 3 feet thick over sandstone. In places these soils are gravelly.

Hector soils make up about 15 percent of the association. Their surface layer is brown fine sandy loam, and their subsoil is strong-brown or yellowish-brown loam or fine sandy loam. These soils are only 10 to 20 inches thick over sandstone. Generally they are gravelly and stony throughout.

The rest of the association consists of Mountainburg, Captina, and Enders soils and rock outcrops.

About 40 percent of this association is wooded. Much of the cleared acreage consists of the deeper soils. The cleared areas are parts of farms that range from 80 to 300 acres in size. Some are cultivated to feed crops for livestock, some are used for pasture, and some are fallowed. A few are used for truck crops. Almost every farm has a few beef cattle. Many of the farms are occupied by part-time farmers or by people who are retired. There are few full-time farmers, except in the area near Lincoln.

This association is poorly suited to moderately well suited to most farm crops. The erosion hazard is moderate to severe in cleared areas, the available water capacity is low to moderate, and natural fertility is low. Pasture and hay crops grow well.

This association has serious limitations for intensive nonfarm development. Most areas are fairly remote from large population centers. The massive sandstone bedrock at or near the surface is a moderate to severe limitation in the construction of highways or heavy industrial buildings. Parts of the association have suitable residential building sites, but accessibility is a problem, establishing ornamental plantings is difficult, and the limitations for septic tank drainage fields are moderate to severe.

This association is well suited to trees and plants that provide wildlife food and cover and also to shortleaf pine. It has slight to moderate limitations for recreational developments, for example, golf courses, camps, and playgrounds.

4. *Fayetteville-Hector-Mountainburg association*

Loamy, deep and shallow, well-drained to somewhat excessively drained, gently sloping to steep soils on mountaintops

This association occurs as insular areas within the large areas of heavily wooded mountainsides described in association 2. The areas are half a mile to 2 miles wide and 1 mile to 4 miles long. Most are 1,400 to 1,750 feet above sea

level. The gradient is mainly 3 to 20 percent. This association occupies about 3 percent of the county. It is in the northern part of the Boston Mountains.

Fayetteville soils are on the middle parts of the low mountaintops, and Hector and Mountainburg soils are on the steeper parts, along the margins and on knobs. All developed in material weathered from locally calcareous sandstone caprock.

Fayetteville soils make up about 60 percent of this association. Their surface layer is dark-brown or dark reddish-brown fine sandy loam 6 to 11 inches thick. Their subsoil is dark-red to dark reddish-brown, friable loam to clay loam that is 4 to 7 feet thick over soft sandstone. In a few places these soils are gravelly or stony.

Hector and Mountainburg soils make up about 20 percent of the association. They have a surface layer of brown or dark-brown fine sandy loam and a subsoil of reddish-brown to yellowish-brown loam or fine sandy loam. They are only 10 to 20 inches thick over sandstone. Most areas are stony.

The rest of the association consists of sandstone outcrops and areas of Linker and Enders soils.

About 30 percent of this association is wooded, mainly the shallow and stony areas. The cleared areas are parts of farms that range from 80 to 300 acres in size. Some are cultivated to feed crops for livestock, some are pastured, some fallowed, and some are used for truck crops and orchards. Almost every farm has beef cattle. Most of the farms are occupied by people who are retired or who farm part time. There are a few full-time farmers. Some farms are abandoned.

Most of this association is moderately well suited to farming. The available water capacity and natural fertility are moderate in Fayetteville soils and low in Hector and Mountainburg soils. The erosion hazard is severe to very severe in cleared areas.

This association has moderate to severe limitations for intensive nonfarm development. Parts of it are remote from large population centers. The underlying sandstone is a slight to severe limitation, depending on depth, in the construction of highways, residences, and industrial structures. The shallow areas have moderate to severe limitations for use as septic tank drainage fields and also for establishment of ornamental plantings.

This association is suited to trees and plants that provide wildlife food and cover. It is also suited to use for recreational developments, such as camps, playgrounds, and golf courses.

5. *Savannah-Cleora-Razort association*

Loamy, deep, moderately well drained to well drained, nearly level to gently sloping soils on terraces and flood plains

This association occurs as stream terraces and flood plains along streams that drain the Boston Mountains. It is 1,100 to 1,400 feet above sea level. Individual areas are half a mile to 2 miles wide and 10 to 20 miles long. This association occupies about 9 percent of the county. The largest area is in the east-central part.

Cleora soils are adjacent to streams. Razort soils, which have a gradient of 0 to 2 percent, are a few feet higher in elevation than Cleora soils and are seldom flooded. Some areas of Razort soils are adjacent to streams, and some are adjacent to Cleora soils. Savannah soils, which have smooth slopes of 1 to 8 percent, are adjacent to either Cleora or Razort soils on one side and to areas of association 2 on the other.

Savannah soils make up about 35 percent of the association. Their surface layer is grayish-brown or brown fine sandy loam 4 to 12 inches thick. Their subsoil is strong-brown or yellowish-brown loam to clay loam. This subsoil is friable to a depth of 18 to 28 inches. Below this depth it is compact and brittle and mottled gray and brown.

Cleora soils make up about 20 percent of the association. Their surface layer is dark-brown or very dark grayish-brown, friable fine sandy loam 10 to 26 inches thick. Their subsoil is dark-brown to yellowish-brown, friable fine sandy loam 3 to 5 feet thick.

Razort soils make up about 20 percent of the association. Their surface layer is dark-brown or dark yellowish-brown loam 7 to 12 inches thick. Their subsoil is dark-brown, or dark yellowish-brown, friable loam to clay loam 4 to 6 feet thick.

The rest of the association consists of Johnsburg, Pickwick, Elsah, and Samba soils.

More than 90 percent of this association is cleared. The wooded areas are mostly along streambanks. Most farms are 80 to 300 acres in size. Almost every farmer has beef cattle and raises pasture and hay crops and feed crops for livestock.

This association is well suited to farming. The available water capacity is moderate to high. Natural fertility is low in Savannah soils and moderate in Cleora and Razort soils. Flood damage is a moderate hazard on Cleora soils and on some areas of Razort soils. The erosion hazard is moderate to severe on Savannah soils and slight on Razort soils.

Cleora and Razort soils are not suited to industrial or residential development because of the overflow hazard. Savannah soils have moderate limitations for septic tank drainage fields.

This association is well suited to ornamental plantings and to plants that provide wildlife food and cover. It has moderate to severe limitations for recreational developments, such as golf courses, camps, and playgrounds.

Soils of the Springfield Plateau

Soil associations 6, 7, and 8 are on the Springfield Plateau of the Ozark Highlands. These soils formed mainly under hardwoods. They are underlain by silty deposits or cherty limestone, or by alluvium derived from these sources (fig. 3).

6. *Clarksville-Nixa-Baxter association*

Cherty, deep and moderately shallow, moderately well drained to excessively drained, gently sloping to steep soils on hillsides and narrow ridges

This association is on a highly dissected plateau. It is characterized by long, narrow, gently sloping ridges separated by steep V-shaped valleys 200 to 800 feet wide. The individual areas are 1 mile to 5 miles wide and 3 to 10 miles long. The bedrock is cherty limestone. This association is about 1,000 to 1,450 feet above sea level. It occupies about 15 percent of the county and is in the northern part.

Nixa soils are on the gently sloping ridgetops. Clarksville and Baxter soils are on the steep hillsides.

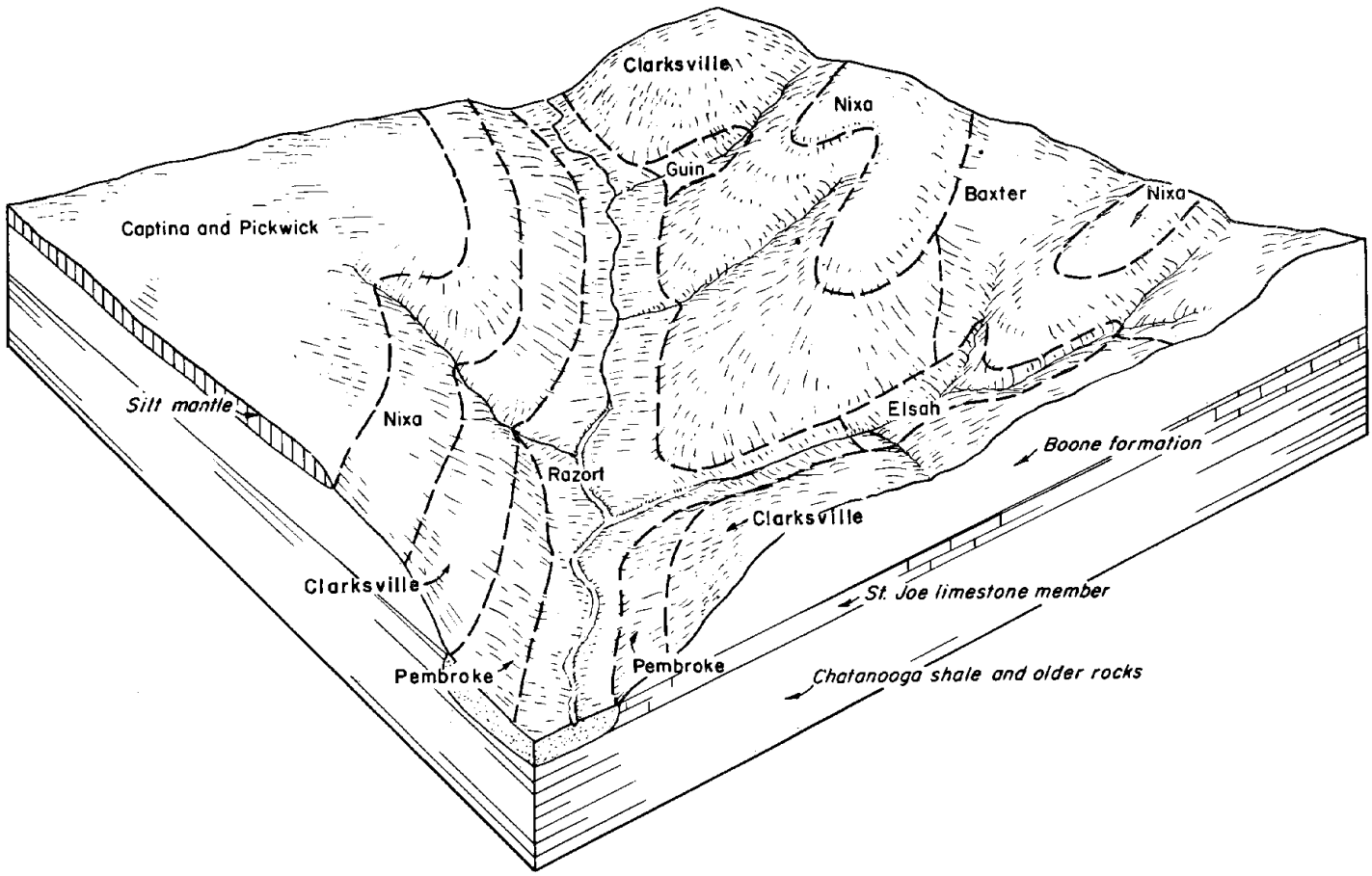

Figure 3.—**Typical pattern of soils and underlying material in associations 6, 7, and 8.**

Clarksville soils make up about 45 percent of this association. They are 50 to 90 percent chert. Their surface layer is grayish-brown or brown cherty silt loam 6 to 12 inches thick. Their subsoil is strong-brown to pale-brown cherty silt loam.

Nixa soils make up about 20 percent of the association. Their surface layer is dark grayish-brown or brown cherty silt loam 7 to 15 inches thick. Their subsoil is yellowish-brown to strong-brown cherty silt loam. It extends to a depth of 14 to 24 inches and is underlain by fractured chert bedrock, the cracks in which are filled with compact, brittle silt loam.

Baxter soils make up about 15 percent of the association. Their surface layer is grayish-brown or brown cherty silt loam 6 to 12 inches thick. Their subsoil is dark-red to yellowish-red cherty clay or cherty silty clay. The depth to fractured cherty limestone is 3 to 8 feet.

The rest of the association consists of Captina and Pickwick soils, which are on the broader ridges; Guin soils, which are on foot slopes; and Elsah soils, which are on the narrow flood plains.

About 80 percent of this association is hardwood forest. The cleared areas are parts of farms that range from 80 to 300 acres in size. They are used for pasture or are cultivated to feed crops for livestock. Almost every farm has beef cattle. Broiler production is important on many farms. There are a few full-time farmers, but most of the farms are occupied by part-time farmers or by people who are retired. Some farms are abandoned.

This association is poorly suited to row crops. The narrow ridges are moderately well suited to pasture crops, and the hillsides are moderately well suited to poorly suited. The ridges and hillsides are poorly suited to trees, but foot slopes, heads of draws, and north-facing slopes are moderately well suited. The soils are droughty because of the high chert content. In cleared areas the erosion hazard is moderate to severe on ridgetops and severe to very severe on hillsides.

This association has moderate to severe limitations for nonfarm development. It is well suited to plants that provide wildlife food and cover. It is also well suited to use for recreational activities, such as hunting, camping, and hiking.

7. *Captina-Nixa-Pickwick association*

Silty and cherty, deep and moderately shallow, moderately well drained to well drained, nearly level to sloping soils

This association is on a broad plateau. Its gradient is mainly 1 to 8 percent. Along some small streams there are steep V-shaped draws 50 to 150 feet deep and about 300 to 600 feet wide. Individual areas are 1 mile to 5 miles wide and 5 to 15 miles long. The bedrock is cherty limestone. This association is about 1,000 to 1,450 feet above sea level. It occupies about 16 percent of the county and is in the northern half.

Captina and Pickwick soils developed in loamy material essentially free of gravel. Nixa soils developed in cherty limestone.

Captina soils make up about 32 percent of this association. Their gradient is mainly 2 to 5 percent. Their surface layer is brown silt loam 6 to 10 inches thick. Their subsoil is silt loam or silty clay loam. To a depth of 18 to 28 inches, this layer is yellowish brown or strong brown and is friable. Below this depth it is mottled gray, brown, and yellowish red and is compact and brittle.

Nixa soils make up about 17 percent of the association. Their gradient is mainly 5 to 8 percent. Their surface layer is grayish-brown or brown cherty silt loam 7 to 11 inches thick. Their subsoil is yellowish-brown to strong-brown cherty silt loam. It extends to a depth of 14 to 24 inches and is underlain by fractured chert bedrock, the cracks in which are filled with compact, brittle silt loam.

Pickwick soils make up about 16 percent of the association. Their gradient is mainly 2 to 5 percent. Their surface layer is brown or dark-brown silt loam 4 to 10 inches thick. Their subsoil is silty clay loam. To a depth of about 18 to 28 inches, this layer is friable and is red or yellowish red. Below this depth it is slightly compact and brittle and is mottled red, gray, and brown.

The rest of the association consists of Clarksville, Baxter, and Guin soils, which are on steep slopes; Jay and Pembroke soils, which are on gentle slopes; and Johnsburg and Taloka soils, which are in depressions.

More than 90 percent of this association is cleared. The wooded areas are mainly the Nixa, Clarksville, Baxter, and Taloka soils. Most of the farms are 80 to 350 acres in size. Some of the farmland is pastured, and some is cultivated to feed crops for livestock. Broiler production is important on many farms. Some farms have vineyards and apple orchards.

This association is well suited to farming. Natural fertility is moderate to low. The available water capacity is moderate in Captina and Pickwick soils and low in Nixa soils. Erosion is a moderate to severe hazard in cultivated areas.

This association has few limitations for nonfarm developments. It is accessible to population centers and has many suitable residential and industrial building sites. It is moderately well suited to oak and pine trees and well suited to ornamental plantings. It has slight to moderate limitations for septic tank drainage fields.

This association has only slight to moderate limitations for recreational developments, such as golf courses, camps, and playgrounds.

8. *Razort-Captina-Pembroke association*

Loamy and silty, deep, moderately well drained to well drained, nearly level to gently sloping soils on terraces and flood plains

This association is about 950 to 1,150 feet above sea level. It occupies about 2 percent of the county and is in the northern part. The individual areas are half a mile to three-quarters of a mile wide and 5 to 10 miles long.

Razort soils are on the flood plains and adjoin the streams. Captina and Pembroke soils are between the areas of Razort soils and the adjoining hills. They are a few feet higher in elevation than Razort soils and are not subject to flooding.

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Razort soils make up about 30 percent of this association. Their surface layer is dark-brown to very dark brown silt loam 7 to 15 inches thick. Their subsoil is friable, dark yellowish-brown or dark-brown silt loam and is 2 feet to several feet thick. Few areas are gravelly. Some areas are subject to overflow.

Captina soils make up about 25 percent of the association. Their surface layer is brown or dark grayish-brown silt loam 4 to 10 inches thick. Their subsoil is silty clay loam or silt loam. To a depth of 18 to 28 inches, this layer is yellowish brown or strong brown and is friable. Below this depth it is mottled gray and brown and is compact and brittle.

Pembroke soils make up about 25 percent of the association. Their surface layer is dark-brown silt loam 8 to 18 inches thick. Their subsoil is yellowish-red to dark-red, friable silt loam or silty clay loam and is 3 feet to several feet thick.

The rest of the association consists of Johnsburg, Guin, and Sloan soils.

More than 90 percent of this association is cleared. Wooded areas are mostly along streambanks. The cleared areas are parts of the farms described in associations 6 and 7. Some are pastured, some are used for hay, and some are cultivated to feed crops for livestock. Beef cattle and broilers are important on most of the farms.

Erosion is a moderate hazard. Flood damage is a moderate hazard on most areas of Razort soils. The available water capacity is moderate to high. Natural fertility is moderate.

This association has slight to moderate limitations for septic tank drainage fields. Razort soils are not suited to industrial or residential development because of the overflow hazard. Pembroke and Captina soils have moderate limitations for industrial and residential development.

This association is well suited to ornamental plantings and plants that provide wildlife food and cover. It is moderately well suited to use for recreational developments, such as golf courses, camps, and playgrounds.

Descriptions of the Soils

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

A description of each soil series is given, and it is followed by descriptions of the mapping units in that series. For full information on any one mapping unit, it is necessary to read the description of the soil series as well as the description of the mapping unit.

Following the name of each mapping unit is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of the description of each mapping unit are the capability unit, the woodland group, the range site, and the wildlife group in which the mapping unit has been placed. The page on which each capability unit, each woodland group, each range site, and each wildlife group is described can be found readily by referring to the "Guide to Mapping Units."

Many terms used in the soil descriptions and other sections of the survey are defined in the Glossary.

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

Soil	Area	Extent	Soil	Area	Extent
	Acres	*Percent*		*Acres*	*Percent*
Allegheny gravelly loam, 3 to 8 percent slopes	1, 223	0. 2	Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes	37, 030	6. 2
Allegheny gravelly loam, 3 to 8 percent slopes, eroded	1, 421	. 2	Jay silt loam, 1 to 3 percent slopes	2, 220	. 4
Allegheny gravelly loam, 8 to 12 percent slopes, eroded	1, 208	. 2	Jay silt loam, 3 to 8 percent slopes	2, 410	. 4
Allegheny stony loam, 8 to 12 percent slopes	1, 531	. 2	Johnsburg silt loam	11, 572	1. 9
Allegheny stony loam, 12 to 40 percent slopes	5, 007	. 8	Johnsburg complex, mounded	974	. 2
Allen loam, 3 to 8 percent slopes, eroded	1, 249	. 2	Leaf silt loam	3, 648	. 6
Allen loam, 8 to 12 percent slopes, eroded	1, 534	. 2	Leaf complex, mounded	1, 442	. 2
Allen loam, 12 to 20 percent slopes, eroded	751	. 1	Linker loam, 1 to 3 percent slopes	1, 016	. 2
Allen soils, 8 to 20 percent slopes	5, 038	. 8	Linker loam, 3 to 8 percent slopes, eroded	17, 820	2. 9
Allen stony loam, 12 to 35 percent slopes	2, 696	. 4	Linker gravelly loam, 3 to 8 percent slopes, eroded	5, 199	. 8
Allen-Hector complex, 20 to 40 percent slopes	25, 755	4. 2	Linker gravelly loam, 8 to 12 percent slopes	923	. 1
Allen-Hector complex, 40 to 55 percent slopes	9, 037	1. 5	Montevallo soils, 3 to 12 percent slopes	1, 818	. 3
Apison loam, 1 to 3 percent slopes	801	. 1	Montevallo soils, 12 to 25 percent slopes	225	(1)
Apison loam, 3 to 8 percent slopes, eroded	5, 973	1. 0	Nixa cherty silt loam, 3 to 8 percent slopes	32, 806	5. 3
Apison gravelly loam, 3 to 8 percent slopes, eroded	1, 170	. 2	Nixa cherty silt loam, 8 to 12 percent slopes	5, 633	. 9
Baxter cherty silt loam, 3 to 8 percent slopes	625	. 1	Pembroke silt loam, 1 to 3 percent slopes	2, 097	. 3
Baxter cherty silt loam, 8 to 12 percent slopes	1, 155	. 2	Pembroke silt loam, 3 to 6 percent slopes, eroded	4, 063	. 7
Baxter cherty silt loam, 12 to 20 percent slopes	1, 628	. 3	Pembroke gravelly silt loam, 3 to 8 percent slopes, eroded	1, 769	. 3
Baxter cherty silt loam, 20 to 45 percent slopes	9, 969	1. 6	Pickwick gravelly loam, 3 to 8 percent slopes, eroded	1, 087	. 2
Captina silt loam, 1 to 3 percent slopes	12, 598	2. 0	Pickwick gravelly loam, 8 to 12 percent slopes, eroded	598	. 1
Captina silt loam, 3 to 6 percent slopes	4, 763	. 8	Pickwick silt loam, 1 to 3 percent slopes	2, 376	. 4
Captina silt loam, 3 to 6 percent slopes, eroded	17, 748	2. 9	Pickwick silt loam, 3 to 8 percent slopes, eroded	16, 613	2. 7
Cherokee silt loam	1, 190	. 2	Razort silt loam, occasionally flooded	4, 435	. 7
Cherokee complex, mounded	1, 528	. 2	Razort gravelly silt loam, occasionally flooded	5, 421	. 9
Clarksville cherty silt loam, 12 to 60 percent slopes	40, 807	6. 6	Razort loam	5, 449	. 9
Cleora fine sandy loam	10, 917	1. 8	Rock land	2, 161	. 3
Elsah cobbly soils	6, 310	1. 0	Samba silt loam	2, 559	. 4
Elsah gravelly soils	5, 392	. 9	Samba complex, mounded	317	(1)
Enders gravelly loam, 3 to 8 percent slopes	1, 077	. 2	Savannah fine sandy loam, 1 to 3 percent slopes	3, 687	. 6
Enders gravelly loam, 3 to 8 percent slopes, eroded	3, 571	. 6	Savannah fine sandy loam, 3 to 8 percent slopes, eroded	17, 304	2. 8
Enders gravelly loam, 8 to 12 percent slopes	875	. 1	Sloan silt loam	6, 480	1. 1
Enders gravelly loam, 8 to 12 percent slopes, eroded	2, 500	. 4	Sogn rocky silt loam	1, 595	. 2
Enders stony loam, 3 to 12 percent slopes	9, 859	1. 6	Summit complex, mounded	539	. 1
Enders-Allegheny complex, 8 to 20 percent slopes	70, 389	11. 4	Summit silty clay, 0 to 1 percent slopes	4, 605	. 7
Enders-Allegheny complex, 20 to 40 percent slopes	95, 395	15. 5	Summit silty clay, 1 to 3 percent slopes	972	. 2
Fayetteville fine sandy loam, 3 to 8 percent slopes, eroded	7, 633	1. 2	Summit silty clay, 3 to 8 percent slopes, eroded	2, 157	. 3
Fayetteville fine sandy loam, 8 to 12 percent slopes, eroded	2, 364	. 4	Summit silty clay, 8 to 12 percent slopes, eroded	712	. 1
Fayetteville fine sandy loam, 12 to 20 percent slopes, eroded	813	. 1	Summit stony silty clay, 3 to 12 percent slopes, eroded	2, 310	. 4
Fayetteville stony fine sandy loam, 12 to 35 percent slopes	1, 109	. 2	Summit stony silty clay, 12 to 25 percent slopes, eroded	983	. 2
Fayetteville-Hector complex, 20 to 40 percent slopes	4, 953	.8	Taloka complex, mounded	1, 399	. 2
Guin cherty silt loam, 3 to 8 percent slopes	3, 442	. 6	Taloka silt loam, 0 to 1 percent slopes	2, 459	. 4
Hector-Mountainburg gravelly fine sandy loams, 3 to 8 percent slopes	4, 626	. 8	Taloka silt loam, 1 to 3 percent slopes	1, 945	. 4
Hector-Mountainburg gravelly fine sandy loams, 8 to 12 percent slopes	1, 898	. 3	Dumps	26	(1)
			Gravel pits	32	(1)
			Lime quarry	22	(1)
			Shale outcrops	36	(1)
			Water	5, 848	. 9
			Total	616, 320	100. 0

[1] Less than 0.05 percent.

Allegheny Series

The Allegheny series consists of well-drained, moderately permeable soils in coves, on benches, and on foot slopes of the Boston Mountains. The upper part of these soils developed in colluvium derived from acid sandstone, siltstone, and shale, and the lower part in residuum derived from acid shale. The slope range is 3 to 40 percent.

Allegheny soils are associated with Enders, Allen, Savannah, Mountainburg, and Hector soils. They differ from Enders soils in having a less clayey subsoil that is brown instead of red. In comparison with Allen soils, they have a strong-brown or yellowish-brown, instead of a yellowish-red or red, subsoil and are finer textured in the lower part of the subsoil and in the underlying material. They lack the mottled fragipan that is typical of Savannah soils. They are deeper and have a thicker, more evident subsoil than the shallow Mountainburg and Hector soils.

Representative profile (Allegheny stony loam in an area of Enders-Allegheny complex, 8 to 20 percent slopes, in a hardwood forest; NW¼SW¼SW¼ sec. 17, T.14 N., R. 28 W.):

O1—1 inch to 0, hardwood leaf and twig litter.

A11— 0 to 2 inches, dark-brown (7.5YR 3/2) stony loam; moderate, fine, granular structure; very friable; many roots; many worm casts; 20 percent sandstone; slightly acid; abrupt, smooth boundary.

A12—2 to 5 inches, dark-brown (10YR 3/3) stony loam; weak, fine, granular structure; very friable; many roots; 20 percent sandstone; medium acid; clear, wavy boundary. A1 horizon 1 to 6 inches thick.

A3—5 to 13 inches, dark-brown (10YR 4/3) stony loam; weak, fine, subangular blocky structure; friable; 20 percent sandstone; many roots; medium acid; clear, wavy boundary. 4 to 10 inches thick.

B21t—13 to 30 inches, dark yellowish-brown (10YR 4/4) stony clay loam; moderate, fine, subangular blocky structure; friable; thin clay films in pores; 30 percent sandstone; common, small, hard, dark-colored concretions; medium acid; gradual, irregular boundary. 12 to 25 inches thick.

B22t—30 to 43 inches, yellowish-brown (10YR 5/6) stony clay loam; moderate, fine, subangular blocky structure; firm; common, thin clay films in pores and few, patchy clay films on ped faces; common vesicular and tubular pores; 25 percent sandstone; many, small, dark-colored concretions; medium acid; clear, irregular boundary. 12 to 25 inches thick.

IIB3—43 to 60 inches, yellowish-brown (10YR 5/6) stony silty clay; common, medium, distinct, light brownish-gray mottles that increase in number with increasing depth; weak, medium, subangular blocky structure; firm; few roots; many dark-colored concretions; 25 percent sandstone; strongly acid; gradual, wavy boundary. 8 to 20 inches thick.

IIC—60 to 74 inches +, variegated light-gray (10YR 7/2) and yellowish-brown (10YR 5/6) clay; few, fine, distinct, yellowish-red (5YR 4/6) mottles; massive; firm; plastic; few roots; strongly acid. 10 to 60 inches thick.

The A1 horizon is dark grayish-brown (10YR 4/2), very dark grayish-brown (10YR 3/2), or dark-brown (10YR 3/3, 7.5YR 3/2) stony or gravelly loam. The A2 horizon, where present, is yellowish-brown (10YR 5/4), brown (10YR 4/3), or dark yellowish-brown (10YR 4/4) stony or gravelly loam. The A3 horizon is dark-brown (10YR 4/3, 3/3) or dark yellowish-brown (10YR 4/4) stony loam or gravelly loam. In cultivated areas the Ap horizon is dark brown (10YR 4/3, 3/3) or dark grayish brown (10YR 4/2) and is 4 to 8 inches thick. The B1 horizon, where present, is dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/4), or dark-brown (10YR 4/3) loam 4 to 12 inches thick. The B2t horizon is dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/6), or strong-brown (7.5YR 5/6) loam, clay loam, or silty clay loam. In places the lower part is mottled grayish brown. The IIB3 horizon is silty clay or clay and is variegated with strong brown (7.5YR 5/6), yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and intermediate colors. The IIC horizon is silty clay or clay and is variegated with yellowish red, light gray, and yellowish brown. In places it contains lenses of weathered shale. Typically, each horizon is 15 to 50 percent sandstone fragments up to 3 feet in diameter. In places more than 50 percent of the surface is covered with coarse fragments. The B horizon is less than 10 percent coarse fragments in places. The depth to shale, sandstone, or siltstone ranges from 4 to 10 feet. The reaction is medium acid or strongly acid in the A horizon and medium acid to very strongly acid in the B2t, IIB, and IIC horizons.

Allegheny gravelly loam, 3 to 8 percent slopes (AeC).—This soil occurs mainly as long, narrow areas that range from 5 to 30 acres in size. Included in mapping were nongravelly spots and small areas of Allen, Savannah, and Enders soils.

The surface layer is dark-brown gravelly loam 7 to 14 inches thick. The subsoil extends to a depth of 35 to 55 inches. The upper part is yellowish-brown or strong-brown gravelly clay loam. The lower part is mottled red and gray, plastic clay.

This soil is strongly acid. It has low fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

This soil is well suited to hay crops, pasture grasses, and small grain and is moderately well suited to corn and other row crops. It is also moderately well suited to upland oak, shortleaf pine, hickory, black locust, and black walnut. Most of the acreage either is used for hay or pasture crops or is reverting to hardwoods. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–2; woodland group 6; wildlife group 3; no range site classification)

Allegheny gravelly loam, 3 to 8 percent slopes, eroded (AeC2).—This soil occurs mainly as long, narrow areas that range from 10 to 35 acres in size. Included in mapping were nongravelly spots and small areas of Allen, Savannah, and Enders soils. There are a few rills and shallow gullies.

The surface layer is dark-brown gravelly loam 4 to 8 inches thick. In spots the plow layer is a mixture of the surface layer and material from the subsoil. The subsoil extends to a depth of 30 to 50 inches. The upper part is yellowish-brown or strong-brown gravelly clay loam. The lower part is mottled red and gray, plastic clay.

This soil is strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

This soil is moderately well suited to hay crops, pasture grasses, small grain, and corn and other row crops, and to upland oak, shortleaf pine, hickory, and black walnut. Part of the acreage is used for hay or pasture crops, and the rest is reverting to hardwoods. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–2; woodland group 6; wildlife group 3; no range site classification)

Allegheny gravelly loam, 8 to 12 percent slopes, eroded (AeD2).—This soil occurs mainly as long, narrow areas that range from 5 to 30 acres in size. Included in mapping were spots of Allen, Savannah, and Enders soils. There are a few rills and gullies.

The surface layer of this soil is dark-brown gravelly loam 4 to 8 inches thick. In spots the plow layer is a mixture of the surface layer and material from the subsoil.

The subsoil extends to a depth of 30 to 50 inches. The upper part is yellowish-brown or strong-brown gravelly clay loam. The lower part is mottled red and gray, plastic clay.

This soil is strongly acid. It has low fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

This soil is moderately well suited to hay crops, pasture grasses, and small grain, and to upland oak, shortleaf pine, hickory, and black walnut. Part of the acreage is used for hay and pasture crops, and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe–1; woodland group 6; wildlife group 3; no range site classification)

Allegheny stony loam, 8 to 12 percent slopes (AgD).—This soil occurs mainly as long, narrow areas that range from 5 to 30 acres in size. Included in mapping were spots of Allen, Savannah, and Enders soils.

The surface layer is dark-brown stony loam 7 to 14 inches thick. The subsoil extends to a depth of 35 to 55 inches. The upper part is yellowish-brown or strong-brown gravelly clay loam. The lower part is mottled red and gray, plastic clay.

This soil is strongly acid. It has low natural fertility but responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

This soil is moderately well suited to pasture grasses and to pine, upland oak, hickory, and black walnut. Stones make tillage and the operation of equipment difficult. Most of the acreage is hardwood forest (fig. 4). The rest either is used for hay or pasture or is reverting to hardwoods. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe–3; woodland group 7; wildlife group 6; no range site classification)

Allegheny stony loam, 12 to 40 percent slopes (AgF).—This soil generally occurs as long, narrow areas that range

Figure 4.—**Hardwoods on Allegheny stony loam, 8 to 12 percent slopes.**

from 10 to 100 acres in size. Included in mapping were small areas of Allen, Savannah, and Enders soils.

A profile of this soil is shown in figure 5. The surface layer is dark-brown stony loam 7 to 14 inches thick. The subsoil extends to a depth of 35 to 55 inches. The upper part is yellowish-brown or strong-brown stony clay loam. The lower part is mottled red and gray, plastic clay.

This soil is strongly acid. It has low fertility. The available water capacity is moderate. The root zone is 3 feet or more thick.

This soil is not suited to cultivated crops. Stones and steep slopes make tillage and the operation of equipment difficult. The soil is moderately well suited to pasture grasses and to upland oak, black walnut, shortleaf pine, and black locust. Most of the acreage is hardwood forest. Cleared areas are used for rough pasture and range. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIIe–1; woodland group 7; wildlife group 9; no range site classification)

Allen Series

The Allen series consists of well-drained, moderately permeable soils that developed in colluvium derived from acid sandstone, siltstone, and shale. These soils are on benches and foot slopes of the Boston Mountains. Their slope range is 3 to 55 percent.

Allen soils are associated with Allegheny, Linker, Enders, Mountainburg, Hector, and Savannah soils. They differ from Allegheny soils in having a reddish instead of a yellowish subsoil. They are less clayey than Enders soils. They are not so shallow over bedrock as Mountainburg, Hector, and Linker soils, and they lack the yellowish-brown subsoil and the mottled fragipan that are typical of Savannah soils.

Representative profile (Allen loam, 12 to 20 percent slopes, eroded, in a cultivated field; NW¼SE¼SE¼ sec. 28, T. 14 N., R. 29 W.):

Ap—0 to 6 inches, dark-brown (10YR 4/3) loam; moderate, medium, granular structure; friable; abundant roots; some sandstone gravel; medium acid; gradual, smooth boundary. 5 to 8 inches thick.

B1—6 to 18 inches, reddish-brown (5YR 4/3) silt loam; weak, medium, subangular blocky structure; friable; plentiful roots; many, fine to coarse, tubular pores; some sandstone gravel; medium acid; gradual, smooth boundary. 6 to 14 inches thick.

B21t—18 to 26 inches, dark-red (2.5YR 3/6) clay loam; moderate, medium, subangular blocky structure; firm; plentiful roots; common, fine to medium, tubular pores; common, patchy clay films on pore walls and ped faces; 3 percent sandstone gravel; medium acid; gradual, smooth boundary.

B22t—26 to 39 inches, red (2.5YR 4/6) clay loam; moderate, medium, subangular blocky structure; firm; plentiful roots; common, fine to medium, tubular pores; common, patchy clay films on pore walls and ped faces; few black ped coatings; 3 percent sandstone gravel; medium acid; gradual, smooth boundary.

B23t—39 to 72 inches, 80 percent dark-red (2.5YR 3/6) and 20 percent yellowish-brown (10YR 5/4) clay loam; moderate, medium, angular blocky structure; firm; few roots; few tubular pores; thin, continuous clay films on ped faces and pore walls; few, dark-colored, soft concretions; 3 percent sandstone gravel; strongly acid. B2t horizon 30 to 60 inches thick.

In undisturbed areas the A1 horizon is dark-brown (10YR 4/3), dark grayish-brown (10YR 4/2), or very dark grayish-brown (10YR 3/2) loam or stony loam and is ½ inch to 4 inches thick. The A2 horizon in these areas in brown (10YR 5/3, 4/3), grayish-brown (10YR 5/2), or yellowish-brown (10YR 5/4) loam or stony loam and is 6 to 10 inches thick. The Ap horizon is dark brown (10YR 4/3) or dark yellowish brown (10YR 4/4). In spots it is a mixture of the original A and B1 horizons and is reddish brown or yellowish red. The B1 horizon is yellowish-red (5YR 4/8), reddish-brown (5YR 4/3), dark-brown (10YR 4/3), or strong-brown (7.5YR 5/6) loam or silt loam. The B2t horizon is yellowish-red (5YR 4/6), red (2.5YR 4/6), or dark-red (2.5YR 3/6) loam, silty clay loam, or clay loam. Commonly, the lower part of the B horizon is variegated with dark red, red, yellowish red, and yellowish brown. The C horizon, commonly at a depth of more than 72 inches, is 1 to several feet thick and is loam or clay loam. It is variegated with dark red (2.5YR 3/6), yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and intermediate colors. The depth to sandstone, siltstone, or shale ranges from 4 to 15 feet. In some places sandstone boulders up to 3 feet in diameter make up as much as 50 percent of the soil mass. The reaction is slightly acid or medium acid in the A horizon and medium acid or strongly acid in the B horizon.

Figure 5.—**Profile of Allegheny stony loam, 12 to 40 percent slopes.**

Allen loam, 3 to 8 percent slopes, eroded (A|C2).—This soil occurs on narrow mountain benches. Most areas are between 5 and 30 acres in size. Included in mapping were gravelly spots and small areas of Allegheny, Enders, and Savannah soils. There are a few rills and shallow gullies.

The surface layer, 5 to 8 inches thick, is brown, dark brown, or dark yellowish brown. In spots the plow layer is a mixture of the surface layer and material from the subsoil. The finer textured part of the subsoil is yellowish-red or dark-red loam, silty clay loam, or clay loam. It is 30 to

60 inches thick. Sandstone fragments up to 10 inches in diameter make up as much as 15 percent of the soil mass. The depth to bedrock ranges from 4 to 15 feet.

This soil is medium acid. It has low natural fertility and responds well to fertilizer and lime. The available water capacity is moderate. The root zone is 4 feet or more thick.

This soil is well suited to pasture grasses, hay crops, corn, and small grain, and to apples and strawberries. It is moderately well suited to upland oak, shortleaf pine, hickory, and black walnut. The entire acreage has been cultivated, but now part of it is used for pasture or hay crops and the rest is reverting to hardwoods. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–2; woodland group 6; wildlife group 3; no range site classification)

Allen loam, 8 to 12 percent slopes, eroded (AlD2).—This soil occurs on narrow mountain benches. Most areas are between 5 and 40 acres in size. Included in mapping were gravelly spots and small areas of Allegheny, Enders, and Savannah soils. There are a few rills and shallow gullies.

The surface layer, 5 to 8 inches thick, is dark brown or dark yellowish brown. In spots the plow layer is a mixture of the surface layer and material from the subsoil. The finer textured part of the subsoil is yellowish-red or dark-red clay loam, loam, or silty clay loam. It is 30 to 60 inches thick. Sandstone fragments up to 10 inches in diameter make up as much as 15 percent of the soil mass. The depth to bedrock ranges from 4 to 15 feet.

This soil is medium acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 4 feet or more thick.

This soil is poorly suited to clean-tilled crops but is well suited to hay crops, pasture grasses, and small grain. It is moderately well suited to upland oak, shortleaf pine, hickory, and black walnut. The entire acreage has been cultivated, but now part of it is used for hay or pasture crops and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe–1; woodland group 6; wildlife group 3; no range site classification)

Allen loam, 12 to 20 percent slopes, eroded (AlE2).—This soil occurs on narrow mountain benches. Most areas are between 5 and 40 acres in size. Included in mapping were gravelly spots and small areas of Allegheny and Enders soils. There are a few rills and shallow gullies.

The surface layer, 5 to 8 inches thick, is dark brown or dark yellowish brown. In spots the plow layer is a mixture of the surface layer and material from the subsoil. The finer textured part of the subsoil is yellowish-red, red, or dark-red clay loam, loam, or silty clay loam. It is 30 to 60 inches thick. Sandstone fragments up to 10 inches in diameter make up 5 to 15 percent of the soil mass. The depth to bedrock ranges from 4 to 15 feet.

This soil is medium acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 4 feet or more thick.

This soil is not suited to clean-tilled crops but is well suited to pasture grasses, hay crops, and small grain. It is moderately well suited to upland oak, shortleaf pine, hickory, and black walnut. Most of the acreage has been cultivated, but now part of it is used for hay or pasture crops and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–1; woodland group 6; wildlife group 6; no range site classification)

Allen soils, 8 to 20 percent slopes (AnE).—These soils occur on long, narrow benches. Most areas are between 20 and 60 acres in size. The slope is concave. Included in mapping were spots of Allegheny and Savannah soils.

The surface layer of these soils is about 50 percent gravelly loam, 25 percent stony loam, and 25 percent loam. It is dark brown or dark yellowish brown and is 6 to 9 inches thick. The finer textured part of the subsoil is yellowish-red, red, or dark-red loam, clay loam, or silty clay loam. It is 30 to 60 inches thick. In places it is gravelly or stony. The steeper, gravelly and stony soils are generally on the uphill sides of the benches or in the more narrow areas.

These soils are medium acid. They have low natural fertility and respond moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 4 feet or more thick.

These soils are easy to till except in stony areas. They are well suited to hay crops and pasture grasses and are moderately well suited to upland oak, shortleaf pine, hickory, and black walnut. Except for steep, stony areas, most of the acreage has been cultivated. Now most of it is used for hay or pasture crops. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–1; woodland group 7; wildlife group 6; no range site classification)

Allen stony loam, 12 to 35 percent slopes (AoF).—This soil occurs on long, narrow mountain benches. Most areas are between 20 and 80 acres in size. Included in mapping were spots of Allegheny and Enders soils.

The surface layer, 6 to 9 inches thick, is dark brown or dark yellowish brown. The finer textured part of the subsoil, 30 to 60 inches thick, is yellowish-red, red, or dark-red loam, clay loam, or silty clay loam. Sandstone fragments up to 3 feet in diameter make up 15 to 50 percent of the soil mass. The depth to sandstone, siltstone, or shale is 4 to 15 feet.

This soil is medium acid. It has low natural fertility. The available water capacity is moderate. The root zone is 4 feet or more thick.

This soil is not suited to cultivated crops. The sandstone fragments and steep slopes interfere with the operation of farm machinery. The soil is well suited to pasture grasses and is moderately well suited to upland oak, shortleaf pine, hickory, and black walnut. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIIe–1; woodland group 7; wildlife group 6; no range site classification)

Allen-Hector complex, 20 to 40 percent slopes (AhF).—This complex is on mountainsides. It is 60 percent Allen soils, 30 percent Hector and Mountainburg soils, and 10 percent rock outcrop and Allegheny and Savannah soils.

The well-drained Allen soils are on foot slopes and long, narrow benches. They have a surface layer of dark-brown or dark yellowish-brown stony loam 6 to 9 inches thick and a subsoil of yellowish-red, red, or dark-red loam, clay loam, or silty clay loam that is 30 to 60 inches thick. The sandstone content is 15 to 50 percent. The reaction is medium acid, natural fertility is low, and the available water capacity is moderate. The root zone is 4 or more feet thick. These soils are too steep to be suited to clean-tilled crops. They can be used for pasture, but pastures are difficult to

maintain. The soils are moderately well suited to upland oak, hickory, black walnut, and shortleaf pine. Runoff is rapid, and the erosion hazard is very severe.

The somewhat excessively drained Hector soils and the well-drained Mountainburg soils occur as long, narrow areas. They are only 10 to 20 inches thick over bedrock. They have a surface layer of brown stony fine sandy loam and a subsoil of yellowish-brown or yellowish-red stony loam or stony fine sandy loam. The reaction is strongly acid, natural fertility is low, the organic-matter content is low, and the available water capacity is low. The stone content is high. Stones and steep slopes prohibit the operation of farm machinery. Most of the acreage is forest. Cleared areas are used for pasture or range. Trees grow slowly, and pastures are difficult to maintain.

(Because of inaccessible location, this complex was surveyed at lower intensity than most of the county. Differences between the soils of this complex justify placing them in different interpretative groups. Allen soils: capability unit VIIe–1; woodland group 7; wildlife group 6; no range site classification. Hector and Mountainburg soils: capability unit VIIs–2; woodland group 10; wildlife group 6; Sandstone Ridge range site)

Allen-Hector complex, 40 to 55 percent slopes (AhG).—This complex is on mountainsides. It is 40 percent Allen soils, 45 percent Hector and Mountainburg soils, and 15 percent rock outcrops and Allegheny and Savannah soils.

The well-drained Allen soils are on foot slopes and long, narrow benches. They have a surface layer of dark-brown or dark yellowish-brown stony loam 6 to 9 inches thick and a subsoil of yellowish-red, red, or dark-red loam, clay loam, or silty clay loam that is 30 to 60 inches thick. The sandstone content is 15 to 50 percent. The reaction is medium acid, natural fertility is low, and the available water capacity is moderate. The root zone is 4 feet or more thick. Steep slopes make the operation of farm equipment impractical. Runoff is rapid, and the erosion hazard is very severe. These soils are moderately well suited to upland oak, hickory, black walnut, and shortleaf pine.

The somewhat excessively drained Hector soils and the well-drained Mountainburg soils occur as long, narrow areas. They are only 10 to 20 inches thick over bedrock. They have a surface layer of brown stony fine sandy loam and a subsoil of yellowish-brown or yellowish-red stony loam or stony fine sandy loam. The reaction is strongly acid, natural fertility is low, the organic-matter content is low, and the available water capacity is low. The stone content is high. Stones and steep slopes prohibit the operation of farm machinery. Nearly all of the acreage is forest. Trees grow slowly.

(Because of inaccessible location, this complex was surveyed at lower intensity than most of the county. Differences between the soils of this complex justify placing them in different interpretative groups. Allen soils: capability unit VIIe-1; woodland group 7; wildlife group 6; no range site classification. Hector and Mountainburg soils: capability unit VIIs–2; woodland group 10; wildlife group 6; Sandstone Ridge range site)

Apison Series

The Apison series consists of well-drained, moderately permeable soils that developed in residuum derived from acid sandstone and siltstone. The soils are mainly on ridges and mountaintops in the southern two-thirds of the county. Their slope range is 1 to 8 percent. Sandstone bedrock is at a depth of 2 to 4 feet.

Apison soils are associated with Linker, Captina, Johnsburg, Hector, Mountainburg, and Enders soils. They differ from Linker soils in having a less red, more silty, less sandy subsoil. They are better drained than Johnsburg soils and lack the mottling in the subsoil that is typical of Johnsburg soils. They lack the fragipan that is typical of Johnsburg and Captina soils. They are deeper over bedrock and have a thicker, finer textured, more strongly developed subsoil than Mountainburg and Hector soils. They have a browner, less clayey subsoil than Enders soils.

Representative profile (Apison loam, 3 to 8 percent slopes, eroded, in an old field planted to pine trees; SE¼ SW¼NE¼ sec. 5, T. 16 N., R. 32 W.):

Ap—0 to 6 inches, brown (10YR 4/3) loam; moderate, medium, granular structure; very friable; abundant roots; medium acid; abrupt, smooth boundary. 5 to 10 inches thick.

B1—6 to 13 inches, yellowish-brown (10YR 5/4) loam; weak, medium, subangular blocky structure; friable; plentiful roots; many tubular pores; strongly acid; clear, smooth boundary. 5 to 10 inches thick.

B21t—13 to 25 inches, yellowish-brown (10YR 5/8) silty clay loam; moderate, medium, subangular blocky structure; friable; common roots; many, fine to medium, tubular pores; thin, discontinuous clay films on ped faces and pore walls; strongly acid; clear, smooth boundary. 9 to 20 inches thick.

B22t—25 to 33 inches, variegated strong-brown (7.5YR 5/6), reddish-brown (5YR 5/4), and gray (10YR 5/1) stony silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; few tubular pores; thin, discontinuous clay films on ped faces; strongly acid; abrupt, irregular boundary. 4 to 12 inches thick.

R—33 inches +, sandstone bedrock; variegated silty clay loam in crevices.

In undisturbed areas the A1 horizon is dark grayish-brown (10YR 4/2) or very dark grayish-brown (10YR 3/2) loam or gravelly loam 1 to 3 inches thick, and the A2 horizon is brown (10YR 5/3, 4/3) loam or gravelly loam 5 to 9 inches thick. The Ap horizon is brown (10YR 4/3) or dark grayish-brown (10YR 4/2) loam or gravelly loam. The B1 horizon is pale-brown (10YR 6/3), yellowish-brown (10YR 5/4, 5/6), or strong-brown (7.5YR 5/6) loam to silt loam. The B21t is yellowish-brown (10YR 5/4, 5/8), strong-brown (7.5YR 5/6), or brown (7.5YR 5/4) loam, clay loam, or silty clay loam. The B22t horizon is loam, clay loam, or silty clay loam and is variegated with yellowish red, strong brown, gray, and intermediate colors. The gravel content ranges from 0 to 30 percent in all horizons. The reaction is medium acid or slightly acid in the A horizon and strongly acid or very strongly acid in the B horizon.

Apison loam, 1 to 3 percent slopes (ApB).—This soil is on ridges and mountaintops. The areas are between 10 and 20 acres in size. Included in mapping were spots of Linker soils.

The surface layer is brown or dark grayish brown and is 6 to 10 inches thick. The subsoil is yellowish-brown or strong-brown loam, silty clay loam, or clay loam and is 24 to 40 inches thick. The depth to sandstone or siltstone is 2½ to 4 feet.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 2½ to 4 feet thick.

This soil is well suited to moderately well suited to hay and pasture crops and is moderately well suited to corn and other row crops. It is also moderately well suited to

upland oak, shortleaf pine, black walnut, and black locust. Most of the acreage has been cultivated, but now most of it is pasture or meadow and the rest is reverting to forest. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–3; woodland group 5; wildlife group 3; no range site classification)

Apison loam, 3 to 8 percent slopes, eroded (ApC2).—This soil is on ridges and mountaintops. The areas are between 10 and 100 acres in size. Included in mapping were a few gravelly spots and small areas of Linker soils. There are rills and a few shallow gullies in most areas.

The surface layer is brown or dark grayish brown and is 5 to 10 inches thick. In scattered eroded spots where the original surface layer has been mixed with material from the subsoil, the plow layer is brown or yellowish brown. The subsoil is yellowish-brown or strong-brown loam, silty clay loam, or clay loam and is 20 to 36 inches thick. The depth to sandstone or siltstone is 2 to 4 feet.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 2 to 4 feet thick.

This soil is moderately well suited to well suited to hay and pasture crops and small grain and is moderately well suited to corn and other row crops. It is also moderately well suited to upland oak, shortleaf pine, black walnut, and black locust. Most of the acreage has been cultivated, but now most of it is pasture or meadow and the rest is reverting to forest. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–4; woodland group 5; wildlife group 3; no range site classification)

Apison gravelly loam, 3 to 8 percent slopes, eroded (AsC2).—This soil is on ridges and mountaintops. The areas are between 10 and 20 acres in size. Included in mapping were nongravelly spots and small areas of Linker soils. There are rills and shallow gullies in most areas.

The surface layer is brown or dark grayish brown and is 5 to 10 inches thick. In scattered eroded spots where the original surface layer has been mixed with material from the subsoil, the plow layer is brown or yellowish brown. The subsoil is yellowish-brown or strong-brown gravelly loam or gravelly clay loam 20 to 34 inches thick. The gravel content is 15 to 30 percent. The depth to sandstone or siltstone is 2 to 4 feet.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 2 to 4 feet thick.

This soil is moderately well suited to hay and pasture crops and to upland oak, shortleaf pine, black walnut, and black locust. Most of the acreage has been cultivated but now is pasture or meadow. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–4; woodland group 5; wildlife group 3; no range site classification)

Baxter Series

The Baxter series consists of well-drained, moderately permeable, cherty soils that developed in residuum derived from cherty limestone. These soils are on hillsides and ridgetops. Their slope range is 3 to 45 percent.

Baxter soils are associated with Nixa, Clarksville, and Guin soils. They differ from these soils in having a redder, finer textured, more strongly developed subsoil. Also, they lack the cherty fragipan that is typical of Nixa soils. They differ from Pembroke and Pickwick soils in being cherty throughout and having a finer textured subsoil.

Representative profile (Baxter cherty silt loam, 20 to 45 percent slopes, in a wooded area; SE¼NE¼SE¼ sec. 27, T. 18 N., R. 28 W.):

A1—0 to 1 inch, brown (10YR 5/3) cherty silt loam; moderate, medium, granular structure; very friable; abundant roots; 45 percent chert; medium acid; abrupt, smooth boundary. 1 to 4 inches thick.

A2—1 inch to 10 inches, yellowish-brown (10YR 5/4) cherty silt loam; weak, fine, granular structure; friable; abundant roots; many fine pores; 45 percent chert; strongly acid; gradual, irregular boundary. 4 to 12 inches thick.

B1—10 to 17 inches, yellowish-red (5YR 5/8) cherty silty clay loam; moderate, fine to medium, subangular blocky structure; friable; roots common; plentiful fine to medium pores; common, patchy, yellowish-brown (10YR 5/4) silt coatings on peds; few, patchy clay films on peds; 30 percent chert; strongly acid; clear, wavy boundary. 4 to 12 inches thick.

B21t—17 to 29 inches, red (2.5YR 4/8) cherty clay; moderate, fine to medium, subangular blocky structure; firm; roots plentiful; few fine pores; thin, continuous clay films on most ped faces, pore walls, and chert fragments; about 30 percent chert; strongly acid; gradual, wavy boundary. 12 to 24 inches thick.

B22t—29 to 50 inches, dark-red (2.5YR 3/6) cherty clay; strong, medium, angular blocky structure; firm; common roots; few fine pores; continuous clay films on ped faces, pore walls, and chert fragments; approximately 30 percent chert; strongly acid; gradual, wavy boundary. 12 to 24 inches thick.

B3t—50 to 60 inches +, about 90 percent fractured, partly weathered chert; interstices filled with dark-red clay. Several feet thick.

The A1 horizon is dark brown (10YR 4/3), very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2), or brown (10YR 5/3). In cultivated areas the Ap horizon is grayish brown (10YR 5/2), brown (10YR 5/3 or 7.5YR 5/4), or dark brown (10YR 4/3). The A2 horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3 or 7.5YR 5/4), or yellowish brown (10YR 5/4). The B1 horizon is yellowish-red (5YR 5/8), reddish-yellow (7.5YR 6/6), or strong-brown (7.5YR 5/6) cherty silt loam or cherty silty clay loam. The B2t horizon is yellowish-red (5YR 5/8), reddish-brown (5YR 4/4), dark-red (2.5YR 3/2), or red (2.5YR 4/8) cherty silty clay or cherty clay 20 to 50 inches thick. In places the B22t horizon is variegated with yellowish red and red. The B2t horizons have chert lenses, but the total chert content of the solum is between 20 and 35 percent. The reaction is slightly acid to strongly acid in the A horizon and strongly acid or very strongly acid in the B horizon.

Baxter cherty silt loam, 3 to 8 percent slopes (BaC).—This soil is on narrow ridgetops. The areas are between 5 and 25 acres in size. Included in mapping were spots of Nixa soils.

The surface layer is grayish brown or brown and is 4 to 12 inches thick. The finer textured part of the subsoil is red, yellowish-red, or dark-red cherty clay or cherty silty clay and is underlain by fractured, partly weathered chert at a depth of 4 to 6 feet.

This soil is strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

Because of the chert content, this soil is difficult to till. It is well suited to pasture grasses, hay crops (fig. 6), corn, small grain, apples, grapes, and strawberries, and is moderately well suited to native grasses and forbs. It is well suited to upland oak, hickory, black walnut, and shortleaf pine. Runoff is medium, and the erosion hazard is severe.

(Capability unit IIIe–3; woodland group 5; wildlife group 4; no range site classification)

Baxter cherty silt loam, 8 to 12 percent slopes (BaD).—This soil is on ridgetops. The areas are between 5 and 25 acres in size. Included in mapping were small areas of Nixa and Clarksville soils.

The surface layer is grayish brown or brown and is 5 to 12 inches thick. The finer textured part of the subsoil is red, yellowish-red, or dark-red cherty clay or cherty silty clay. It is underlain by fractured, partly weathered chert at a depth of 4 to 6 feet.

This soil is strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

Because of the chert content, this soil is difficult to till. It is well suited to small grain, hay crops, and pasture grasses, and moderately well suited to native grasses and forbs. It is well suited to upland oak, hickory, black walnut, and shortleaf pine. Runoff is medium, and the erosion hazard is very severe. (Capability unit IVe–2; woodland groups 6 and 7; wildlife group 4; no range site classification)

Baxter cherty silt loam, 12 to 20 percent slopes (BaE).—This soil is on ridges and hillsides. The areas are between 10 and 50 acres in size. Included in mapping were small areas of Nixa and Clarksville soils.

The surface layer is grayish brown or brown and is 6 to 12 inches thick. The finer textured part of the subsoil is red, yellowish-red, or dark-red cherty clay or cherty silty clay. It is underlain by fractured, partly weathered chert at a depth of 3 to 6 feet.

This soil is strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. The root zone is 3 feet or more thick.

Because of the chert content, this soil is difficult to till. It is too steep to be suited to row crops, but it is moderately well suited to hay crops, pasture grasses, native grasses, and forbs. It is well suited to upland oak, hickory, black walnut, and shortleaf pine. Runoff is medium to rapid, and the erosion hazard is severe. (Capability unit VIe–2; woodland group 7; wildlife group 4; no range site classification)

Baxter cherty silt loam, 20 to 45 percent slopes (BaF).—This soil is mainly on short steep hillsides bordering narrow V-shaped valleys. The areas are long and narrow and are between 20 and 150 acres in size. Included in mapping were small areas of Elsah, Nixa, and Clarksville soils.

The surface layer is yellowish brown, grayish brown, or brown and is 6 to 12 inches thick. The finer textured part of the subsoil is red, yellowish-red, or dark-red cherty clay or cherty silty clay. It is underlain by fractured, partly weathered chert at a depth of 3 to 6 feet.

This soil is strongly acid. It has low natural fertility. The available water capacity is moderate. The root zone is 3 feet or more thick.

Because of the steep slopes, this soil is not suited to row crops. It is moderately well suited to native grasses and forbs, and it is well suited to upland oak, hickory, black walnut, and shortleaf pine. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIIe–2; woodland group 7; wildlife group 4; no range site classification)

Figure 6.—**Midland bermudagrass hay on Baxter cherty silt loam, 3 to 8 percent slopes.**

Captina Series

The Captina series consists of moderately well drained, slowly permeable soils that developed in silty material. These soils commonly have a fragipan at a depth of about 20 inches. They are on uplands and stream terraces. Their slope range is 1 to 6 percent.

Captina soils are associated with Nixa, Pickwick, Johnsburg, Apison, Jay, Pembroke, and Taloka soils. They do not have the high chert content that is typical of Nixa soils. They differ from Pickwick and Pembroke soils in having a fragipan and a yellowish-brown, instead of a red, subsoil. They differ from Apison soils mainly in having a fragipan. They lack the thick, dark-colored surface layer that is typical of Jay soils. They are browner and better drained than Johnsburg and Taloka soils, which have mottles throughout the subsoil, and they lack the claypan that is typical of Taloka soils. They are more silty and less sandy than Savannah soils.

Representative profile (Captina silt loam, 1 to 3 percent slopes, in a cultivated field; NE¼SW¼NW¼ sec. 30, T. 18 N., R. 30 W.):

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, medium, granular structure; very friable; plentiful roots; common, fine, dark-colored concretions; medium acid; abrupt, smooth boundary. 4 to 10 inches thick.

B21t—8 to 12 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, subangular blocky structure; friable; plentiful roots; many, fine and medium, tubular pores; common, fine, dark-colored concretions; few pockets of brown silt loam from Ap horizon; strongly acid; clear, wavy boundary. 3 to 8 inches thick.

B22t—12 to 20 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; common, fine and medium, tubular pores; common, thin, patchy clay films on ped faces and pore walls; strongly acid; clear, smooth boundary. 6 to 14 inches thick.

Bx1—20 to 26 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, faint, grayish-brown mottles and few, fine, distinct, yellowish-red mottles; moderate, fine, subangular blocky structure; firm; slightly brittle; few roots; few fine pores, many, thin, patchy clay films mainly on pore walls and a few in crevices; common, fine, dark-colored concretions; strongly acid; clear, irregular boundary. 3 to 9 inches thick.

Bx2—26 to 54 inches, variegated grayish-brown (10YR 5/2), yellowish-brown (10YR 5/6), and dark-red (2.5YR 3/6) silty clay loam; moderate, thick, platy and moderate, medium, angular blocky structure; firm; brittle; few roots; common, medium, vesicular pores; continuous, thin clay films on ped faces and pore walls; common, fine, dark-colored concretions; nearly vertical streaks of gray silty clay up to 0.7 inch wide; very strongly acid; abrupt, irregular boundary. 10 to 35 inches thick.

C—54 to 60 inches +, brown-stained, somewhat weathered chert; grayish-brown silty clay loam in seams, crevices, and fractures.

The Ap horizon is brown (10YR 4/3, 5/3) or dark grayish brown (10YR 4/2). In spots it is a mixture of the A horizon and material from the B horizon and is yellowish brown. The B1 horizon, where present, is yellowish-brown (10YR 5/6, 5/4) or dark yellowish-brown (10YR 4/4) silt loam and is 4 to 8 inches thick. The B2t horizon is yellowish brown (10YR 5/6 5/8, 5/4) or strong brown (7.5YR 5/6, 5/8) and in places has faint pale-brown (10YR 6/3) and distinct yellowish-red (5YR 4/6) mottles in the lower part. The Bx horizon is variegated with light gray (10YR 6/1), strong brown (7.5YR 5/6), red (2.5YR 4/8), and intermediate colors. The texture in the B2t and Bx horizons is silty clay loam or silt loam. The depth to the C horizon ranges from 36 to 60 inches. On stream terraces the C horizon generally consists of strata of gravelly material. In places there are a few chert or siltstone fragments on the surface and throughout the solum. The reaction is slightly acid to strongly acid in the Ap horizon and is very strongly acid or strongly acid in the B horizons.

Captina silt loam, 1 to 3 percent slopes (CaB).—This soil is on mountaintops in the Boston Mountains, on the Springfield Plateau, and on stream terraces. Most areas are 20 to 200 acres in size. Included in mapping were spots of Johnsburg soils.

The surface layer is brown and is 6 to 10 inches thick. The upper part of the subsoil is yellowish-brown or strong-brown silt loam or silty clay loam and is 10 to 22 inches thick. The lower part is a firm, brittle fragipan of mottled yellowish-brown, grayish-brown, and red silt loam or silty clay loam. The depth to strata of gravel, sandstone, or cherty limestone is 36 to 60 inches.

This soil is strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. Roots and moisture easily penetrate the subsoil as far down as the fragipan, which retards further penetration.

This soil is well suited to small grain, corn and other row crops, hay crops, and pasture grasses. It is also well suited to grapes. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–1; woodland group 5; wildlife group 3; no range site classification)

Captina silt loam, 3 to 6 percent slopes (CaC).—This soil is on stream terraces. Most areas are 20 to 50 acres in size. Included in mapping were spots of Pembroke and Johnsburg soils.

The surface layer is brown and is 5 to 9 inches thick. The upper part of the subsoil is yellowish-brown or strong-brown silt loam or silty clay loam and is 10 to 22 inches thick. The lower part is a firm, brittle fragipan of mottled gray, strong-brown, and red silt loam or silty clay loam.

This soil is strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. Roots and moisture easily penetrate the subsoil as far down as the fragipan, which retards further penetration.

This soil is well suited to small grain, corn and other row crops, hay crops, and pasture grasses. It is also well suited to grapes. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–1; woodland group 5; wildlife group 3; no range site classification)

Captina silt loam, 3 to 6 percent slopes, eroded (CaC2).—This soil is on mountaintops in the Boston Mountains and on the Springfield Plateau. Most areas are 20 to 200 acres in size. There are a few rills and shallow gullies. Included in mapping were spots of Pickwick, Johnsburg, and Nixa soils.

The surface layer is brown and is 4 to 8 inches thick. In spots the plow layer is a mixture of the surface layer and material from the subsoil and is yellowish brown. The upper part of the subsoil is yellowish-brown or strong-brown silt loam or silty clay loam and is 10 to 20 inches thick. The lower part is a firm, brittle fragipan of mottled gray, strong-brown, and red silt loam or silty clay loam. The depth to sandstone or cherty limestone is 36 to 60 inches.

This soil is strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. Roots and moisture easily penetrate the subsoil as far down as the fragipan, which retards further penetration.

This soil is well suited to small grain, corn and other row crops, hay crops, and pasture grasses. It is also well suited to grapes (fig. 7), apples, and peaches. It produces many of the grape crops grown in the county. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–1; woodland group 5; wildlife group 3; no range site classification)

Figure 7.—**Vineyard on Captina silt loam, 3 to 6 percent slopes, eroded. Average annual yield is 5 tons per acre.**

Cherokee Series

The Cherokee series consists of poorly drained, very slowly permeable soils on stream terraces. These soils developed in material washed from soils that were derived from acid sandstone, siltstone, and shale. They occur as nearly level or depressional areas that are mounded in places.

Cherokee soils are associated with Johnsburg, Samba, and Summit soils. They are more poorly drained and are grayer throughout than Johnsburg soils, and they have a claypan instead of a fragipan. They have a thicker, some-

what lighter colored surface layer than Samba and Summit soils. They are more acid and coarser textured above the claypan than Summit soils.

Representative profile (Cherokee silt loam in an area of Cherokee complex, mounded, in a pasture; NW¼SE¼-SW¼ sec. 36, T. 16 N., R. 29 W.):

Ap—0 to 9 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable; many roots; common, small, round, dark-colored concretions; common, yellowish-brown (10YR 5/6) splotches on peds; medium acid; clear, smooth boundary. 6 to 10 inches thick.

A2g—9 to 19 inches, light brownish-gray (10YR 6/2) silt loam; few, fine, faint, brown mottles; weak, fine, subangular blocky structure; firm; slightly brittle; many, dark-colored, soft and hard concretions; medium acid; clear, wavy boundary. 5 to 15 inches thick.

B1g—19 to 24 inches, light-gray (10YR 6/1) silty clay loam; common, medium, prominent, yellowish-red mottles; moderate, medium, subangular and angular blocky structure; firm; few, thin, discontinuous clay films on ped faces; common tubular pores; strongly acid; clear, wavy boundary. 4 to 10 inches thick.

B21tg—24 to 48 inches, light-gray (10YR 6/1) clay; 10 percent prominent, yellowish-red mottles; weak, medium, prismatic structure that breaks to strong, medium, angular blocky structure; firm; plastic; few roots; common tubular pores; thick, continuous clay films on ped faces and pore walls; strongly acid; gradual, wavy boundary. 15 to 32 inches thick.

B22tg—48 to 61 inches, variegated, 60 percent light-gray (10YR 6/1) and 40 percent yellowish-brown (10YR 5/4, 5/6) silty clay; moderate, fine and medium, subangular blocky structure; firm; few roots; thin, continuous clay films on ped faces and pore walls; few tubular pores; krotovinas up to 4 inches in diameter of dark-gray (10YR 4/1) silty clay loam; strongly acid; gradual, wavy boundary. 10 to 15 inches thick.

C—61 to 74 inches +, variegated light-gray (10YR 7/1) and yellowish-brown (10YR 5/6) silty clay loam; massive; firm; few roots; few, fine, tubular pores; common, brown and black, medium concretions; strongly acid. 1 foot to several feet thick.

The Ap horizon is gray (10YR 5/1), dark gray (10YR 4/1), or dark grayish brown (10YR 4/2) and is mottled in places. In wooded areas the A1 horizon is dark grayish brown (10YR 4/2) to very dark grayish brown (10YR 3/2) and is 1 to 3 inches thick. The A2g horizon is light brownish-gray (10YR 6/2) or gray (10YR 5/1) silt loam. The B horizon is light gray (10YR 6/1), gray (10YR 5/1), or dark gray (10YR 4/1) and is mottled or variegated with yellowish brown (10YR 5/6) and in places with red (2.5YR 4/6). The B2tg is clay or silty clay. The C horizon ranges from silty clay loam to silty clay. The depth to bedrock ranges from 5 to 12 feet. The reaction is slightly acid to strongly acid in the A horizon and strongly acid or very strongly acid in the B and C horizons.

Cherokee silt loam (0 to 2 percent slopes) (Ch).—Most areas of this soil are between 10 and 40 acres in size. Included in mapping were low mounds, spots where the surface layer is very dark grayish brown, and spots where the subsoil is neutral to alkaline.

The surface layer is dark grayish brown and is 11 to 20 inches thick. The subsoil is mottled grayish-brown and yellowish-brown silty clay or clay and is 28 to 50 inches thick.

This soil is strongly acid. It has low natural fertility and responds moderately well to fertilizer. The organic-matter content is low. The available water capacity is moderate. The root zone is limited by a high water table, but its potential depth is more than 3 feet.

This soil stays wet for long periods after heavy rains. If drained, it is moderately well suited to pasture and meadow grasses, small grain, and row crops. Runoff is slow. Wetness is a very severe hazard. Erosion is a slight hazard in the more sloping areas. (Capability unit IVw–1; woodland group 8; wildlife group 5; no range site classification)

Cherokee complex, mounded (0 to 1 percent slopes) (Ck).—This complex is mainly on stream terraces. Most areas are between 10 and 50 acres in size. Rounded mounds make up 15 to 30 percent of each area. They are 40 to 100 feet in diameter, 1½ to 3 feet high, and 20 to 200 feet apart. The areas between the mounds are Cherokee soils. The mounds are unnamed soils. Included in mapping were small areas of Johnsburg, Summit, and Samba soils and spots where the subsoil is neutral.

The surface layer of the Cherokee soil is dark-gray or dark grayish-brown silt loam 12 to 24 inches thick. The subsoil is mottled gray, brown, and yellowish-brown, plastic silty clay or clay and is 4 to 7 feet thick. The depth to sandstone is 5 to 12 feet.

The surface layer of the unnamed soils is dark-brown or very dark grayish-brown silt loam 15 to 24 inches thick. The subsoil is strongly acid or medium acid. It extends to a depth of several feet. The upper part is brown or yellowish-brown silt loam, and the lower part is mottled gray and yellowish-brown clay or silty clay.

These soils are strongly acid. They have low natural fertility and respond moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Permeability is very slow. The root zone is limited by a high water table, but its potential depth is more than 3 feet.

These soils are moderately well suited to small grain, hay crops, and pasture grasses. Drainage and smoothing are needed before row crops can be grown. The mounds make the operation of farm equipment difficult. Most of the acreage is pasture. A few small acreages have never been cleared. Runoff is very slow to ponded, and wetness is a very severe hazard. (Capability unit IVw–1; woodland group 8; wildlife group 5; no range site classification)

Clarksville Series

The Clarksville series consists of excessively drained, rapidly permeable, cherty soils on hillsides. These soils developed in residuum derived from very cherty limestone. Their slope range is 12 to 60 percent.

Clarksville soils are associated with Nixa, Guin, and Baxter soils. They have a less red, coarser textured, more cherty subsoil than Baxter soils. They lack the cherty fragipan that is typical of Nixa soils. They have more chert throughout the profile than Guin soils and are shallower over bedrock.

Representative profile (Clarksville cherty silt loam, 12 to 60 percent slopes, in a wooded area; NW¼NE¼NE¼ sec. 29, T. 18 N., R. 28 W.):

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) cherty silt loam; moderate, medium, granular structure; very friable; abundant roots; 80 percent angular chert up to 9 inches in diameter; slightly acid; abrupt, wavy boundary. ½ inch to 3 inches thick.

A2—1 inch to 9 inches, grayish-brown (10YR 5/2) cherty silt loam; weak, medium, granular structure; friable; plentiful roots; 80 percent angular chert up to 9 inches in diameter; slightly acid; clear, wavy boundary. 6 to 10 inches thick.

B21t—9 to 25 inches, variegated yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) cherty silt loam; weak, medium and fine, subangular blocky structure; ped shape determined by shape of interstices between chert fragments; friable; plentiful roots; many, medium, tubular and vesicular pores; few, thin, discontinuous clay films on pore walls; 80 percent angular chert up to 9 inches in diameter; strongly acid; gradual, wavy boundary. 8 to 26 inches thick.

B22t—25 to 32 inches, variegated strong-brown (7.5YR 5/6) and pale-brown (10YR 6/3) cherty silt loam; weak, medium and fine, subangular blocky structure; ped shape determined by shape of interstices between chert fragments; firm; few roots; many, medium, tubular and vesicular pores; few, thin, discontinuous clay films on pore walls; 80 percent angular chert up to 9 inches in diameter; strongly acid; abrupt, irregular boundary. 6 to 24 inches thick.

B3t—32 to 47 inches, chert bed; interstices filled with strong-brown (7.5YR 5/6) and pale-brown (10YR 6/3) silt loam.

The A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). The A2 horizon is grayish brown (10YR 5/2), brown (10YR 5/3), or dark grayish brown (10YR 4/2). Some pedons have a B1 horizon that is like the B21t except that it has a lower clay content. The B21t horizon is yellowish brown (10YR 5/4), brown (10YR 5/3), or pale brown (10YR 6/3) and is variegated in most places. The B22t horizon is yellowish brown (10YR 5/4, 5/6) or strong brown (7.5YR 5/6) and in most places is variegated with pale brown (10YR 6/3). The chert content in all horizons ranges from 50 to 90 percent. The depth to the B3t horizon ranges from 24 to 54 inches. In places the B3t horizon is lacking and there is a B23t horizon that is about 90 to 95 percent fractured chert and has red and dark-red clay or silty clay in the interstices. The reaction is slightly acid or medium acid in the A horizon and medium acid or strongly acid in the B horizon.

Clarksville cherty silt loam, 12 to 60 percent slopes (ClG).—This soil is on short, steep hillsides of V-shaped valleys. It occurs as long and narrow and, in places, branched areas that range from 30 to 150 acres in size. Included in mapping were spots of Nixa and Baxter soils.

The surface layer is grayish brown or brown and is 6 to 12 inches thick. The subsoil is yellowish-brown, strong-brown, or pale-brown cherty silt loam. The chert content is 50 to 90 percent in all horizons. The depth to the chert bed ranges from 24 to 54 inches.

This soil is medium acid or strongly acid. It has low natural fertility. The available water capacity is low because of the high chert content. The root zone is 24 inches or more thick.

Because of steep slopes, the high chert content, and droughtiness, this soil is not suited to row crops. Moderately steep areas are moderately well suited to pasture grasses. Some areas are moderately well suited to native grasses and forbs and are used for range. North- and east-facing slopes, the lower parts of slopes, and the heads of draws are moderately well suited to upland oak, hickory, and shortleaf pine. South and west exposures are poorly suited. Most of the acreage is in timber. Runoff is medium, and the erosion hazard is moderate. (Capability unit VIIs–1; woodland groups 6 and 10; wildlife group 4; Chert Hills range site)

Cleora Series

The Cleora series consists of well-drained soils on flood plains. These soils formed in alluvium washed from soils that developed in residuum derived mainly from acid sandstone, siltstone, and shale, and partly from limestone. The landscape is one of alternate short slopes and narrow depressions. The slope range is 0 to 3 percent.

Cleora soils are associated with Razort, Sloan, and Elsah soils. They differ from Razort soils mainly in lacking a B horizon. They are better drained and more sandy than Sloan soils and lack the gray mottles typical of those soils. They are much less gravelly than Elsah soils.

Representative profile (Cleora fine sandy loam in a pasture; SW¼SE¼NE¼ sec. 4, T. 15 N., R. 30 W.):

Ap—0 to 6 inches, dark-brown (10YR 3/3) fine sandy loam; massive; firm; abundant roots; slightly acid; clear, smooth boundary. 4 to 8 inches thick.

A1—6 to 13 inches, dark-brown (10YR 3/3) fine sandy loam; weak, medium, granular structure; friable; many roots and tubular pores; medium acid; gradual, smooth boundary. 6 to 16 inches thick.

C1—13 to 33 inches, dark-brown (10YR 3/3) fine sandy loam; weak, medium, granular structure; very friable; few roots; many tubular pores; lenses of structureless, loose, yellowish-brown (10YR 5/6) sand less than 1 inch thick; medium acid; abrupt, wavy boundary. 15 to 25 inches thick.

C2—33 to 45 inches, very dark grayish-brown (10YR 3/2) fine sandy loam; weak, medium, granular structure; very friable; few roots; many tubular pores; few, thin, discontinuous lenses of sand; medium acid; abrupt, wavy boundary. 10 to 20 inches thick.

C3—45 to 72 inches +, stratified, 75 percent yellowish-brown (10YR 5/4) and 25 percent dark-brown (10YR 3/3) loamy fine sand; structureless (single grain); loose; very few roots; medium acid.

The A1 horizon is dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2). The upper part of the C horizon is dark-brown (10YR 3/3 or 7.5YR 3/2) or very dark grayish-brown (10YR 3/2) fine sandy loam, and the lower part is dark-brown (10YR 3/3) or yellowish-brown (10YR 5/4) fine sandy loam or loamy fine sand. In places there are faint, grayish-brown (10YR 5/2) mottles. Most profiles contain thin strata of sand, gravel, or silt loam. The content of sandstone gravel ranges from 0 to 15 percent. The depth to bedrock ranges from 5 to 10 feet. The reaction is slightly acid or medium acid throughout the profile.

Cleora fine sandy loam (0 to 3 percent slopes) (Cr).—This soil is on flood plains. It occurs as long, narrow, gently undulating areas parallel to streams. The areas are between 15 and 50 acres in size. The landscape is one of alternate short slopes and narrow depressions. Included in mapping were small areas of Sloan, Razort, and Elsah soils, and spots that have a brown surface layer.

The surface layer of Cleora soils is dark brown or very dark grayish brown and is 10 to 24 inches thick. The upper part of the underlying material is dark-brown or very dark grayish-brown fine sandy loam, and the lower part is dark-brown or yellowish-brown fine sandy loam or loamy fine sand. In places there are thin strata of sand, gravel, or silt loam. The depth to bedrock ranges from 5 to 10 feet. The content of sandstone gravel is as much as 15 percent.

This soil is slightly acid. It has medium natural fertility and responds well to fertilizer. The available water capacity is medium. The root zone is 4 feet or more thick and is easily penetrated by roots and moisture.

This soil is moderately well suited to well suited to pasture grasses, hay crops, small grain, and row crops and is well suited to black walnut and sycamore trees. Runoff is slow. Overflow is a moderate hazard. (Capability unit IIIw–3; woodland group 1; wildlife group 1; no range site classification)

Elsah Series

The Elsah series consists of excessively drained to well drained, moderately rapidly permeable soils. These soils were derived from gravelly and stony alluvium. The slope range is 0 to 3 percent.

Elsah soils are associated with Razort and Cleora soils. They have a much higher content of coarse fragments than either of those soils.

Representative profile (Elsah gravelly soils in a wooded area; NW¼SE¼SE¼ sec. 26, T. 17 N., R. 32 W.):

A1—0 to 10 inches, very dark grayish-brown (10YR 3/2) gravelly silt loam; weak, fine, granular structure; friable; abundant roots; 85 percent chert gravel; slightly acid; clear, wavy boundary. 7 to 20 inches thick.

C—10 to 72 inches +, brown (10YR 4/3) gravelly silt loam; weak, fine, granular structure; friable; plentiful roots; 90 percent chert gravel; medium acid. 3 to 6 feet thick.

The A1 horizon is very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), or very dark brown (10YR 2/2). The C horizon is brown (10YR 4/3, 5/3) or yellowish brown (10YR 5/4). The profile is gravelly silt loam, gravelly loam, or stony loam. It is 75 to 90 percent gravel or stones. The coarse fragments generally consist of chert or sandstone. In places the A1 and C horizons contain layers of gravel or silt loam 3 to 12 inches thick. The depth to bedrock ranges from 5 to more than 8 feet. The reaction is slightly acid or medium acid throughout the profile.

Elsah cobbly soils (0 to 3 percent slopes) (Ec).—These soils occur as long, narrow areas along small streams in the Boston Mountains. The areas are between 10 and 75 acres in size. Gravel bars or cobbly spots are common.

The surface layer and the underlying material are dark-brown stony loam. Sandstone cobblestones and stones make up 85 to 90 percent of the soil mass. Generally the stones are between 10 and 20 inches in diameter. In places there are layers of sandy or silty material up to 6 inches thick. The depth to bedrock ranges from 5 feet to more than 8 feet.

These soils are medium acid. They have low natural fertility and show only slight response to lime and fertilizer. The organic-matter content is medium. The available water capacity is very low. The root zone is 3 feet or more thick.

Because of frequent overflow and a high stone content, these soils are not suited to row crops. They are poorly suited to pasture and meadow grasses, and stands are difficult to establish. The soils are moderately well suited to well suited to sycamore and black walnut, because the roots of these trees are deep enough to absorb seepage water. Runoff is slow. The overflow hazard is severe. (Capability unit Vw–1; woodland group 2; wildlife group 1; no range site classification)

Elsah gravelly soils (0 to 3 percent slopes) (Eg).—These soils occur as long, narrow areas along small streams. The areas are between 15 and 30 acres in size. Small gravel bars and cobbly spots are common.

The surface layer is very dark grayish-brown, dark-brown, or very dark brown gravelly silt loam or gravelly loam. The underlying material is brown or yellowish-brown gravelly silt loam or gravelly loam. The gravel content is 75 to 90 percent throughout the profile. The depth to bedrock is 5 feet to more than 8 feet.

These soils are medium acid. They are medium in organic-matter content. They respond moderately well to lime and fertilizer. The available water capacity is low because of the high gravel content. The root zone is 3 feet or more thick.

Because of frequent damaging overflow, these soils are not suited to row crops. They are moderately well suited to bermudagrass, fescue, Ladino clover, sudangrass, and lespedeza. They are well suited to sycamore, red oak, white oak, and black walnut (fig. 8), because the roots of these trees are deep enough to absorb seepage water. Runoff is slow. The overflow hazard is severe. (Capability unit Vw–1; woodland group 2; wildlife group 1; no range site classification)

Figure 8.—**Black walnut trees on Elsah gravelly soils.**

Enders Series

The Enders series consists of moderately well drained, very slowly permeable soils on mountainsides. These soils have a clay subsoil. They developed in material weathered from acid shale interbedded with a small amount of siltstone and sandstone. The slope range is 3 to 40 percent.

Enders soils are associated with Allegheny, Allen, Savannah, Linker, Apison, Fayetteville, Hector, Mountainburg, Summit, and Montevallo soils. They have a finer textured subsoil than Allegheny, Allen, Savannah, Linker, Fayetteville, and Apison soils. They lack the fragipan that is characteristic of Savannah soils, and they have a lighter colored surface layer and lower base saturation than Fayetteville soils. They are deeper, are finer textured, and have a more strongly developed subsoil than the shallow Hector, Mountainburg, and Montevallo soils. They differ from Summit soils mainly in having a red, clayey horizon and much lower base saturation and cation exchange capacity.

Representative profile (Enders stony loam in an area of Enders-Allegheny complex, 8 to 20 percent slopes, in a

wooded area; SE¼NW¼NW¼ sec. 3, T. 16 N., R. 30 W.):

A1—0 to 2 inches, dark-brown (10YR 3/3) stony loam; weak, medium, granular structure; very friable; abundant roots; 25 percent stones; medium acid; abrupt, smooth boundary. 1 to 3 inches thick.

A2—2 to 9 inches, brown (10YR 4/3) stony loam; weak, medium, granular structure; very friable; abundant roots; 25 percent sandstone; strongly acid; clear, wavy boundary. 3 to 9 inches thick.

B21t—9 to 22 inches, red (2.5YR 4/6) stony clay; strong, fine and medium, angular blocky structure; firm; plastic; few roots; medium, continuous clay films on peds; 15 percent sandstone; strongly acid; clear, wavy boundary. 6 to 18 inches thick.

B22t—22 to 32 inches, variegated clay; 60 percent dark red (2.5YR 3/6), 25 percent light brownish gray (10YR 6/2), and 15 percent yellowish brown (10YR 5/4); moderate, fine, angular blocky structure; firm; plastic; few roots; continuous, thick clay films on peds; 10 percent sandstone; many black shale fragments; strongly acid; clear, wavy boundary. 5 to 15 inches thick.

B23t—32 to 48 inches, variegated dark-red (2.5YR 3/6) and pale-brown (10YR 6/3) clay; moderate, fine, angular blocky structure; firm; plastic; few roots; medium, continuous clay films; few sandstone and shale fragments; very strongly acid; clear, wavy boundary. 8 to 20 inches thick.

B3g—48 to 84 inches, variegated clay; 60 percent light gray (10YR 7/1) and 40 percent dark red (2.5YR 3/6); massive; firm; plastic; few, patchy clay films in upper part; many shale fragments; very strongly acid; clear, irregular boundary. 15 to 40 inches thick.

R—84 inches +, black shale.

The A1 horizon is dark-brown (10YR 3/3) or very dark grayish-brown (10YR 3/2) gravelly loam or stony loam. The A2 horizon is brown (10YR 4/3) or dark grayish-brown (10YR 4/2) gravelly loam or stony loam. In cultivated areas the Ap horizon is brown (10YR 4/3) or dark grayish brown (10YR 4/2) and is 4 to 10 inches thick. In places there is a B1 horizon of yellowish-brown (10YR 5/4) gravelly loam or gravelly clay loam 2 to 6 inches thick. The B21t horizon is yellowish-red (5YR 4/6), red (2.5YR 4/6), or dark-red (2.5YR 3/6) clay or silty clay. In places it is variegated with yellowish red and red. The B22t and B23t horizons are variegated with dark red (2.5YR 3/6), yellowish red (5YR 4/6), yellowish brown (10YR 5/6), light brownish gray (10YR 6/2), and intermediate colors. They are clay or silty clay in texture. Most profiles have a B3, B3g, or C horizon variegated with the same colors as the B2t, but with less red and more gray (10YR 5/1, 6/1). These horizons are silty clay or clay and contain partly weathered shale fragments. The content of sandstone gravel or stones ranges from 20 to 60 percent in the A and B1 horizons and from 0 to 15 percent in the B2t horizon. The depth to shale bedrock is 3½ to 8 feet. The reaction is medium acid or strongly acid in the A horizon and strongly acid to extremely acid in the B and C horizons.

Enders gravelly loam, 3 to 8 percent slopes (EnC).—This soil is mainly on mountain benches. Most areas are between 5 and 20 acres in size. Included in mapping were spots of Savannah, Allegheny, and Allen soils.

The surface layer is brown or grayish brown and is 5 to 10 inches thick. The subsoil is red or dark-red, plastic clay 36 to 80 inches thick. The lower part is mottled with pale brown and gray. The gravel content is 20 to 60 percent in the surface layer and 0 to 15 percent in the subsoil. The depth to shale is 3½ to 8 feet.

This soil is very strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. Permeability is very slow. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil.

This soil is somewhat difficult to till because of the gravel content. It is poorly suited to moderately well suited to pasture and meadow grasses and row crops. It is poorly suited to upland hardwoods, such as oak, elm, and hickory, and is moderately well suited to shortleaf pine. Most of the acreage has been cultivated, but now part of it is used for pasture or hay crops and the rest is reverting to hardwoods. Runoff is moderate, and the erosion hazard is very severe. (Capability unit IVe–5; woodland group 10; wildlife group 9; Claybreak Shale range site)

Enders gravelly loam, 3 to 8 percent slopes, eroded (EnC2).—This soil is mainly on mountain benches. Most areas are between 5 and 25 acres in size. Included in mapping were spots of Savannah, Allegheny, and Allen soils. Rills are common, and there are a few shallow gullies.

The surface layer is brown or grayish brown and is 4 to 9 inches thick. In spots the plow layer is a mixture of the original surface layer and material from the subsoil. The subsoil is red or dark-red, plastic clay 36 to 80 inches thick. The lower part is mottled pale brown and gray. The gravel content is 20 to 60 percent in the surface layer and 0 to 15 percent in the subsoil. The depth to shale is 3½ to 8 feet.

This soil is very strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. Permeability is very slow. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil.

This soil is somewhat difficult to till because of the gravel content. It is moderately well suited to poorly suited to pasture and meadow grasses and row crops. It is poorly suited to upland hardwoods, such as oak, elm, and hickory, and is moderately well suited to shortleaf pine. All of the acreage has been cultivated, but now part of it is used for pasture grasses or hay crops and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe–5; woodland group 10; wildlife group 9; Claybreak Shale range site)

Enders gravelly loam, 8 to 12 percent slopes (EnD).—This soil is mainly on mountain benches. Most areas are between 5 and 25 acres in size. Included in mapping were spots of Savannah, Allegheny, and Allen soils.

The surface layer is brown or grayish brown and is 5 to 10 inches thick. The subsoil is red or dark-red, plastic clay 36 to 80 inches thick. The lower part is mottled pale brown and gray. The gravel content is 20 to 60 percent in the surface layer and 0 to 15 percent in the subsoil. The depth to shale is 3½ to 8 feet.

This soil is very strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. Permeability is very slow. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil.

This soil is somewhat difficult to till because of the gravel content. It is moderately well suited to poorly suited to pasture and meadow grasses. It is poorly suited to upland hardwoods, such as oak, elm, and hickory, and is moderately well suited to shortleaf pine. Much of the acreage has been cleared, and part has been cultivated. Now, part of it is used for pasture or hay crops and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–4; woodland group 10; wildlife group 9; Claybreak Shale range site)

Enders gravelly loam, 8 to 12 percent slopes, eroded (EnD2).—This soil is mainly on mountain benches. Most areas are between 10 and 75 acres in size. Included in map-

ping were spots of Savannah, Allen, and Allegheny soils. Rills are common, and there are a few shallow gullies.

The surface layer is brown or grayish brown and is 4 to 9 inches thick. In spots the plow layer is a mixture of the original surface layer and material from the subsoil. The subsoil is red or dark-red, plastic clay 36 to 80 inches thick. The lower part is mottled pale brown and gray. The gravel content is 20 to 60 percent in the surface layer and 0 to 15 percent in the subsoil.

This soil is very strongly acid. It has low natural fertility and responds moderately well to fertilizer and lime. The available water capacity is moderate. Permeability is very slow. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil.

This soil is somewhat difficult to till because of the gravel content. It is moderately well suited to poorly suited to pasture and meadow grasses. It is poorly suited to upland hardwoods, such as oak, elm, and hickory, and is moderately well suited to shortleaf pine. Most of the acreage has been cleared, and part has been cultivated. Now, part of it is used for pasture or hay crops and the rest is reverting to hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–4; woodland group 10; wildlife group 9; Claybreak Shale range site)

Enders stony loam, 3 to 12 percent slopes (EoD).—This soil is mainly on ridgetops. Most areas are between 10 and 75 acres in size.

The surface layer is brown or grayish brown and is 5 to 10 inches thick. The subsoil is red or dark-red, plastic clay 36 to 70 inches thick. The lower part is mottled pale brown and gray. The sandstone content is 20 to 60 percent in the surface layer and 0 to 15 percent in the subsoil. The depth to shale is 3½ to 7 feet.

This soil is very strongly acid. It has low natural fertility and shows poor response to fertilizer and lime. The available water capacity is moderate. Permeability is very slow. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil.

This soil is difficult to till because stones interfere with the operation of farm machinery. The soil is moderately well suited to poorly suited to pasture crops. It is poorly suited to upland hardwoods, such as oak, elm, and hickory, and is moderately well suited to shortleaf pine. Most of the acreage is either pasture or woodland consisting of poor-quality hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIs–1; woodland group 10; wildlife group 9; Claybreak Shale range site)

Enders-Allegheny complex, 8 to 20 percent slopes (ErE).—This complex is on mountainsides. It is 55 percent Enders soils, 35 percent Allegheny soils, and 10 percent Allen, Montevallo, and Savannah soils It also includes outcrops and ledges of sandstone. The areas are between 40 and 600 acres in size.

The moderately well drained Enders soils have a surface layer of brown or grayish-brown stony loam 5 to 10 inches thick and a subsoil of mottled red and gray, plastic clay 36 to 75 inches thick. The reaction is strongly acid, natural fertility is low, and the available water capacity is moderate. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil. These soils are poorly suited to upland hardwoods, such as oak, elm, and hickory, and are moderately well suited to shortleaf pine.

The well-drained Allegheny soils are in coves and small pockets and on foot slopes and narrow benches. They have a surface layer of dark-brown stony loam 7 to 14 inches thick. Their subsoil extends to a depth of 25 to 50 inches. The upper part is yellowish-brown or strong-brown stony clay loam, and the lower part is mottled red and gray, plastic clay. The reaction is strongly acid, natural fertility is low, and the available water capacity is moderate. The root zone is 3 feet or more thick. These soils are moderately well suited to upland oak, black walnut, shortleaf pine, and black locust.

Stones and steep slopes make the operation of farm machinery difficult. Small acreages have been cleared, and a few have been cultivated. Now most of the acreage is cutover woodland, dominantly hardwoods. Most of the cleared acreage is used for pasture or is idle. Runoff is rapid, and the erosion hazard is very severe. (Because of inaccessible location, this complex was surveyed at lower intensity than most of the county. Differences between the soils of this complex justify placing them in different interpretative groups. Enders soils: capability unit VIIs–4; woodland group 10; wildlife group 9; Claybreak Shale range site. Allegheny soils: capability unit VIIe–1; woodland group 7; wildlife group 9; no range site classification)

Enders-Allegheny complex, 20 to 40 percent slopes (ErF).—This complex is on mountainsides. It is 60 percent Enders soils and about 40 percent Allegheny soils. Included in mapping were spots of Allen, Montevallo, Hector, Mountainburg, and Savannah soils, and outcrops and ledges of sandstone. The areas are between 40 and 600 acres in size.

The moderately well drained Enders soils have a surface layer of brown or grayish-brown stony loam 5 to 10 inches thick, and a subsoil of mottled red and gray, plastic clay 36 to 70 inches thick. The reaction is strongly acid, natural fertility is low, and the available water capacity is moderate. The root zone is more than 3 feet thick, but root penetration is slow in the subsoil. These soils are poorly suited to upland hardwoods, such as oak, elm, and hickory, and are moderately well suited to shortleaf pine.

The well-drained Allegheny soils have a surface layer of dark-brown stony loam 7 to 14 inches thick. Their subsoil extends to a depth of 25 to 50 inches. The upper part is yellowish-brown or strong-brown stony clay loam, and the lower part is mottled red and gray, plastic clay. The reaction is strongly acid, natural fertility is low, and the available water capacity is moderate. The root zone is 3 feet or more thick. These soils are moderately well suited to upland oak, black walnut, shortleaf pine, and black locust.

Stones and steep slopes make the operation of farm machinery difficult or impossible. Small acreages have been cleared, but most have reverted to woodland. Now nearly all of the acreage is wooded. The few open spots are used for grazing. Runoff is very rapid, and the erosion hazard is very severe. (Because of inaccessible location, this complex was surveyed at lower intensity than most of the county. Differences between the soils of this complex justify placing them in different interpretative groups. Enders soils: capability unit VIIs–4; woodland group 10; wildlife group 9; Claybreak Shale range site. Allegheny soils: capability unit VIIe–1; woodland group 7; wildlife group 9; no range site classification)

Fayetteville Series

The Fayetteville series consists of deep, well-drained, moderately permeable, red soils that developed in residuum derived from massive, soft, calcareous sandstone. The slope range is 3 to 40 percent.

These soils are associated with Mountainburg, Hector, Linker, and Enders soils. They have a darker colored surface layer and higher base saturation than any of those soils. They are redder and are much deeper over bedrock than Mountainburg and Hector soils. They are redder throughout the solum and are deeper over bedrock than Linker soils. Their subsoil is less clayey than that of Enders soils and lacks gray mottles. Fayetteville soils are more sandy and less silty than Pembroke and Pickwick soils. Also, they have a darker colored surface layer than Pickwick soils.

Representative profile (Fayetteville fine sandy loam, 12 to 20 percent slopes, eroded, in an idle field; NE¼SE¼ SE¼ sec. 18, T. 14 N., R. 32 W.):

Ap—0 to 9 inches, dark reddish-brown (5YR 3/3) fine sandy loam; moderate, medium, granular structure; very friable; abundant roots; small amount of sandstone gravel; slightly acid; clear, smooth boundary. 6 to 11 inches thick.

B1—9 to 16 inches, dark reddish-brown (5YR 3/4) fine sandy loam; weak, fine, subangular blocky structure; friable; abundant roots; small amount of sandstone gravel; slightly acid; clear, smooth boundary. 5 to 12 inches thick.

B21t—16 to 25 inches, dark reddish-brown (2.5YR 3/4) sandy clay loam; moderate, fine, subangular blocky structure; friable; plentiful roots; common, fine to medium, tubular pores; common clay bridges between sand grains; many sand grains coated with clay; thin, patchy clay films on ped faces and in pores; less than 1 percent sandstone gravel; slightly acid; gradual, smooth boundary. 6 to 14 inches thick.

B22t—25 to 36 inches, dark-red (10R 3/6) sandy clay loam; moderate, medium, angular blocky structure; friable; few roots; common, fine, tubular pores; many clay bridges; most sand grains coated with clay; thin, patchy clay films on ped surfaces and in pores; less than 1 percent sandstone gravel; slightly acid; gradual, smooth boundary. 7 to 14 inches thick.

B23t—36 to 67 inches, dark-red (10R 3/6) sandy clay loam; moderate, medium, subangular blocky structure; friable; few roots; common, fine, tubular pores; many clay bridges; many sand grains coated with clay; thin, patchy clay films on ped surfaces and in pores; less than 1 percent sandstone gravel; slightly acid; gradual, smooth boundary. 10 to 40 inches thick.

C—67 to 72 inches +, angular sandstone fragments and weathered sandstone; interstices filled with red and reddish-yellow sandy loam. 5 to 20 inches thick.

The Ap horizon is dark reddish brown (5YR 3/3, 3/4) or dark brown (7.5YR 3/2). In spots up to 1 acre in size, the Ap horizon is dark reddish brown (2.5YR 3/4) and is a mixture of material from the A and B horizons. The B1 horizon is dark reddish brown (5YR 3/3, 3/4, or 2.5YR 3/4). The B2t horizon is dark reddish-brown (2.5YR 3/4), dark-red (2.5YR 3/6 or 10R 3/6), or dusky-red (10R 3/4) loam, clay loam, or sandy clay loam. The C horizon is mottled dark-red (10R 3/6) and light yellowish-brown (10YR 6/4) stony sandy loam or stony sandy clay loam. In places the C horizon is lacking. The sandstone content throughout the profile is 0 to 40 percent. The depth to sandstone bedrock ranges from 3 to 8 feet. In some places, either the B2t horizon or the C horizon overlies partly weathered, mottled clay shale. The reaction is medium acid or slightly acid throughout the profile.

Fayetteville fine sandy loam, 3 to 8 percent slopes, eroded (FaC2).—This soil occurs on hilltops. Most areas are between 10 and 100 acres in size. There are a few rills and shallow gullies.

The surface layer is dark reddish brown or dark brown and is 6 to 10 inches thick. In spots the plow layer is a mixture of the original surface layer and material from the subsoil. The subsoil is dark reddish-brown, dark-red, or dusky-red, friable fine sandy loam, sandy clay loam, or clay loam. It is 42 to 65 inches thick. The depth to bedrock is 4 to 8 feet.

This soil is slightly acid. It has moderate fertility and responds well to fertilizer and moderately well to lime. The organic-matter content is low. The available water capacity is moderate. Roots and moisture penetrate to a depth of 4 feet or more.

This soil is easy to keep in good tilth. It is well suited to hay and pasture crops and small grain. It is also well suited to apple trees. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe-4; woodland group 3; wildlife group 3; no range site classification)

Fayetteville fine sandy loam, 8 to 12 percent slopes, eroded (FaD2).—This soil is mainly on hilltops. Most areas are between 10 and 80 acres in size. Included in mapping were spots of Allen soils. There are a few rills and gullies.

The surface layer is dark reddish brown or dark brown and is 6 to 10 inches thick. In spots the plow layer is a mixture of the original surface layer and material from the subsoil. The subsoil is dark reddish-brown, dark-red, or dusky-red, friable loam, sandy clay loam, or clay loam. It is 42 to 65 inches thick. The depth to bedrock is 4 to 7 feet.

This soil is slightly acid. It has moderate natural fertility and responds well to fertilizer and moderately well to lime. The organic-matter content is low. The available water capacity is moderate. Roots and moisture easily penetrate to a depth of 4 feet or more.

This soil is easy to keep in good tilth. It is well suited to hay and pasture crops, small grain, and row crops. It is also well suited to apple trees. Runoff is medium, and the erosion hazard is very severe. (Capability unit IVe-1; woodland group 4; wildlife group 3; no range site classification)

Fayetteville fine sandy loam, 12 to 20 percent slopes, eroded (FaE2).—This soil is mainly on hillsides. Most areas are between 10 and 40 acres in size. Included in mapping were stony and gravelly spots and small areas of Allen soils. There are a few rills and gullies.

The surface layer is dark reddish brown or dark brown and is 6 to 10 inches thick. In spots the plow layer is a mixture of the original surface layer and material from the subsoil. The subsoil is dark reddish-brown, dark-red, or dusky-red, friable loam, sandy clay loam, or clay loam. It is 40 to 65 inches thick. The depth to bedrock is 4 to 7 feet.

This soil is slightly acid. It has moderate natural fertility and responds well to fertilizer and moderately well to lime. The organic-matter content is low. The available water capacity is moderate. Roots and moisture easily penetrate to a depth of 4 feet or more.

This soil is easy to keep in good tilth. It is well suited to hay and pasture crops. It is poorly suited to row crops because of the slope. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe-1; woodland group 4; wildlife group 6; no range site classification)

Fayetteville stony fine sandy loam, 12 to 35 percent slopes (FeF).—This soil is mainly on hillsides. Most areas are between 10 and 60 acres in size. Included in mapping were spots of Allen and Hector soils and outcrops of sandstone and limestone.

The surface layer is dark reddish brown or dark brown and is 6 to 10 inches thick. The subsoil is dark reddish-brown, dark-red, or dusky-red, friable stony loam, stony sandy clay loam, or stony clay loam. It is 30 to 55 inches thick. The depth to bedrock is 3 to 6 feet.

This soil is slightly acid. It has moderate natural fertility and responds well to fertilizer and moderately well to lime. The organic-matter content is low. The available water capacity is moderate. Roots and moisture easily penetrate to a depth of 3 feet or more.

This soil is easy to keep in good tilth. Because of the slope and the stone content, it is not suited to row crops. It is well suited to upland oak, hickory, black walnut, and black locust. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIIe–1; woodland group 4; wildlife group 6; no range site classification)

Fayetteville-Hector complex, 20 to 40 percent slopes (FhF).—This complex is on mountainsides, mainly in the southwestern part of the county. It is 35 percent Fayetteville soils and 65 percent Hector and Mountainburg soils. Included in mapping were outcrops of sandstone and limestone and spots of Linker, Allen, and Allegheny soils.

The well-drained Fayetteville soils have a surface layer of dark-brown or dark reddish-brown stony fine sandy loam that is 6 to 10 inches thick and a subsoil of dark reddish-brown or dark-red stony loam or stony sandy clay loam that is 30 to 50 inches thick. The reaction is medium acid, the organic-matter content is low, natural fertility is low, and the available water capacity is moderate. Roots and moisture easily penetrate as far down as bedrock. Stones and steep slopes interfere with the operation of farm machinery. These soils are not suited to row crops but are moderately well suited to pasture crops. They are well suited to upland oak, hickory, black walnut, and black locust. Most of the acreage is wooded. Runoff is medium, and the erosion hazard is very severe.

The shallow, somewhat excessively drained Hector soils and the well-drained Mountainburg soils make up the steeper parts of this complex. Their surface layer is dark-brown stony fine sandy loam 6 to 11 inches thick. Their subsoil is reddish-brown to yellowish-brown stony fine sandy loam. Bedrock is at a depth of 20 inches or less. The reaction is strongly acid, natural fertility is low, the organic-matter content is low, and the available water capacity is low. The root zone is less than 20 inches thick. Stones and steep slopes interfere with the use of farm machinery. These soils are poorly suited to moderately well suited to pasture crops and are poorly suited to trees. Most of the acreage is wooded. Part of it has been cleared, and the cleared areas are used chiefly for native pasture. Runoff is rapid, and the erosion hazard is very severe.

(Because of inaccessible location, this complex was surveyed at lower intensity than most of the county. Differences between the soils of this complex justify placing them in different interpretative groups. Fayetteville soils: capability unit VIIe–1; woodland group 4; wildlife group 6; no range site classification. Hector and Mountainburg soils: capability unit VIIs-2; woodland group 10; wildlife group 6; Sandstone Ridge range site)

Guin Series

The Guin series consists of well-drained, moderately rapidly permeable, cherty soils on fans and foot slopes. These soils developed in colluvium derived from cherty limestone. The slope range is 3 to 8 percent.

Guin soils are associated with Baxter, Clarksville, and Pembroke soils. They are more cherty throughout and have a much less clayey subsoil than Baxter soils. Also, their subsoil is brown instead of red. They are less cherty and are deeper over bedrock than Clarksville soils. They are much less red in the subsoil and are more cherty and less clayey in the surface layer and subsoil than Pembroke soils.

Representative profile (Guin cherty silt loam, 3 to 8 percent slopes, in a pasture; SW¼SW¼NW¼ sec. 8, T. 14 N., R. 33 W.):

Ap—0 to 5 inches, dark-brown (10YR 3/3) cherty silt loam; weak, medium, granular structure; very friable; about 50 percent chert; medium acid; clear, wavy boundary. 5 to 8 inches thick.

A2—5 to 10 inches, brown (10YR 4/3) cherty silt loam; weak, fine, subangular blocky structure; very friable; about 50 percent chert; medium acid; gradual, wavy boundary. 3 to 8 inches thick.

B1—10 to 15 inches, brown (10YR 4/3) cherty silt loam; weak, fine, subangular blocky structure; friable; about 60 percent chert; medium acid; gradual, wavy boundary. 4 to 10 inches thick.

B2—15 to 52 inches +, yellowish-brown (10YR 5/4) cherty silt loam; weak, medium, subangular blocky structure; friable; about 70 percent chert; medium acid. 25 to 50 inches thick.

The Ap horizon is dark brown (10YR 3/3) or very dark grayish brown (10YR 3/2). In undisturbed areas the A1 horizon is 1 to 3 inches thick and is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2), and the A2 horizon is 7 to 12 inches thick and is brown (10YR 4/3, 5/3) or yellowish brown (10YR 5/4, 5/6). The B2 horizon is yellowish brown (10YR 5/4, 5/6) or strong brown (7.5YR 5/6). Generally it overlies a mass of chert rubble 2 to several feet thick. The depth to cherty limestone is 5 to 8 feet. The solum is 36 to 76 inches thick. The chert content is 50 to 70 percent. The reaction is slightly acid or medium acid in the A horizon and medium acid or strongly acid in the B horizon.

Guin cherty silt loam, 3 to 8 percent slopes (GuC).—This soil occurs mainly as fan-shaped or long, narrow areas on foot slopes. Most areas are between 5 and 20 acres in size. Included in mapping were spots of Clarksville soils and narrow strips of Elsah soils.

The surface layer is brown, dark brown, or very dark grayish brown and is 8 to 14 inches thick. The subsoil is yellowish-brown or strong-brown cherty silt loam 2 to 5 feet thick.

This soil is medium acid. It has low natural fertility and responds moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is low. Water and roots move freely through the soil. The root zone is 3 feet or more thick.

This soil is somewhat droughty. It is difficult to till because of the high chert content. It is moderately well suited to corn, small grain, pasture grasses, hay crops, native grasses, and forbs. It is well suited to trees, particularly upland oak, hickory, black walnut, and shortleaf pine, because the roots of these trees are deep enough to absorb

seepage water. Runoff is slow. Droughtiness is a severe limitation. (Capability unit IVs–2; woodland group 6; wildlife group 4; no range site classification)

Hector Series

The Hector series consists of shallow, somewhat excessively drained soils that developed in material weathered from acid sandstone and siltstone. These soils occupy narrow ridges, edges of broad mountaintops, steep mountainsides, and narrow bluffs between mountainside benches. The slope range is 3 to 40 percent.

These soils occur as small areas intermingled with Mountainburg, Allen, and Fayetteville soils and are mapped as complexes with these soils. They are also associated with Linker, Apison, Allegheny, and Enders soils. They contain more coarse fragments than Mountainburg soils and have a thinner, coarser textured subsoil that is yellowish brown instead of brown to yellowish red. They are much shallower over bedrock and have a thinner, much less clayey subsoil than Linker, Apison, Allen, Allegheny, Fayetteville, and Enders soils.

Representative profile (Hector stony fine sandy loam in an area of Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes, in a sparsely wooded area; SE¼-SE¼NE¼ sec. 28, T. 15 N., R. 32 W.):

A1—0 to 1 inch, very dark grayish-brown (10YR 3/2) stony fine sandy loam; moderate, medium, granular structure; very friable; 75 percent sandstone; abundant roots; medium acid; clear, smooth boundary. 1 to 3 inches thick.

A2—1 inch to 6 inches, brown (10YR 5/3) stony fine sandy loam; weak, medium, granular structure; very friable; abundant roots; 75 percent sandstone; strongly acid; abrupt, irregular boundary. 4 to 8 inches thick.

B—6 to 15 inches, yellowish-brown (10YR 5/6) stony fine sandy loam; weak, medium, subangular blocky structure; friable; plentiful roots; 60 percent sandstone; few to common clay bridges between sand grains; strongly acid; abrupt, irregular boundary. 4 to 10 inches thick.

R—15 inches +, acid, level-bedded sandstone.

The A1 horizon is very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), or very dark gray (10YR 3/1). The A2 horizon is brown (10YR 5/3, 4/3) or yellowish-brown (10YR 5/4, 5/6) fine sandy loam or loam. In cultivated areas the Ap horizon, 4 to 8 inches thick, is brown (10YR 5/3, 4/3) or dark grayish brown (10YR 4/2). The B horizon is yellowish-brown (10YR 5/4, 5/6) or strong-brown (7.5YR 5/6) loam or fine sandy loam. Each horizon is 50 to 80 percent gravel or stones. The depth to sandstone or siltstone is 10 to 20 inches. The reaction is slightly acid to strongly acid in the A horizon and strongly acid or very strongly acid in the B horizon.

Hector-Mountainburg gravelly fine sandy loams, 3 to 8 percent slopes (HmC).—This complex consists of about equal proportions of Hector and Mountainburg soils. It is in the Boston Mountains, on long narrow ridges or near the edges of broad mountaintops. Included in mapping were stony spots and rock outcrops and small areas of Linker soils.

The surface layer of the somewhat excessively drained Hector soils is brown and is about 6 inches thick. The subsoil is yellowish-brown or strong-brown gravelly fine sandy loam and is about 8 inches thick.

The surface layer of the well-drained Mountainburg soils is brown and is about 8 inches thick. The subsoil is yellowish-red gravelly loam and is about 10 inches thick.

Both soils are strongly acid. They have low natural fertility and show poor response to lime and fertilizer. The organic-matter content is low. The available water capacity is low because of shallowness and the high gravel content. The root zone is less than 20 inches thick.

These soils are difficult to till because of the gravel content. They are poorly suited to row crops and are only poorly suited to moderately well suited to hay and pasture crops. They are also poorly suited to trees. Most of the acreage is pasture or meadow. Part of it is forest or is reverting to forest. Runoff is medium, and the erosion hazard is very severe. (Capability unit IVe–4; woodland group 10; wildlife group 7; Sandstone Ridge range site)

Hector-Mountainburg gravelly fine sandy loams, 8 to 12 percent slopes (HmD).—This complex consists of about equal proportions of Hector and Mountainburg soils. It is in the Boston Mountains, on long narrow ridges or near the edges of broad mountaintops. Included in mapping were stony spots and rock outcrops and small areas of Linker soils.

The surface layer of the somewhat excessively drained Hector soils is brown and is about 6 inches thick. The subsoil is yellowish-brown or strong-brown gravelly fine sandy loam and is about 8 inches thick.

The surface layer of the well-drained Mountainburg soils is brown and is about 8 inches thick. The subsoil is yellowish-red gravelly loam about 10 inches thick.

Both soils are strongly acid. They have low natural fertility and show poor response to lime and fertilizer. The organic-matter content is low. The available water capacity is low because of shallowness and the gravel content. The root zone is less than 20 inches thick.

These soils are difficult to till because of the gravel content. They are poorly suited to row crops and are only poorly suited to moderately well suited to hay and pasture crops. They are also poorly suited to trees. Most of the acreage is pasture or meadow. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIe–3; woodland group 10; wildlife group 7; Sandstone Ridge range site)

Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes (HoF).—This complex consists of Hector and Mountainburg soils, in about equal proportions. It is in the Boston Mountains, on long narrow ridges, on mountainsides, or near the edges of broad mountaintops. Included in mapping were rock outcrops and small areas of Linker soils.

The surface layer of the somewhat excessively drained Hector soils is brown and is about 6 inches thick. The subsoil is yellowish-brown or strong-brown stony fine sandy loam and is about 8 inches thick.

The surface layer of the well-drained Mountainburg soils is brown and is about 8 inches thick. The subsoil is yellowish-red stony loam and is about 10 inches thick.

Both soils are strongly acid. They have low natural fertility and low organic-matter content. The available water capacity is low because of shallowness and the high stone content. The root zone is less than 20 inches thick.

These soils are difficult to till because of the slope and the stone content. They are poorly suited to moderately well suited to pasture grasses and poorly suited to trees. Most of the acreage is forest of poor-quality timber or is reverting to forest. Part of it has been cleared, and the cleared areas are used chiefly for native pasture. Pastures are difficult to maintain. Runoff is rapid, and the erosion hazard is very severe. (Capability unit VIIs-2; woodland group 10; wildlife group 7; Sandstone Ridge range site)

Jay Series

The Jay series consists of well-drained, slowly permeable soils that have a fragipan. These soils developed mainly in silty material under tall grasses. The slope range is 1 to 8 percent.

Jay soils are associated with Summit, Cherokee, Captina, Sogn, and Taloka soils. They have a thicker, darker colored surface layer than Captina soils. They are better drained and have a less clayey subsoil than Cherokee soils. They are browner, better drained, and coarser textured than Taloka and Summit soils, and they have a fragipan instead of a claypan. They have a thicker solum than Sogn soils.

Representative profile (Jay silt loam, 3 to 8 percent slopes, in a meadow; NW¼NE¼NW¼ sec. 36, T. 16 N., R. 32 W.):

Ap—0 to 9 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable; abundant roots; few, fine, hard and soft, dark-colored concretions; medium acid; abrupt, smooth boundary.

A1—9 to 16 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, subangular blocky structure; very friable; abundant roots; common fine pores; few, fine, hard and soft concretions; strongly acid; gradual, smooth boundary. A horizon 10 to 18 inches thick.

B2t—16 to 25 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, angular blocky structure; firm; plentiful roots; common fine pores; few channels filled with very dark grayish-brown (10YR 3/2) silt loam from A1 horizon; continuous, medium, clay films on ped faces and pore walls; very strongly acid; clear, wavy boundary. 6 to 17 inches thick.

A'2x & B'tx—25 to 29 inches, brown (10YR 5/3) silty clay loam; few, fine, faint, pale-brown mottles and distinct, medium, yellowish-brown mottles; moderate, medium, subangular blocky structure; firm; few fine roots; few, thin, patchy clay films; pale-brown areas contain common uncoated sand grains; common, medium to coarse, hard, dark-colored concretions; very strongly acid; clear, smooth boundary. 2 to 6 inches thick.

B'x1—29 to 56 inches, variegated light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), yellowish-brown (10YR 5/8), and yellowish-red (5YR 5/8) silty clay loam; weak, coarse, polygonal masses breaking to moderate, medium, angular blocky structure; firm; brittle; common pores; continuous, thin to thick, clay films on ped faces and pore walls; many, medium and coarse, black and brown, hard concretions; strongly acid; gradual, wavy boundary. 18 to 30 inches thick.

B'x2—56 to 72 inches +, variegated light-gray (10YR 6/1) and strong-brown (7.5YR 5/8) silty clay loam; weak, coarse, polygonal masses breaking to moderate, medium, angular blocky structure; firm; common, thin, patchy clay films; lower part contains small amount of rounded sandstone gravel up to ¾ inch in diameter; few, medium, black concretions; medium acid. 12 to 30 inches thick.

The Ap and A1 horizons are very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), or very dark brown (10YR 2/2). The B2t horizon is yellowish brown (10YR 5/6) or strong brown (7.5YR 5/6). The depth to the A'2x & B'tx horizon is 18 to 32 inches. The B'x horizon is variegated with yellowish brown (10YR 5/8), grayish brown (10YR 5/2), light gray (10YR 6/1), yellowish red (5YR 5/8), and intermediate colors. The yellowish-red colors are lacking in places. The thickness of the fragipan ranges from 35 to 60 inches. In places the profile is 1 percent sandstone and chert pebbles. The depth to bedrock is 60 to 85 inches. The reaction is slightly acid to strongly acid in the A horizon, very strongly acid to medium acid in the B2t and B'x1 horizons, and medium acid or slightly acid in the B'x2 horizon.

Jay silt loam, 1 to 3 percent slopes (JaB).—This soil is on broad uplands. The areas are between 10 and 100 acres in size. Included in mapping were spots of Captina and Pickwick soils.

The surface layer is dark brown, very dark brown, or very dark grayish brown and is 10 to 18 inches thick. The upper part of the subsoil is yellowish-brown or strong-brown silt loam or silty clay loam that is 6 to 17 inches thick. The lower part is a firm, brittle fragipan 35 to 60 inches thick. The pan is silt loam or silty clay loam and is mottled with yellowish brown, grayish brown, light gray, and yellowish red.

This soil is medium acid or strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. Water and roots penetrate the upper part of the subsoil readily but move slowly into the fragipan.

This soil is well suited to hay and pasture crops, small grain, and corn. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–1; woodland group 13; wildlife group 2; Loamy Prairie range site)

Jay silt loam, 3 to 8 percent slopes (JaC).—This soil is on broad uplands. The areas are between 10 and 100 acres in size. Included in mapping were spots of Captina and Pickwick soils and areas where the surface layer is brown or yellowish brown.

The surface layer of this soil is dark brown, very dark brown, or very dark grayish brown and is 10 to 16 inches thick. The upper part of the subsoil is yellowish-brown or strong-brown silt loam or silty clay loam that is 6 to 16 inches thick. The lower part is a firm, brittle fragipan 35 to 55 inches thick. The pan is silt loam or silty clay loam and is mottled with yellowish brown, grayish brown, light gray, and yellowish red.

This soil is medium acid or strongly acid. It has moderate natural fertility and responds well to fertilization. The available water capacity is moderate. Water and roots penetrate the upper part of the subsoil readily but move slowly into the fragipan.

This soil is well suited to hay and pasture crops, small grain, and corn. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe-1; woodland group 13; wildlife group 2; Loamy Prairie range site)

Johnsburg Series

The Johnsburg series consists of somewhat poorly drained, slowly permeable soils that have a fragipan. These soils developed in silty material on stream terraces or broad uplands. The slope range is 0 to 2 percent. Some areas are mounded.

Johnsburg soils are associated with Captina, Cherokee, Leaf, Apison, Samba, Summit, and Savannah soils. They differ from Captina, Apison, and Savannah soils in having mottles throughout the subsoil. They are better drained and are less gray in the surface layer and in the upper part of the subsoil than Cherokee and Leaf soils. Also, they are less clayey in the subsoil than those soils. Johnsburg soils lack the thick, dark-colored surface layer and the high clay content of Samba and Summit soils. They have a fragipan, which the Samba and Summit soils lack.

Representative profile (Johnsburg silt loam in a pasture; SW¼SE¼SW¼ sec. 4, T. 15 N., R. 32 W.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure; very friable; few, fine, dark-colored concretions; many roots; medium acid; abrupt, smooth boundary. 6 to 10 inches thick.

B1—8 to 12 inches, dark grayish-brown (10YR 4/2) silt loam; few, fine, distinct, strong-brown mottles; weak, medium, subangular blocky structure; friable; few krotovinas up to 3 inches in diameter filled with grayish-brown silt loam; roots common; few, fine, dark-colored concretions; strongly acid; clear, smooth boundary. 4 to 8 inches thick.

B2t—12 to 23 inches, silty clay loam; about 40 percent light brownish gray (10YR 6/2), 40 percent strong brown (7.5YR 5/6), and 20 percent yellowish red (5YR 4/6); moderate, medium, subangular blocky structure; friable; few roots; thin, discontinuous clay films; krotovinas up to 3 inches in diameter filled with grayish-brown silt loam; few, fine, dark-colored concretions; strongly acid; clear, wavy boundary. 7 to 14 inches thick.

Bx1—23 to 38 inches, silt loam; 50 percent light gray (10YR 7/2), 20 percent yellowish brown (10YR 5/6), and 30 percent brown (10YR 5/3); moderate, medium and coarse, angular blocky structure; firm; brittle; few roots; medium, continuous clay films on pore walls and thin, discontinuous clay films on ped faces; strongly acid; clear, wavy boundary. 10 to 20 inches thick.

Bx2—38 to 72 inches, silty clay loam; about 35 percent strong brown (7.5YR 5/6), 15 percent yellowish red (5YR 4/6), and 50 percent light gray (10YR 7/2); moderate, medium and coarse, angular blocky structure; firm; brittle; very few roots; medium, continuous clay films on pore walls and thin, discontinuous clay films on ped faces; many, dark-colored, hard concretions in uppermost 12 inches; concretions decrease in number with increasing depth; strongly acid. 20 to 42 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2), brown (10YR 4/3), or grayish brown (10YR 5/2). The B1 horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3), and in places is mottled with yellowish brown, strong brown, gray, or intermediate colors. The B2t horizon is silty clay loam or silt loam and is variegated with grayish brown (10YR 5/2), yellowish brown (10YR 5/6), yellowish red (5YR 4/6), and intermediate colors. The depth to the Bx horizon is 18 to 28 inches. This horizon is silt loam or silty clay loam and is variegated with gray, yellowish brown, yellowish red, and intermediate colors. Some profiles have a mottled silt loam B3 or C horizon, both of which are likely to contain thin strata of gravel. The depth to bedrock is 5 to 12 feet. The reaction is slightly acid or medium acid in the Ap horizon and medium acid to very strongly acid in the B horizon.

Johnsburg silt loam (0 to 2 percent slopes) (Jo).—This soil is nearly level or depressional. Most areas are between 10 and 75 acres in size. Included in mapping were spots of Leaf and Cherokee soils.

The surface layer is dark grayish brown or brown and is 6 to 10 inches thick. The upper part of the subsoil is mottled grayish-brown, yellowish-brown, and strong-brown silt loam or silty clay loam that is 10 to 20 inches thick. The lower part is a firm, brittle fragipan 30 to 50 inches thick. The pan is silt loam or silty clay loam and is mottled with gray, dark brown, yellowish brown, and red.

This soil is medium acid. It has low natural fertility and responds moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Water and roots move readily in the upper part of the soil but are limited in the lower part by the fragipan, which slows root penetration and percolation of water.

This soil is moderately well suited to well suited to row crops, small grain, hay crops, and pasture grasses. Wetness is a severe hazard. Surface drainage is needed if row crops are to be grown. Runoff is slow. There is a slight hazard of erosion on the more sloping areas. (Capability unit IIIw–2; woodland group 8; wildlife group 5; no range site classification)

Johnsburg complex, mounded (0 to 1 percent slopes) (Js).—This complex is mainly on stream terraces. Most areas are between 10 and 100 acres in size. Rounded mounds make up 20 to 40 percent of each area. They are 40 to 80 feet in diameter, 1½ to 3 feet high, and 20 to 150 feet apart. The areas between mounds are Johnsburg soils, and the mounds are unnamed soils. Included in mapping were spots of Cherokee and Summit soils.

The surface layer of Johnsburg soils is grayish-brown, dark grayish-brown, or brown silt loam that is 6 to 10 inches thick. The upper part of the subsoil is mottled grayish-brown, yellowish-brown, and strong-brown silt loam or silty clay loam that is 10 to 20 inches thick. The lower part is a firm, brittle fragipan 30 to 50 inches thick. The pan is silt loam or silty clay loam and is mottled with gray, dark brown, yellowish brown, and red.

The surface layer of the unnamed soils is dark-brown silt loam 15 to 25 inches thick. The subsoil extends to a depth of 40 to 56 inches. It is brown and grayish-brown, friable silt loam. This layer is underlain by a firm, brittle fragipan of mottled gray and brown silt loam.

The soils in this complex are medium acid. They have low natural fertility and respond moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Water and roots move readily in the upper part of the soils but are limited in the lower part by a fragipan, which slows root penetration and percolation of water.

These soils are moderately well suited to row crops, small grain, hay crops, and pasture grasses. Runoff is slow, and wetness is a severe hazard. Surface drainage is needed if row crops are to be grown. The mounds interfere with the operation of most farm equipment. (Capability unit IVw–1; woodland group 8; wildlife group 5; no range site classification)

Leaf Series

This series consists of poorly drained, very slowly permeable soils on broad uplands. These soils occur as level or depressional areas that are mounded in places.

Leaf soils are associated with Johnsburg and Captina soils. They differ from those soils mainly in having grayer colors and a claypan. They lack the dark-colored surface layer that is typical of Taloka soils. They have lower base saturation than Cherokee soils.

Representative profile (Leaf silt loam in a cultivated field; NE¼NW¼SW¼ sec. 28, T. 15 N., R. 32 W.):

Ap—0 to 5 inches, grayish-brown (10YR 5/2) silt loam; many, medium, faint, brown (10YR 5/3, 7.5YR 5/4) mottles; weak, fine, subangular blocky structure; friable; plentiful roots; medium acid; abrupt, smooth boundary. 5 to 8 inches thick.

A2g—5 to 12 inches, grayish-brown (2.5Y 5/2) silt loam; many, coarse, distinct, yellowish-brown (10YR 5/6) mottles and many, fine, distinct, strong-brown mottles; weak, fine, subangular blocky structure; friable; plentiful roots; strongly acid; clear, smooth boundary. 5 to 10 inches thick.

B21tg—12 to 17 inches, light-gray (10YR 6/1) silty clay loam; many, medium, distinct, dark yellowish-brown mottles and few, medium, distinct, dark-brown mottles; moderate, medium, subangular blocky structure; firm; few roots; common, fine and medium pores; common, thin, discontinuous clay films; very strongly acid; abrupt, smooth boundary. 4 to 12 inches thick.

B22tg—17 to 50 inches, dark-gray (10YR 4/1) silty clay; many, medium, distinct, dark yellowish-brown mottles; moderate, coarse, angular blocky structure; very firm; plastic; few roots; few pores; common, thin, discontinuous clay films on ped surfaces; very strongly acid; gradual, smooth boundary. 20 to 40 inches thick.

C—50 to 72 inches +, clay; about 60 percent light gray (10YR 6/1), 25 percent grayish brown (10YR 5/2), and 15 percent dark gray (10YR 4/1); massive; very firm; few roots; few pores; very strongly acid. 15 to 30 inches thick.

The Ap horizon is grayish brown (10YR 5/2) or dark grayish brown (10YR 4/2) and in places contains yellowish-brown and brown mottles. The A2g horizon is grayish brown (2.5Y 5/2 or 10YR 5/2) or dark grayish brown (10YR 4/2) and has yellowish-brown and strong-brown mottles. The B21tg horizon is light-gray (10YR 6/1, 7/2), gray (10YR 5/1), or grayish-brown (10YR 5/2) silt loam or silty clay loam and has dark yellowish-brown (10YR 4/4), light yellowish-brown (10YR 6/4), or dark-brown (7.5YR 4/4) mottles. The B22tg horizon is clay or silty clay and has dark-gray (10YR 4/1), dark yellowish-brown (10YR 4/4), strong-brown (7.5YR 5/6), and, in places, red (2.5YR 4/8) mottles. The macrostructure of the B horizon is weak prismatic in some profiles. The C horizon is clay, silty clay, or silty clay loam, and is variegated with light gray (10YR 6/1), gray (10YR 4/1), and yellowish brown (10YR 4/6). The depth to sandstone or cherty limestone ranges from 56 to 96 inches. Dark-colored, hard concretions are a common feature of all horizons. The reaction is medium acid or strongly acid in the A horizon and strongly acid to extremely acid in the B and C horizons.

Leaf silt loam (0 to 1 percent slopes) (Le).—This soil occurs as level areas or as depressions on broad uplands. Most areas are between 5 and 40 acres in size. Included in mapping were mounds, small areas of Johnsburg soils, and spots where the subsoil is slightly acid.

The surface layer of this soil is dark grayish brown or grayish brown and is 10 to 18 inches thick. The subsoil is 36 to 60 inches thick. The uppermost 4 to 12 inches of this layer is silty clay loam. The rest is silty clay or clay mottled with light gray and dark yellowish brown. The depth to sandstone or cherty limestone is 56 to 96 inches.

This soil is very strongly acid. It has low natural fertility and responds moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Permeability is very slow. The root zone is 3 feet or more in thickness.

This soil is moderately well suited to row crops and small grain and is moderately well suited to well suited to pasture and hay crops. Runoff is very slow, and prolonged wetness after heavy rain is a very severe limitation. (Capability unit IVw–1; woodland group 8; wildlife group 5; no range site classification)

Leaf complex, mounded (0 to 1 percent slopes) (Lf).—This complex is mainly on broad uplands. Most areas are between 5 and 20 acres in size. Rounded mounds make up 20 to 40 percent of each area. They are 40 to 100 feet in diameter, 1½ to 3 feet high, and 20 to 100 feet apart. The areas between mounds are Leaf soils, and the mounds are unnamed soils. Included in mapping were spots of Johnsburg soils.

The surface layer of Leaf soils is dark grayish-brown or grayish-brown silt loam that is 10 to 18 inches thick. The subsoil is mottled light-gray and dark yellowish-brown silty clay or clay that is 36 to 60 inches thick. The depth to sandstone or cherty limestone is 56 to 96 inches.

The surface layer of the unnamed soils is dark-brown or very dark grayish-brown silt loam that is 15 to 24 inches thick. The subsoil is 25 to 40 inches thick. The upper part is brown or grayish-brown silt loam, and the lower part is mottled gray and yellowish-brown clay or silty clay.

The soils in this complex are strongly acid. They have low natural fertility and respond moderately well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

These soils are moderately well suited to row crops and small grain and are moderately well suited to well suited to pasture and hay crops. Runoff is very slow, and prolonged wetness after heavy rains is a very severe limitation. The mounds interfere with cultivation and drainage. (Capability unit IVw–1; woodland group 8; wildlife group 5; no range site classification)

Linker Series

The Linker series consists of well-drained, moderately permeable soils that developed in residuum derived from acid sandstone and siltstone. These soils are mainly on ridges and mountaintops in the southern two-thirds of the county. Their slope range is 1 to 12 percent. Bedrock is at a depth of 2 to 4 feet.

Linker soils are associated with Apison, Hector, Mountainburg, and Enders soils. They are more sandy and less silty than Apison soils, and they have a red or yellowish-red subsoil. They are deeper over bedrock and have a thicker, more evident subsoil than the shallow Mountainburg and Hector soils. They have a less clayey subsoil than Enders soils.

Representative profile (Linker loam, 3 to 8 percent slopes, eroded, in an idle field; SE¼SE¼NE¼ sec. 13, T. 15 N., R. 33 W.):

Ap—0 to 5 inches, brown (10YR 4/3), mixed with yellowish-red (5YR 5/6), loam; weak, medium, granular structure; very friable; abundant roots; small amount of sandstone gravel; medium acid; clear, smooth boundary. 4 to 10 inches thick.

B21t—5 to 14 inches, yellowish-red (5YR 5/6) loam; weak, medium, subangular blocky structure; firm; few roots; many medium pores; few, thin, continuous clay films on pore walls; few subrounded sandstone pebbles; strongly acid. 5 to 12 inches thick.

B22t—14 to 26 inches, yellowish-red (5YR 4/6) loam; weak, medium, subangular blocky structure; firm; few roots; few pores; thin, continuous clay films on pore walls and thin, patchy films on some vertical ped faces; strongly acid; gradual, wavy boundary. 8 to 16 inches thick.

B3—26 to 34 inches, variegated dark-red (2.5YR 3/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) fine sandy loam; weak, medium, angular blocky structure; firm; slightly brittle; few roots; common, fine and medium, vesicular pores; common, thin, continuous clay films on ped surfaces; 5 percent subrounded pebbles; strongly acid; clear, irregular boundary. 5 to 15 inches thick.

R—34 inches +, sandstone bedrock.

In undisturbed areas the A1 horizon is dark grayish brown (10YR 4/2) or very dark grayish brown (10YR 3/2) and is 1 to 3 inches thick. The A2 horizon is brown (10YR 4/3, 5/3) or yellowish brown (10YR 5/4) and is 4 to 8 inches thick. Both are loam or gravelly loam in texture. The Ap horizon is brown

(10YR 4/3, 5/3) or dark grayish brown (10YR 4/2). In spots it is mixed with yellowish-red (5YR 5/6) material from the B horizon. The B2t horizon is yellowish-red (5YR 4/6, 4/8, 5/6), red (2.5YR 4/6), or dark-red (2.5YR 3/6) loam or sandy clay loam. The B3 horizon is fine sandy loam, loam, or clay loam. In some profiles there is a C horizon of fine sandy loam or loam. The B3 horizon and the C horizon are variegated with dark red (2.5YR 3/6), strong brown (7.5YR 5/6), grayish brown (10YR 5/2), and intermediate colors. In places both horizons are lacking and there is a B23t horizon of brown and red loam or fine sandy loam. The gravel content in each horizon ranges from 0 to 30 percent. The reaction is medium acid or strongly acid in the A horizon and strongly acid or very strongly acid in the B and C horizons.

Linker loam, 1 to 3 percent slopes (LkB).—This soil is on ridges and mountaintops. The areas are between 10 and 20 acres in size. Included in mapping were small areas of Apison soils and eroded spots.

The surface layer is brown or dark grayish brown and is 6 to 10 inches thick. The subsoil is yellowish-red, red, or dark-red loam or sandy clay loam 22 to 36 inches thick. The depth to sandstone or siltstone is 30 to 48 inches.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 2½ to 4 feet thick.

This soil is well suited to apples. It is moderately well suited to well suited to hay and pasture crops and small grain and is moderately well suited to corn and other row crops. It is also moderately well suited to upland oak, shortleaf pine, black walnut, and black locust. Most of the acreage has been cultivated. Now most of it is pasture or meadow, part is idle, and the rest is planted to shortleaf pine. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–3; woodland group 5; wildlife group 3; no range site classification)

Linker loam, 3 to 8 percent slopes, eroded (LkC2).—This soil is on ridges and mountaintops. The areas are between 10 and 100 acres in size. Included in mapping were gravelly spots and small areas of Apison soils.

The surface layer is brown or dark brown mixed with yellowish red and is 4 to 8 inches thick. The subsoil is yellowish-red, red, or dark-red loam or sandy clay loam 18 to 33 inches thick. The depth to sandstone is 24 to 48 inches. There are a few rills and shallow gullies.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 2 to 4 feet thick.

This soil is well suited to apples (fig. 9). It is moderately well suited to well suited to hay and pasture crops and small grain and is moderately well suited to corn and other row crops. It is also moderately well suited to upland oak, shortleaf pine, black walnut, and black locust. The entire acreage has been cultivated. Now most of it is pasture or

Figure 9.—Apple orchard on Linker loam, 3 to 8 percent slopes, eroded.

meadow, part is idle, and the rest is planted to shortleaf pine. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–4; woodland group 5; wildlife group 3; no range site classification)

Linker gravelly loam, 3 to 8 percent slopes, eroded (LnC2).—This soil is mainly on ridges and mountaintops. The areas are between 10 and 30 acres in size. Included in mapping were small areas of Hector and Mountainburg soils and spots that are less than 15 percent gravel.

The surface layer is brown or dark grayish brown mixed with yellowish red and is 4 to 8 inches thick. The subsoil is red, yellowish-red, or dark-red gravelly loam or gravelly sandy clay loam, 18 to 32 inches thick. The depth to sandstone or siltstone is 24 to 40 inches. The gravel content is 15 to 30 percent. There are a few rills and shallow gullies.

This soil is strongly acid. It has low natural fertility and responds moderately well to lime and fertilizer. The available water capacity is moderate. The root zone is 24 to 40 inches thick.

This soil is well suited to apples. It is moderately well suited to well suited to hay and pasture crops and small grain and is moderately well suited to corn and other row crops. It is also moderately well suited to upland oak, shortleaf pine, black walnut, and black locust. The entire acreage has been cultivated. Now most of it is pasture or meadow, part is reverting to forest, and the rest is planted to shortleaf pine. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–4; woodland group 5; wildlife group 3; no range site classification)

Linker gravelly loam, 8 to 12 percent slopes (LnD).—This soil is mainly on ridges and mountaintops. The areas are between 10 and 30 acres in size. Included in mapping were spots of Hector and Mountainburg soils.

The surface layer is brown and is 5 to 9 inches thick. The subsoil is red, yellowish-red, or dark-red gravelly loam or gravelly sandy clay loam that is 18 to 30 inches thick. The depth to sandstone is 24 to 40 inches. The gravel content is 15 to 30 percent.

This soil is strongly acid. It has low natural fertility and responds moderately well to lime and fertilizer. The available water capacity is moderate. The root zone is 24 to 40 inches thick.

This soil is moderately well suited to well suited to hay and pasture crops and small grain and is poorly suited to row crops. It is moderately well suited to upland oak, shortleaf pine, and black locust. Much of the acreage has been cultivated. Now most of it is pasture or meadow, part is reverting to forest, and the rest is planted to shortleaf pine. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe-1; woodland group 6; wildlife group 3; no range site classification)

Montevallo Series

The Montevallo series consists of shallow, somewhat excessively drained, moderately permeable soils that developed in material weathered from acid shale. These soils are on or near the foot slopes of the Boston Mountains. Their slope range is 3 to 25 percent.

Montevallo soils are associated with Enders, Hector, and Mountainburg soils. They are darker colored in the upper part of the profile than those soils. They are shallower over bedrock than Enders and Mountainburg soils and are finer textured than Mountainburg and Hector soils. They are more acid, are coarser textured, and have lower base saturation than Sogn soils.

Representative profile (Montevallo stony loam in a wooded area of Montevallo soils, 3 to 12 percent slopes; NW¼SE¼NE¼ sec. 3, T. 15 N., R. 31 W.):

O1—1 inch to 0, hardwood leaves and twigs.
A11—0 to 2 inches, very dark brown (10YR 2/2) stony loam; moderate, medium, granular structure; very friable; abundant roots; medium acid; abrupt, wavy boundary.
A12—2 to 8 inches, very dark grayish-brown (10YR 3/2) stony loam; weak, medium, subangular blocky structure; friable; abundant roots; medium acid; clear, smooth boundary. A1 horizon 4 to 10 inches thick.
B—8 to 12 inches, brown (10YR 5/3) stony silt loam; weak, medium, subangular blocky structure; friable; abundant roots; medium acid; abrupt, smooth boundary. 3 to 6 inches thick.
C—12 to 15 inches, partly weathered, acid, dark-colored shale that is about 35 percent yellowish-brown (10YR 5/4) silty clay loam; massive; firm; few roots; medium acid; abrupt, wavy boundary. 3 to 5 inches thick.
R—15 inches +, acid, dark-colored shale.

The A1 horizon is very dark brown (10YR 2/2) or very dark grayish-brown (10YR 3/2) gravelly loam or stony loam. The B horizon is brown (10YR 5/3) or dark brown (10YR 4/3 or 7.5YR 4/4) gravelly silt loam, stony silt loam, or silty clay loam. The C horizon is lacking in places. Stones up to 3 feet in diameter and gravel make up 25 to 60 percent of the profile. The depth to shale ranges from 8 to 20 inches. The reaction is medium acid or slightly acid in the A horizon and medium acid or strongly acid in the B horizon.

Montevallo soils, 3 to 12 percent slopes (MoD).—These soils are on low knolls and foot slopes along the northern border of the Boston Mountains. Most areas are between 5 and 50 acres in size. Included in mapping were shale outcrops and spots of Enders and Allegheny soils.

The surface layer, 4 to 10 inches thick, is very dark brown or very dark grayish-brown stony loam or gravelly loam. The subsoil, 6 to 11 inches thick, is brown or dark-brown stony silt loam, gravelly silt loam, or silty clay loam. Sandstone and shale fragments make up 25 to 60 percent of the soil mass. The depth to shale is 8 to 20 inches.

These soils are medium acid. They have very low natural fertility and show little response to lime and fertilizer. The available water capacity is very low. The root zone is 8 to 20 inches thick.

These soils are droughty. They are poorly suited to pasture and hay crops, row crops, and timber because of shallowness and the stone and gravel content. They are moderately well suited to native pasture. About 20 percent of the acreage has been cleared and is used for native pasture. The rest is in scrubby hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIe–3; woodland group 11; wildlife group 7; Shale Break range site)

Montevallo soils, 12 to 25 percent slopes (MoE).—These soils are on foot slopes along the northern margin of the Boston Mountains. Most areas are between 5 and 60 acres in size. Included in mapping were shale outcrops and spots of Enders and Allegheny soils.

The surface layer, 4 to 10 inches thick, is very dark grayish-brown gravelly loam or stony loam. The subsoil, 6 to 11 inches thick, is brown or dark-brown gravelly silt loam, stony silt loam, or silty clay loam. Sandstone and shale fragments make up 25 to 60 percent of the soil mass. The depth to shale is 8 to 20 inches.

These soils are medium acid. They have very low natural fertility and show little response to lime and fertilizer. The available water capacity is very low. The root zone is 8 to 20 inches thick.

These soils are very droughty. They are poorly suited to pasture and hay crops, row crops, and timber because of shallowness and stoniness. They are moderately well suited to native pasture. Nearly all of the acreage is in scrubby hardwoods. Runoff is rapid, and the erosion hazard is severe. (Capability unit VIIs–2; woodland group 11; wildlife group 7; Shale Break range site)

Mountainburg Series

The Mountainburg series consists of shallow, well-drained, rapidly permeable, gently sloping to steep soils that developed in material weathered from acid sandstone and siltstone. These soils are on narrow ridges, near edges of broad mountaintops, on steep hillsides and mountain slopes, and on long, narrow bluffs between mountain benches. The slope range is 3 to 40 percent.

The Mountainburg soils in this county are mapped only as a complex with Hector soils. They are also associated with Montevallo, Linker, Apison, Allegheny, and Enders soils. They are similar to Hector soils, but they have a redder subsoil that is a few inches thicker over bedrock and that has a higher clay content and a lower content of coarse fragments than that of Hector soils. They are shallower over bedrock than Linker, Apison, Captina, Allen, Allegheny, Fayetteville, and Enders soils and have a thinner, less clayey subsoil. They are less dark colored and higher in sand content than Montevallo soils.

Representative profile (Mountainburg stony fine sandy loam in a wooded location within an area of Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes; SE¼SE¼NE¼ sec. 1, T. 15 N., R. 33 W.):

A1—0 to 2 inches, dark-brown (10YR 3/3) stony fine sandy loam; moderate, medium, granular structure; very friable; abundant roots; 35 percent sandstone fragments; slightly acid; clear, smooth boundary. 1 to 3 inches thick.

A2—2 to 8 inches, brown (10YR 4/3) stony fine sandy loam; moderate, medium, granular structure; very friable; many roots; 35 percent sandstone fragments; some material from A1 horizon in channels; strongly acid; clear, smooth boundary. 4 to 8 inches thick.

B21t—8 to 12 inches, brown (7.5YR 4/4) stony loam; weak, medium, subangular blocky structure; friable; many roots; few, thin, discontinuous clay films on ped faces; 35 percent sandstone fragments; strongly acid; clear, smooth boundary. 3 to 5 inches thick.

B22t—12 to 18 inches, yellowish-red (5YR 4/8) stony loam; weak, medium, subangular blocky structure; friable; thin, patchy clay films; roots common; 35 percent sandstone fragments; strongly acid. 3 to 7 inches thick.

R—18 inches +, sandstone bedrock.

In cultivated areas the Ap horizon is brown (10YR 5/3, 4/3) or dark grayish brown (10YR 4/2) and is 4 to 8 inches thick. The A1 is dark grayish brown (10YR 3/2), dark brown (10YR 3/3), or very dark gray (10YR 3/1). The A2 horizon is brown (10YR 5/3, 4/3) or yellowish brown (10YR 5/4). The B22t horizon is reddish-brown, red, or yellowish-red fine sandy loam, silt loam, or loam. The depth to sandstone or siltstone ranges from 15 to 20 inches. The gravel or stone content in each horizon is between 35 and 50 percent. The reaction is slightly acid or medium acid in the A1 horizon, medium acid or strongly acid in the Ap and A2 horizons, and strongly acid or very strongly acid in the B horizon.

Nixa Series

The Nixa series consists of cherty, moderately well drained, very slowly permeable soils that developed in residuum derived from cherty limestone. These soils occur as long narrow ridgetops in the northern part of the county.

Nixa soils are associated with Clarksville, Baxter, Pickwick, and Captina soils. They differ from those soils in having a cherty fragipan. Captina soils have a fragipan, but it contains little or no chert. Nixa soils lack the red clayey subsoil that is typical of Baxter soils. They are lighter colored, have a lower clay content, have less structural development in the subsoil, and contain much more chert than Captina and Pickwick soils.

Representative profile (Nixa cherty silt loam, 3 to 8 percent slopes, in a native pasture; SE¼NE¼SW¼ sec. 6, T. 17 N., R. 28 W.):

Ap—0 to 5 inches, dark grayish-brown (10YR 4/2) cherty silt loam; moderate, medium, granular structure; friable; abundant roots; 50 percent chert fragments; medium acid; abrupt, smooth boundary. 4 to 6 inches thick.

A2—5 to 8 inches, brown (10YR 5/3) cherty silt loam; weak, medium, subangular blocky structure; friable; common roots; many pores; worm and root channels filled with material from Ap horizon; 35 percent chert; medium acid; clear, smooth boundary. 2 to 5 inches thick.

B1—8 to 11 inches, brown (10YR 5/3) cherty silt loam; weak, medium, subangular blocky structure; friable; few roots; many pores; worm and root channels filled with material from Ap and A2 horizons; 35 percent chert; medium acid; clear, smooth boundary. 3 to 5 inches thick.

B2—11 to 16 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) cherty silt loam; moderate, medium, subangular blocky structure; friable; few roots; many, fine and medium pores; 40 percent chert; medium acid; abrupt, wavy boundary. 4 to 9 inches thick.

Bx—16 to 32 inches, pale-brown (10YR 6/3) cherty silt loam; many, medium, faint, yellowish-brown mottles; massive; brittle; few roots; many, medium to large, vesicular pores; common, medium, continuous clay films on pore walls; 90 percent chert; medium acid; abrupt, irregular boundary. 12 to 24 inches thick.

B3—32 to 40 inches +, 95 percent or more chert fragments; fine earth is red silty clay.

The Ap horizon is dark grayish brown (10YR 4/2), brown (10YR 5/3), or grayish brown (10YR 5/2). In undisturbed areas the A1 horizon, ½ inch to 2 inches thick, is very dark grayish brown (10YR 3/2) or black (10YR 2/1), and the A2 horizon, 6 to 10 inches thick, is brown (10YR 5/3, 4/3), dark grayish brown (10YR 4/2), or grayish brown (10YR 5/2). The B1 horizon is brown (10YR 5/3, 4/3) or yellowish-brown (10YR 5/4) cherty silt loam. The B2 horizon is brown (10YR 5/3), yellowish-brown (10YR 5/4, 5/6), or strong-brown (7.5YR 5/6) cherty silt loam. The Bx horizon is mottled pale-brown (10YR 6/3), yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/6), and grayish-brown (10YR 5/2) cherty silt loam. The A and B2 horizons are 25 to 80 percent chert, and the Bx horizon, 60 to 90 percent. The depth to the Bx horizon ranges from 14 to 24 inches. The reaction is slightly acid or medium acid in the A horizon and medium acid or strongly acid in the B horizon.

Nixa cherty silt loam, 3 to 8 percent slopes (NaC).—This soil occurs as long, narrow, winding ridgetops. The areas are between 20 and 100 acres in size. Included in mapping were small areas of Captina and Baxter soils.

The surface layer is dark grayish brown or brown and is 7 to 11 inches thick. The subsoil is cherty silt loam. The uppermost 7 to 16 inches is brown, yellowish brown, or strong brown. The lowermost part is a mottled grayish-brown, yellowish-brown, and strong-brown, compact, very

slowly permeable fragipan. The depth to the pan is 14 to 24 inches.

This soil is medium acid. It has low fertility and responds moderately well to lime and fertilizer. The available water capacity is low. Roots and moisture penetrate easily as far down as the fragipan, but very slowly through the pan. Because of shallowness and the chert content, this soil is droughty.

This soil is difficult to till. It is moderately well suited to grapes, small grain, annual lespedeza, and native grasses and forbs and is well suited to tall fescue, bermudagrass, and Ladino clover. It is poorly suited to moderately well suited to shortleaf pine and upland oak. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIIs-1; woodland group 10; wildlife group 4; Chert Hills range site)

Nixa cherty silt loam, 8 to 12 percent slopes (NaD).—This soil occurs as long narrow ridgetops. The areas are between 20 and 50 acres in size. Included in mapping were small areas of Baxter and Clarksville soils.

The surface layer is dark grayish brown or brown and is 7 to 11 inches thick. The subsoil is cherty silt loam. The uppermost 7 to 15 inches is brown, yellowish brown, or strong brown. The lowermost part is a mottled grayish-brown, yellowish-brown, and strong-brown, compact, very slowly permeable fragipan. The depth to the pan is 14 to 22 inches.

This soil is medium acid. It has low fertility but responds moderately well to lime and fertilizer. The available water capacity is low. Roots and moisture penetrate easily as far down as the pan, but very slowly through the pan. Because of shallowness and the chert content, this soil is droughty.

This soil is difficult to till. It is moderately well suited to small grain, annual lespedeza, and native grasses and forbs and is well suited to tall fescue, bermudagrass, and Ladino clover. It is poorly suited to moderately well suited to shortleaf pine and upland oak. Runoff is rapid, and the erosion hazard is severe. (Capability unit IVs-1; woodland groups 6 and 10; wildlife group 4; Chert Hills range site)

Pembroke Series

The Pembroke series consists of well-drained, moderately permeable soils on stream terraces and broad uplands. These soils developed in residuum from limestone or in material washed chiefly from limestone, cherty limestone, and siltstone residuum. The slope range is 1 to 8 percent.

Pembroke soils are associated with Guin, Captina, Baxter, and Pickwick soils. They have a darker colored surface layer than any of those soils. They have a redder subsoil than Captina soils and lack a fragipan. They have a redder, finer textured subsoil and are much less cherty than Guin soils. They are less cherty and less clayey than Baxter soils. They are more silty and less sandy than Fayetteville soils.

Representative profile (Pembroke silt loam, 3 to 6 percent slopes, eroded, in a pasture; SW¼SE¼SE¼ sec. 24, T. 14 N., R. 33 W.):

Ap—0 to 5 inches, dark-brown (7.5YR 3/2) and dark reddish-brown (5YR 3/4) silt loam; weak, medium, granular structure; very friable; many fine roots; common, fine, continuous pores; few chert fragments; slightly acid; clear, smooth boundary. 4 to 10 inches thick.

B1—5 to 13 inches, dark reddish-brown (5YR 3/4) silt loam; weak, medium, subangular blocky structure; friable; common, fine pores; few chert fragments; medium acid; clear, smooth boundary. 4 to 12 inches thick.

B21t—13 to 26 inches, red (2.5YR 4/6) silty clay loam; weak, medium, subangular blocky structure; firm; few fine roots; few to common very fine pores; thin, continuous clay films on ped faces and pore walls; few chert fragments; medium acid; gradual, smooth boundary. 8 to 20 inches thick.

B22t—26 to 42 inches, red (10R 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm; few roots; few very fine pores; thin, continuous clay films on ped faces and pore walls; few to many chert fragments; medium acid; gradual, wavy boundary. 10 to 22 inches thick.

B23t—42 to 60 inches +, about 80 percent poorly sorted, subrounded chert fragments and cobblestones, mostly less than 6 inches in diameter; few sandstone pebbles; interstices filled with red (10R 4/6) silty clay loam; weak, medium, subangular blocky structure; friable; common, thin, discontinuous clay films; medium acid. 10 to 25 inches thick.

The Ap horizon is dark brown (7.5YR 3/2, 10YR 3/3) silt loam or gravelly silt loam. The B1 horizon is dark reddish-brown (5YR 3/4) or dark-brown (7.5YR 3/2) silt loam or gravelly silt loam. The B2t horizon is yellowish-red (5YR 4/6), red (2.5YR 4/6, 10R 4/6), or dark-red (2.5YR 3/6) silty clay loam or silt loam. The B23t horizon, where present, is red or yellowish-red and in places is variegated with yellowish brown and grayish brown. In places there is a B3t horizon of gravelly loam, gravelly fine sandy loam, or gravelly clay loam at a depth of 3 to 5 feet. The chert content is as much as 30 percent in the Ap horizon and ranges from 0 to 35 percent in the B horizon. The depth to bedrock is 4 to 12 feet. The reaction is slightly acid or medium acid in the A horizon and medium acid or strongly acid in the B horizon.

Pembroke silt loam, 1 to 3 percent slopes (PeB).—Most areas of this soil are between 10 and 30 acres in size. Included in mapping were small areas of Captina and Pickwick soils and gravelly spots.

The surface layer is dark brown and is 6 to 10 inches thick. The subsoil is red, yellowish-red, or dark-red silty clay loam or silt loam that is 36 to 54 inches thick.

This soil is medium acid or strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 3 feet or more in thickness.

This soil is well suited to most row crops and to hay and pasture crops. All of the acreage has been cultivated, but now most of it is used for pasture and meadow crops or small grain. Runoff is medium. The erosion hazard is moderate. (Capability unit IIe-2; woodland group 3; wildlife group 3; no range site classification)

Pembroke silt loam, 3 to 6 percent slopes, eroded (PeC2).—Most areas of this soil are between 10 and 50 acres in size. Included in mapping were small areas of Captina soils and gravelly spots.

The surface layer is dark brown and is 4 to 10 inches thick. In spots subsoil material has been mixed with the surface layer and there is a reddish-brown plow layer. The subsoil is red, yellowish-red, or dark-red silty clay loam or silt loam that is 36 to 50 inches thick. In places the lower part of the subsoil is gravelly. There are a few rills and shallow gullies.

This soil is medium acid or strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 3 feet or more in thickness.

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This soil is well suited to most row crops and to hay and pasture crops (fig. 10). All of the acreage has been cultivated, but now most of it is used for pasture and meadow crops or small grain. Runoff is medium. The erosion hazard is severe. (Capability unit IIIe–2; woodland group 3; wildlife group 3; no range site classification)

Pembroke gravelly silt loam, 3 to 8 percent slopes, eroded (PgC2).—Most areas of this soil are between 10 and 25 acres in size. Included in mapping were spots of Guin soils and nongravelly soils.

The surface layer is dark brown and is 4 to 10 inches thick. In spots subsoil material has been mixed with the surface layer and there is a reddish-brown plow layer. The subsoil is red, yellowish-red, or dark-red silty clay loam, gravelly silty clay loam, or gravelly silt loam that is 36 to 46 inches thick. There are a few rills and shallow gullies.

This soil is medium acid or strongly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil is well suited to moderately well suited to pasture and meadow crops and to most row crops. All of the acreage has been cultivated, but now most of it is pasture or meadow. Runoff is medium. The erosion hazard is severe. Gravel interferes with tillage. (Capability unit IIIe–2; woodland group 3; wildlife group 3; no range site classification)

Figure 10.—**Midland bermudagrass and Ladino clover on Pembroke silt loam, 3 to 6 percent slopes, eroded.**

Pickwick Series

The Pickwick series consists of well-drained, moderately permeable soils on stream terraces and broad uplands. These soils developed in deeply weathered residuum from siltstone and cherty limestone and in material washed from uplands underlain by sandstone, siltstone, shale, and limestone. The slope range is 1 to 12 percent.

Pickwick soils are associated with Pembroke, Savannah, Nixa, and Captina soils. They have a lighter colored surface layer than Pembroke soils. They are better drained and redder throughout the profile than Nixa, Savannah, and Captina soils. They lack the high chert content and cherty fragipan of Nixa soils and the fragipan of Savannah and Captina soils. They are more silty and less sandy

than Fayetteville soils and are less cherty and less clayey than Baxter soils.

Representative profile (Pickwick silt loam, 1 to 3 percent slopes, in a pasture; SE¼SW¼NW¼ sec. 18, T. 17 N., R. 29 W.):

Ap—0 to 8 inches, brown (10YR 4/3) silt loam; weak, fine, subangular blocky structure; very friable; plentiful roots; few, dark-colored, hard concretions; medium acid; abrupt, smooth boundary. 4 to 10 inches thick.

B1—8 to 15 inches, yellowish-red (5YR 5/6) silt loam; moderate, fine, subangular blocky structure; friable; plentiful roots; few, small, dark-colored concretions; few worm casts; medium acid; clear, wavy boundary. 4 to 10 inches thick.

B21t—15 to 24 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, fine, subangular blocky structure; friable; few roots; common tubular pores; thin, discontinuous clay films on ped faces and pore walls; strongly acid; clear, irregular boundary. 6 to 20 inches thick.

B22t—24 to 64 inches, variegated yellowish-red (5YR 4/6), dark-red (2.5YR 3/6), and light brownish-gray (10YR 6/2) silty clay loam; moderate, medium, angular and subangular blocky structure; firm; slightly brittle; few roots; common, continuous clay films on ped faces; clay plugs in some pores and thick clay films on pore walls; isolated coarse peds about 2 inches in diameter and 5 inches thick contain concentrations of black concretions and have dark-brown and black ped coatings; lowermost 6 inches contains many, dark-colored, hard concretions and is 5 percent subrounded chert and siltstone pebbles; strongly acid. 22 to 48 inches thick.

R—64 inches +, chert bedrock.

The Ap horizon is brown (10YR 4/3), reddish-brown (YR 4/4), or dark-brown (7.5YR 4/4) silt loam or gravelly loam. The B1 horizon is yellowish-red (5YR 5/6) or strong-brown (7.5YR 5/6) silt loam, gravelly silt loam, or silty clay loam. The B2t horizon is clay loam, silty clay loam, or gravelly clay loam. The B21t horizon is yellowish red (5YR 4/6) or red (2.5YR 4/6). The B22t horizon is variegated with yellowish red (5YR 4/6), dark red (2.5YR 3/6), light brownish gray (10YR 6/2), and gray (10YR 6/1). In places the B22t horizon is red and is not variegated. In places bedrock is overlain with strata of rounded gravel. The depth to bedrock ranges from 3 to more than 7 feet. The reaction is slightly acid or medium acid in the Ap horizon and medium acid or strongly acid in the B horizon.

Pickwick gravelly loam, 3 to 8 percent slopes, eroded (PkC2).—Areas of this soil are between 7 and 20 acres in size. Small areas of Savannah soils were included in mapping.

The surface layer is brown or dark brown and is 4 to 8 inches thick. In spots subsoil material has been mixed with the surface layer and there is a reddish-brown plow layer. The subsoil is yellowish-red or red clay loam or gravelly clay loam 28 to 45 inches thick. There are a few rills and shallow gullies.

This soil is medium acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil is well suited to corn, small grain, hay and pasture crops, and orchards and vineyards. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–2; woodland group 3; wildlife group 3; no range site classification)

Pickwick gravelly loam, 8 to 12 percent slopes, eroded (PkD2).—Areas of this soil are between 7 and 20 acres in size. A few small areas of Savannah soils were included in mapping.

The surface layer is brown or dark brown and is 4 to 8 inches thick. In spots subsoil material has been mixed with the surface layer and there is a reddish-brown plow layer. The subsoil is yellowish-red or red clay loam or gravelly clay loam 28 to 40 inches thick. Most areas have a few rills and shallow gullies.

This soil is medium acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 3 feet or more in thickness.

This soil is well suited to small grain and to hay and pasture crops. Runoff is rapid, and the erosion hazard is very severe. (Capability unit IVe–1; woodland group 3; wildlife group 3; no range site classification)

Pickwick silt loam, 1 to 3 percent slopes (PsB).—Areas of this soil are between 10 and 30 acres in size. Spots of Captina and Savannah soils were included in mapping.

The surface layer is brown or dark brown and is 6 to 10 inches thick. The subsoil is yellowish-red to dark-red silty clay loam that is 30 to 60 inches thick. In most places the lower part of the subsoil is mottled yellowish red, dark red, light brownish gray, and gray.

This soil is medium acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 3 feet or more in thickness.

This soil is well suited to corn, small grain, hay and pasture crops, and orchards and vineyards. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–2; woodland group 3; wildlife group 3; no range site classification)

Pickwick silt loam, 3 to 8 percent slopes, eroded (PsC2).—Areas of this soil are between 20 and 100 acres in size. A few spots of Nixa, Savannah, and Captina soils were included in mapping.

The surface layer is brown or dark brown and is 4 to 8 inches thick. In spots subsoil material has been mixed with the surface layer and there is a reddish-brown plow layer. The subsoil is yellowish-red to dark-red clay loam or silty clay loam that is 25 to 55 inches thick. In most places the lower part of the subsoil is mottled yellowish red, dark red, light brownish gray, and gray. There are a few rills and shallow gullies in most areas.

This soil is medium acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 3 feet or more thick.

This soil is well suited to corn, small grain, hay and pasture crops, and orchards and vineyards. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–2; woodland group 3; wildlife group 3; no range site classification)

Razort Series

The Razort series consists of well-drained, moderately permeable soils that formed in alluvium on flood plains and low terraces. The slope range is 0 to 3 percent.

Razort soils are associated with Sloan, Elsah, and Cleora soils. They contain fewer coarse fragments than Elsah soils. They are better drained than Sloan soils and lack gray mottles in the upper part of the underlying material. They are less sandy and contain more fine material than Cleora soils.

Representative profile (Razort silt loam, occasionally flooded, in a pasture; SE¼NE¼SE¼ sec. 33, T. 17 N., R. 31 W.):

Ap—0 to 8 inches, dark yellowish-brown (10YR 3/4) silt loam; moderate, medium, granular structure; very friable; abundant roots; neutral; gradual, smooth boundary. 7 to 15 inches thick.

B1—8 to 19 inches, dark-brown (10YR 3/3) silt loam; weak, coarse, subangular blocky structure; friable; common roots; many, fine and medium, tubular pores; many worm casts; slightly acid; gradual, smooth boundary. 6 to 13 inches thick.

B21t—19 to 24 inches, brown (10YR 4/3) and dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; common roots; many, fine and medium, tubular pores coated with clay films; many worm casts; medium acid; gradual, smooth boundary. 4 to 10 inches thick.

B22t—24 to 33 inches, dark-brown (10YR 3/3) and dark yellowish-brown (10YR 4/4) silt loam; weak, medium and coarse, subangular blocky structure; friable; few roots; common, fine and medium, tubular pores; thin, discontinuous clay films on ped surfaces; medium acid; gradual, wavy boundary. 7 to 14 inches thick.

B23t—33 to 54 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium and coarse, subangular blocky structure; friable; few roots; common, fine and medium, tubular pores; brown, thin, discontinuous clay films on ped surfaces; medium acid; gradual, wavy boundary. 14 to 24 inches thick.

C—54 to 72 inches +, variegated strong-brown (7.5YR 5/6), brown (10YR 5/3), and gray (10YR 5/1) silt loam; massive; friable; few roots; 75 percent chert fragments; common, medium, tubular pores; medium acid; 10 to 30 inches thick.

The A horizon is silt loam, loam, or gravelly silt loam. It is dark yellowish brown (10YR 3/4), very dark brown (10YR 2/2), or dark brown (10YR 3/3). The B1 horizon is dark brown (10YR 3/3) or dark yellowish brown (10YR 3/4). The B2t horizon is dark brown (10YR 3/3–4/3), dark yellowish brown (10YR 4/4), or brown (10YR 5/3) and in places has gray or grayish-brown mottles below a depth of 36 inches. In texture it is loam, clay loam, silt loam, or gravelly silt loam. The C horizon contains strata that are 25 to 90 percent chert gravel. The depth to bedrock ranges from 5 to more than 12 feet. The reaction is neutral or slightly acid in the A and B1 horizons and slightly acid or medium acid in the B2t and C horizons.

Razort silt loam, occasionally flooded (0 to 2 percent slopes) (Ra).—This soil occurs as long, narrow areas parallel to stream channels. The areas are between 10 and 60 acres in size. Included in mapping were small areas of Elsah and Sloan soils, gravelly spots, and depressions where gray mottles are less than 12 inches below the surface.

The surface layer is dark brown, dark yellowish brown, or very dark brown and is 7 to 15 inches thick. The subsoil is dark-brown or dark yellowish-brown silt loam 2 to 4 feet thick. In places it has common gray mottles below a depth of 36 inches. In places the underlying material contains beds of chert gravel or sand up to 12 inches thick. Chert gravel makes up less than 15 percent of the soil mass. The depth to bedrock ranges from 5 to more than 12 feet.

This soil is slightly acid. It has medium natural fertility and responds well to fertilizer. The available water capacity is high. The root zone is 5 feet or more in thickness. Roots and moisture penetrate easily.

This soil is well suited to corn and other row crops, hay and pasture crops, small grain, and truck crops. It is suited to sprinkler irrigation. Runoff is slow. The overflow hazard is moderate. (Capability unit IIw–1; woodland group 1; wildlife group 1; no range site classification)

Razort gravelly silt loam, occasionally flooded (0 to 2 percent slopes) (Rg).—This soil occurs as long narrow areas parallel to stream channels. The areas are between 10 and 25 acres in size. Included in mapping were small areas of Elsah soils and nongravelly spots.

The surface layer is dark brown, dark yellowish brown, or very dark brown and is 7 to 15 inches thick. The subsoil is dark-brown, brown, or dark yellowish-brown gravelly silt loam 2 to 4 feet thick. In places it has gray mottles below a depth of 36 inches. The underlying material commonly has layers of chert gravel 6 to 18 inches thick. Chert gravel makes up 15 to 40 percent of the soil mass. The depth to bedrock ranges from 5 to more than 12 feet .

This soil is slightly acid. It has medium natural fertility and responds well to fertilizer. The available water capacity is moderate. The root zone is 5 feet or more in thickness. Roots and moisture penetrate easily.

This soil is well suited to hay and pasture crops, small grain, corn, and truck crops. It is suited to sprinkler irrigation. Runoff is slow. The overflow hazard is moderate. (Capability unit IIw–1; woodland group 1; wildlife group 1; no range site classification)

Razort loam (0 to 2 percent slopes) (Rk).—Most areas of this soil are between 5 and 60 acres in size. Included in mapping were small areas of Cleora and Elsah soils and gravelly spots.

The surface layer is dark yellowish brown or dark brown and is 7 to 12 inches thick. The subsoil is dark yellowish-brown or dark-brown loam, silt loam, or clay loam that is 45 to 70 inches thick. The depth to bedrock is 5 to more than 12 feet.

This soil is slightly acid. It has medium natural fertility and responds well to lime and fertilizer. The available water capacity is high. The root zone is 5 feet or more in thickness. Roots and moisture penetrate easily.

This soil is well suited to hay and pasture crops, small grain, corn and other row crops, and truck crops. It is suited to sprinkler irrigation. Runoff is medium. The overflow hazard is slight, and the erosion hazard is slight. (Capability unit IIe–2; woodland group 1; wildlife group 1; no range site classification)

Rock Land

Rock land (Ro) consists of limestone outcrops, limestone ledges, and talus. Most areas are between 10 and 30 acres in size. The ledges are 30 to 80 feet high. At the top of the ledges are the limestone outcrops, 35 to 100 feet wide and moderately steep. At the base are the areas of talus 50 to 100 feet wide and with a slope of 10 to 30 percent. The talus is made up mainly of limestone boulders up to 25 feet in diameter. It is 3 to 5 percent very dark brown, neutral silt loam or silty clay loam. Included in mapping were spots of Enders, Summit, and Clarksville soils.

This land type is excessively drained and is very droughty. Except in seep spots at the base of bluffs, it has very low available water capacity. It can be used only as woodland, wildlife habitat, and native pasture. It is moderately well suited to native grasses and forbs. The seep spots are fairly well suited to trees, mainly redcedar, elm, hackberry, and upland oak. (Capability unit VIIs–3; woodland group 12; wildlife group 8; Limestone Ledge range site)

Samba Series

The Samba series consists of poorly drained, very slowly permeable soils on stream terraces and uplands. These soils developed in old alluvium that was washed mainly from upland soils derived from acid sandstone, siltstone, and shale and was affected to some extent by limestone.

Samba soils are associated with Summit, Cherokee, and Johnsburg soils. They have a darker colored surface layer and a finer textured subsoil than Cherokee and Johnsburg soils. They are grayer and more poorly drained than Johnsburg soils and lack the fragipan that is typical of those soils. They are more acid and have a coarser textured surface layer and a less clayey subsoil than Summit soils.

Representative profile (Samba silt loam in a meadow; NW¼NE¼NW¼ sec. 4, T. 15 N., R. 30 W.):

Ap—0 to 6 inches, very dark brown (10YR 2/2) silt loam; weak, medium, granular structure; abundant roots; medium acid; abrupt, smooth boundary. 4 to 8 inches thick.

A1—6 to 12 inches, very dark gray (10YR 3/1) silty clay loam; moderate, medium, subangular blocky structure; friable; plentiful roots; few brown concretions; medium acid; gradual, irregular boundary. 5 to 10 inches thick.

B21tg—12 to 31 inches, variegated clay; 50 percent dark gray (10YR 4/1), 25 percent yellowish brown (10YR 5/6), and 25 percent yellowish red (5YR 4/6); moderate, fine, angular blocky structure; very firm; plastic; few roots; thin, patchy clay films on ped faces; few, soft, dark-colored concretions; strongly acid; diffuse boundary. 15 to 30 inches thick.

B22tg—31 to 52 inches, variegated clay; 70 percent dark gray (10YR 4/1) and 30 percent dark yellowish brown (10YR 4/4); moderate, medium, angular blocky structure; very firm; plastic; common, thin, patchy clay films; many dark-colored concretions; medium acid; clear, wavy boundary. 15 to 30 inches thick.

C—52 to 72 inches +, variegated silty clay; 50 percent dark gray (10YR 4/1) and 50 percent dark brown (7.5YR 4/4); massive; firm; plastic; 20 percent shale gravel; many, dark-colored, hard and soft concretions; few roots; slightly acid. 12 to 30 inches thick.

The A1 horizon is very dark gray (10YR 3/1), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The B2t horizon is mottled dark-gray, brown, yellowish-brown, and yellowish-red clay or silty clay. The gravel and shale content of the A and B horizons ranges from 0 to 10 percent. In places the C horizon is stratified clay, silty clay, and gravel. The reaction is medium acid in the A1 horizon, strongly acid or very strongly acid in the upper part of the B horizon, very strongly acid to medium acid in the lower part of the B horizon, and strongly acid to neutral in the C horizon.

Samba silt loam (0 to 1 percent slopes) (Sa).—This soil is on stream terraces and uplands. It occurs either as level areas or as depressions, most of which range from 5 to 25 acres in size. Included in mapping were spots of Summit and Johnsburg soils and low mounds.

The surface layer is very dark gray, very dark brown, or very dark grayish brown and is 10 to 18 inches thick. The upper part of the subsoil is mottled gray, brown, yellowish-brown, and yellowish-red clay or silty clay. The gravel and shale content is 0 to 10 percent. In places the lower part of the subsoil is stratified clay, silty clay, and gravel.

This soil is medium acid or strongly acid. It has low natural fertility and responds moderately well to lime and fertilizer. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil stays wet for long periods. It is well suited to pasture and hay crops, but drainage is needed to make it suitable for corn, other row crops, or small grain. Runoff is very slow. Excess water is a severe hazard. (Capability unit IIIw–1; woodland group 9; wildlife group 5; no range site classification)

Samba complex, mounded (0 to 1 percent slopes) (Sb).—This complex is on stream terraces and uplands. The surface generally is level or depressional. The areas are between 5 and 25 acres in size. Rounded mounds make up 20 to 40 percent of each area. They are 40 to 100 feet in diameter, 1½ to 3 feet high, and 20 to 100 feet apart. The areas between the mounds are Samba soils, and the mounds are unnamed soils. Included in mapping were spots of Summit and Johnsburg soils.

The surface layer of the Samba soils is very dark gray, very dark brown, or very dark grayish-brown silt loam that is 10 to 18 inches thick. The subsoil is mottled gray, brown, yellowish-brown, and yellowish-red clay or silty clay. In places the lower part of the subsoil is stratified clay, silty clay, and gravel.

The surface layer of the unnamed soils is dark-brown or very dark grayish-brown silt loam that is 15 to 22 inches thick. The upper part of the subsoil is brown silt loam 20 to 35 inches thick. The lower part is mottled gray and yellowish-brown clay or silty clay.

These soils are medium acid or strongly acid. They have low natural fertility and respond moderately well to lime and fertilizer. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

These soils stay wet for long periods. They are well suited to pasture and hay crops. They need smoothing and surface drainage to be suitable for corn, other row crops, or small grain. The mounds interfere with the installation of drainage systems and with cultivation and other management. Runoff is very slow. Excess water is a very severe hazard. (Capability unit IVw–1; woodland group 9; wildlife group 5; no range site classification)

Savannah Series

The Savannah series consists of moderately well drained, slowly permeable soils that have a fragipan. These soils developed in colluvium or old alluvium derived from acid sandstone, siltstone, and shale. They are on benches, foot slopes, and stream terraces in or near the Boston Mountains. The slope range is 1 to 8 percent.

Savannah soils are associated with Allegheny, Pickwick, Allen, Johnsburg, and Enders soils. They differ from Allen, Enders, Pickwick, and Allegheny soils in having a fragipan. They lack the red color of the Pickwick and Allen soils and the clayey subsoil of Enders soils. They are better drained than Johnsburg soils and have mottle-free horizons above the fragipan. They are more sandy and less silty than Captina soils.

Representative profile (Savannah fine sandy loam, 3 to 8 percent slopes, eroded, in an idle field; SW¼NW¼NE¼ sec. 4, T. 15 N., R. 28 W.):

Ap—0 to 5 inches, brown (10YR 4/3) fine sandy loam; weak, fine, granular structure; friable; many fine roots; many worm casts; many fine pores; medium acid; clear, smooth boundary. 4 to 9 inches thick.

B1—5 to 11 inches, yellowish-brown (10YR 5/6) loam; moderate, fine, subangular blocky structure; friable; common pores; small amount of sandstone gravel; medium acid; clear, wavy boundary. 4 to 8 inches thick.

B2t—11 to 22 inches, strong-brown (7.5YR 5/6) loam; moderate, medium, subangular blocky structure; friable; common, thin, continuous clay films in pores and on ped faces; small amount of sandstone gravel; strongly acid; clear, wavy boundary. 8 to 18 inches thick.

Bx1—22 to 29 inches, variegated light brownish-gray (10YR 6/2), yellowish-red (5YR 4/6), and light yellowish-brown (10YR 6/4) loam; moderate, medium, subangular blocky structure; firm; brittle; common vesicular pores; common, thin clay films on ped faces; voids and pores lined with clay films; few, small to medium, black and brown concretions; strongly acid; gradual, irreguiar boundary. 5 to 15 inches thick.

Bx2—29 to 70 inches +, variegated red (2.5YR 4/8), light brownish-gray (10YR 6/2), yellowish-brown (10YR 5/8), and brownish-yellow (10YR 6/6) loam; moderate, fine and medium, subangular blocky structure; firm; brittle; common, thin, continuous clay films on ped faces and pore walls; few vesicular pores; few strata of subangular gravel and stones; few, small, soft, black and brown concretions; strongly acid. 30 to 50 inches thick.

In undisturbed areas the A1 horizon is very dark grayish-brown (10YR 3/2) or dark-brown (10YR 3/3) fine sandy loam 1 to 3 inches thick, and the A2 horizon is brown (10YR 4/3, 5/3) fine sandy loam 6 to 10 inches thick. The Ap horizon is dark grayish brown (10YR 4/2) or brown (10YR 5/3, 4/3). The B1 horizon is dark-brown (7.5YR 4/4), strong-brown (7.5YR 5/6), or yellowish-brown (10YR 5/6) loam or silt loam. The B2t horizon is strong-brown (7.5YR 5/6) or yellowish-brown (10YR 5/6) loam, silt loam, or clay loam. The Bx horizon is 20 inches to several feet thick. It is variegated with red (2.5YR 4/8), light brownish gray (10YR 6/2), yellowish brown (10YR 5/8), and intermediate colors and is loam, clay loam, or silt loam in texture. The depth to sandstone or shale bedrock is more than 5 feet. Generally there is a C horizon, 1 to 2 feet thick, of stratified sandy loam, loam, and sandstone fragments just above the bedrock. The sandstone gravel content ranges from none to 15 percent throughout the profile. The reaction ranges from strongly acid to slightly acid in the A horizon and is strongly acid or very strongly acid in the B and C horizons.

Savannah fine sandy loam, 1 to 3 percent slopes (SfB).—This soil is generally on stream terraces in or near the Boston Mountains. Most areas are between 10 and 30 acres in size. Included in mapping were spots of Johnsburg soils.

The surface layer is dark grayish brown and is 6 to 9 inches thick. The upper part of the subsoil is strong-brown or yellowish-brown silt loam or clay loam that is 10 to 18 inches thick. The lower part is a compact, brittle fragipan. The pan is silt loam or clay loam in texture and is mottled with light brownish gray, yellowish brown, and red. The depth to bedrock is more than 5 feet.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Roots and moisture penetrate easily as far down as the fragipan, which retards further penetration.

This soil is well suited to moderately well suited to small grain, hay and pasture crops, and corn and other row crops. It is also well suited to upland oak, hickory, and shortleaf pine. Runoff is medium, and the erosion hazard is moderate. (Capability unit IIe–1; woodland group 5; wildlife group 3; no range site classification)

Savannah fine sandy loam, 3 to 8 percent slopes, eroded (SfC2).—This soil is on benches, foot slopes, and stream terraces in or near the Boston Mountains. Most areas are between 10 and 50 acres in size. Included in mapping were spots of Allen and Allegheny soils.

The surface layer is brown and is 4 to 9 inches thick. In spots the plow layer is a mixture of the surface layer and material from the subsoil and is yellowish brown. The upper part of the subsoil is strong-brown or yellowish-brown loam or clay loam that is 8 to 16 inches thick. The lower part is a compact, brittle fragipan. The pan is loam or clay loam in texture and is mottled with light brownish gray, yellowish brown, and red. The depth to bedrock is more than 5 feet. There are a few rills and shallow gullies.

This soil is strongly acid. It has low natural fertility and responds well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. Roots and moisture penetrate easily as far down as the fragipan, which retards further penetration.

This soil is well suited to moderately well suited to small grain, hay and pasture crops, and corn and other row crops. It is also well suited to upland oak, hickory, and shortleaf pine. Runoff is medium, and the erosion hazard is severe. (Capability unit IIIe–1; woodland group 5; wildlife group 3; no range site classification)

Sloan Series

The Sloan series consists of soils that developed in sediments washed mainly from soils derived from cherty limestone and acid sandstone, siltstone, and shale. These soils are on flood plains, chiefly in the northern half of the county.

Sloan soils are associated with Cleora, Elsah, and Razort soils. They are not so well drained as those soils, and they have gray mottles at a depth of 12 to 30 inches. They also differ from Razort soils in lacking a B horizon, and from Elsah soils in lacking gravel and cobblestones.

Representative profile (Sloan silt loam in a pasture; NE¼SE¼SE¼ sec. 8, T. 15 N., R. 31 W.):

Ap—0 to 6 inches, dark-brown (10YR 3/3) silt loam; moderate, medium, granular structure; friable; abundant roots; slightly acid; abrupt, smooth boundary. 4 to 8 inches thick.

A1—6 to 17 inches, very dark brown (10YR 2/2) silt loam; massive; friable; plentiful roots; few, medium, soft, brown concretions; many, medium and coarse, tubular pores; slightly acid; gradual, smooth boundary. 6 to 12 inches thick.

C1—17 to 29 inches, mottled dark-gray (10YR 4/1) and dark-brown (10YR 3/3) silt loam; weak, medium, subangular blocky structure; friable; few roots; common, medium, dark-colored concretions; many, medium and coarse, tubular pores; slightly acid; gradual, smooth boundary. 5 to 12 inches thick.

C2—29 to 42 inches, mottled gray (10YR 5/1) and dark-brown (10YR 3/3) silt loam; weak, medium, subangular blocky structure; friable; few roots; many, medium and coarse, tubular and vesicular pores; light-gray silt coatings on some pore walls; many, large, soft, brown concretions; medium acid; clear, smooth boundary. 10 to 20 inches thick.

C3—42 to 61 inches +, mottled gray (10YR 5/1), yellowish-brown (10YR 5/8), and dark-brown (10YR 3/3) silt loam; massive; friable; many, large, soft, brown concretions; many, medium and coarse, tubular and vesicular pores; slightly acid. 15 to 30 inches thick.

The A horizon is dark brown (10YR 3/3), very dark brown (10YR 2/2), or very dark grayish brown (10YR 3/2). The C horizon is mottled dark-brown (10YR 3/3), dark yellowish-brown (10YR 4/4), yellowish-brown (10YR 5/8), dark-gray (10YR 4/1), and grayish-brown (10YR 5/2) loam or silt loam. In places the lower part of the C horizon contains strata of chert, sandstone, or shale gravel. The reaction is medium acid or slightly acid in the A horizon and upper part of the C horizon, and slightly acid or neutral in the lower part of the C horizon.

Sloan silt loam (0 to 3 percent slopes) (Sn).—This soil occurs as long, narrow, mostly undulating areas parallel to streams. Most areas are between 5 and 50 acres in size. Included in mapping were small areas of Razort and Cleora soils and spots where the surface layer is more than 20 inches thick.

The surface layer is brown or very dark grayish brown and is 10 to 20 inches thick. The underlying material is mottled dark-gray and yellowish-brown silt loam or loam.

This soil is slightly acid. It has moderate natural fertility and responds well to lime and fertilizer. The available water capacity is moderate. The root zone is more than 3 feet thick.

This soil is well suited to small grain, hay and pasture crops, corn, and other crops for silage. Runoff is slow. Wetness and overflow are moderate hazards. (Capability unit IIw–1; woodland group 1; wildlife group 1; no range site classification)

Sogn Series

The Sogn series consists of excessively drained, moderately permeable rocky soils that are shallow over limestone. The slope range is 3 to 12 percent.

Sogn soils are associated with Summit and Jay soils. In comparison with those soils, their surface layer is less than 18 inches thick and overlies bedrock. They are coarser textured than Summit soils. They are less acid, have higher base saturation, and are finer textured than Montevallo soils.

Representative profile (Sogn rocky silt loam in a native pasture; SE¼NE¼NE¼ sec. 3, T. 15 N., R. 32 W.):

A11—0 to 2 inches, black (10YR 2/1) rocky silt loam; weak, medium, platy structure that breaks to moderate, medium, granular structure; friable; abundant roots; neutral; abrupt, wavy boundary.

A12—2 to 10 inches, black (10YR 2/1) rocky silt loam; moderate, medium, granular structure; friable; abundant roots; neutral; abrupt, irregular boundary. A1 horizon 4 to 18 inches thick.

R—10 inches +, massive limestone bedrock.

The A1 horizon is black (10YR 2/1), very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), or dark brown (10YR 3/3). In 20 to 50 percent of each area, limestone bedrock is exposed. In the rest, bedrock is at a depth of 4 to 18 inches. The limestone content, excluding bedrock, ranges from 10 to 20 percent. The reaction is neutral or mildly alkaline.

Sogn rocky silt loam (3 to 12 percent slopes) (So).—This soil is mainly on breaks where limestone bedrock is exposed. Most areas are between 5 and 30 acres in size. Included in mapping were spots of Summit soils and areas of limestone boulders.

The surface layer is black to dark brown. It is underlain by massive limestone bedrock at a depth of 4 to 18 inches. In 20 to 50 percent of each area, bedrock is exposed. The limestone content of this soil, excluding bedrock, is 10 to 20 percent.

This soil is neutral in reaction. It has medium to high natural fertility. The available water capacity is low. The root zone is 4 to 18 inches thick.

This soil is droughty. It is not suited to timber, row crops, small grain, or hay crops. It is moderately well suited to native grasses and legumes if brush and weeds are controlled. The rocks make tillage impossible, but generally they are level with the soil surface and can be crossed with tractors and mowing machines. Most of the acreage is either native pasture or idle land. (Capability unit VIIs–3; woodland group 12; wildlife group 8; Limestone Ledge range site)

Summit Series

The Summit series consists of moderately well drained, very slowly permeable soils that developed in residuum or old alluvium derived from calcareous shale and limestone.

Summit soils are associated with Enders, Cherokee, Sogn, Jay, Samba, Johnsburg, and Taloka soils. They are darker colored and have much higher cation exchange capacity and base saturation than Enders soils. They are finer textured and are deeper over bedrock than Sogn soils. They are finer textured and have higher base saturation than Cherokee, Taloka, Jay, Johnsburg, and Samba soils.

Representative profile (Summit silty clay, 3 to 8 percent slopes, eroded, in a moist pasture; NE¼NW¼SW¼ sec. 33, T. 15 N., R. 31 W.):

Ap—0 to 6 inches, very dark gray (10YR 3/1) silty clay; moderate, fine, granular structure; firm; plentiful roots; medium acid; gradual, smooth boundary.

A1—6 to 12 inches, very dark gray (10YR 3/1) silty clay; strong, medium, granular structure; firm; plentiful roots; slightly acid; clear, smooth boundary. A1 horizon 10 to 20 inches thick.

B21t—12 to 21 inches, dark grayish-brown (2.5Y 4/2) clay; common, medium, faint, light olive-brown mottles; moderate, medium, angular blocky structure; firm; plastic; thin, discontinuous clay films on ped faces; few roots; few black concretions in lower part; slightly acid; clear, irregular boundary. 8 to 24 inches thick.

B22t—21 to 36 inches, light olive-brown (2.5Y 5/4) clay; many, coarse, faint, grayish-brown and gray mottles; moderate, medium, angular blocky structure; firm; plastic; few roots; thin, discontinuous clay films on ped faces; common coarse slickensides; few black concretions; neutral; clear, wavy boundary. 12 to 28 inches thick.

B3—36 to 72 inches +, light olive-brown (2.5Y 5/4) clay; many, coarse, faint, grayish-brown and gray mottles; massive; firm; plastic; few roots; common coarse slickensides; few black concretions; neutral. 12 to 44 inches thick.

The A1 horizon is very dark gray (10YR 3/1), black (10YR 2/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2). The B2t horizon is light olive brown (2.5Y 5/4), very dark grayish brown (2.5Y 3/2 or 10YR 3/2), or dark grayish brown (2.5Y 4/2) and is mottled with strong brown (7.5YR 5/6), grayish brown (10YR 5/2), or dark gray (10YR 4/1). Some profiles have a dark grayish-brown (2.5Y 3/2) silty clay B1 horizon. The B3 horizon is light olive brown (2.5Y 5/4), olive brown (2.5Y 4/4), or grayish brown (2.5Y 5/2). The sandstone and limestone content is 0 to 30 percent in the A1 horizon and 0 to 20 percent in the B horizon. There are shale fragments and dark-colored concretions throughout some profiles. Lime concretions and gypsum crystals commonly occur in the lower part of the B horizon. The depth to bedrock ranges from 36 to 85 inches. The reaction is medium acid to neutral in the A horizon and slightly acid to mildly alkaline in the B horizon.

Summit complex, mounded (0 to 1 percent slopes) (Sp).—This complex occurs as level or depressional areas on uplands and stream terraces. The areas are between 5 and 20 acres in size. Rounded mounds make up 15 to 30 percent of each area. They are 1½ to 3 feet high, 40 to 100 feet in diameter, and 40 to 100 feet apart. The areas between the mounds are Summit soils, and the mounds are unnamed soils. Included in mapping were areas of Samba soils and spots where the surface layer is silt loam.

The surface layer of the Summit soils is black or very dark grayish-brown, sticky silty clay that is 10 to 20 inches thick. The subsoil is mottled dark grayish-brown, light olive-brown, and dark-gray, plastic clay or silty clay that is several feet thick.

The surface layer of the unnamed soils is dark brown or very dark brown silt loam 15 to 28 inches thick. The upper part of the subsoil is brown or yellowish-brown silt loam or silty clay loam that is 15 to 25 inches thick. The lower part is mottled yellowish-brown and gray silty clay or clay.

These soils are slightly acid. They have high natural fertility and respond moderately well to fertilizer. The organic-matter content is medium. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

These soils stay wet for long periods after moderate or heavy rains. They are well suited to pasture and hay crops, but they need smoothing and surface drainage to be suitable for corn, other row crops, or small grain. Runoff is very slow or ponded. Wetness is a severe hazard. (Capability unit IIIw–4; woodland group 9; wildlife group 2; no range site classification)

Summit silty clay, 0 to 1 percent slopes (SsA).—This soil occurs as level or depressional areas on uplands and stream terraces. The areas are between 15 and 40 acres in size. Included in mapping were small areas of Samba soils, mounds, and spots where the surface layer is silt loam.

The surface layer is black or very dark grayish brown, sticky, and 10 to 20 inches thick. The subsoil is mottled dark grayish-brown, light olive-brown, and dark-gray, plastic clay or silty clay that is several feet thick.

This soil is slightly acid. It has high natural fertility and responds moderately well to fertilizer. The organic-matter content is medium. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It stays wet for long periods after moderate or heavy rains. It is well suited to pasture and hay crops, but it needs surface drainage to be suitable for corn, other row crops, or small grain. Runoff is very slow. Wetness is a severe hazard. (Capability unit IIIw-4; woodland group 9; wildlife group 2; no range site classification)

Summit silty clay, 1 to 3 percent slopes (SsB).—This soil is on uplands and stream terraces. The areas are between 5 and 25 acres in size. Included in mapping were spots where the surface layer is silt loam.

The surface layer is black, sticky, and 10 to 20 inches thick. The subsoil is mottled light olive-brown, strong-brown, and dark-gray, plastic clay that is 4 to 7 feet thick.

This soil is neutral in reaction. It has high natural fertility and responds moderately well to fertilizer. The organic-matter content is high. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It is well suited to hay and pasture crops, small grain, row crops, and alfalfa. It is poorly suited to all trees except redcedar. Runoff is medium. The erosion hazard is moderate. Wetness is a slight hazard. (Capability unit IIe–4; woodland group 11; wildlife group 2; Claybreak Shale range site)

Summit silty clay, 3 to 8 percent slopes, eroded (SsC2).—This soil is on foot slopes. The areas are between 10 and 40 acres in size. Included in mapping were stony spots and spots where the surface layer is silt loam.

The surface layer is black or very dark gray, sticky, and 10 to 16 inches thick. The subsoil is mottled light olive-brown, strong-brown, and dark-gray, plastic clay that is 3 to 6 feet thick. Most areas have gullies 1 to 3 feet deep and 50 to 200 feet long. Between the gullies are shallow rills.

This soil is neutral in reaction. It has high natural fertility and responds moderately well to fertilizer. The organic-matter content is high. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It is well suited to hay and pasture crops, small grain, row crops, and alfalfa. It is poorly suited to all trees except redcedar. Runoff is rapid. The erosion hazard is severe. (Capability unit IIIe–5; woodland group 11; wildlife group 8; Claybreak Shale range site)

Summit silty clay, 8 to 12 percent slopes, eroded (SsD2).—This soil is on foot slopes and mountainsides. The areas are between 10 and 30 acres in size. Included in mapping were stony spots and spots where the surface layer is silt loam.

The surface layer is black or very dark gray, sticky, and 10 to 16 inches thick. The subsoil is mottled light olive-brown, strong-brown, and dark-gray, plastic clay that is 3 to 5 feet thick. Most areas have gullies 1 to 3 feet deep and 40 to 200 feet long. Between the gullies are shallow rills.

This soil is neutral in reaction. It has high natural fertility and responds moderately well to fertilizer. The organic-matter content is high. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It is well suited to hay and pasture crops, small grain, and alfalfa. It is poorly suited to all trees except redcedar. Runoff is rapid. The erosion hazard is very severe. (Capability unit IVe–6; woodland group 11; wildlife group 8; Claybreak Shale range site)

Summit stony silty clay, 3 to 12 percent slopes, eroded (StD2).—This soil is on foot slopes and mountainsides. The areas are between 20 and 100 acres in size. Included in mapping were small areas of Enders soils and spots where the surface layer is stony silt loam.

The surface layer is black or very dark gray, sticky, and 10 to 15 inches thick. The subsoil is mottled light olive-brown, dark grayish-brown, and dark-gray, plastic stony clay that is 3 to 5 feet thick. There are gullies 1 to 3 feet deep and 50 to 200 feet long. Between the gullies are shallow rills. Sandstone and limestone fragments make up 15 to 30 percent of the surface layer and 5 to 20 percent of the subsoil.

This soil is neutral in reaction. It has high natural fertility and responds moderately well to fertilizer. The organic-matter content is high. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It is well suited to hay and pasture crops but is poorly suited to row crops. Stones interfere with the operation of farm machinery. The soil is poorly suited to all trees except redcedar. It is moderately well suited to native grasses and forbs. Runoff is rapid. The erosion hazard is severe. (Capability unit VIs–1; woodland group 11; wildlife group 8; Claybreak Shale range site)

Summit stony silty clay, 12 to 25 percent slopes, eroded (StE2).—This soil is on foot slopes and mountainsides. The areas are between 20 and 50 acres in size. Included in mapping were small areas of Enders soils and spots where the surface layer is stony silt loam.

The surface layer is black or very dark gray, sticky, and 10 to 15 inches thick. The subsoil is mottled light olive-brown, dark grayish-brown, and dark-gray, plastic clay that is 2½ to 5 feet thick. There are gullies 1 to 3 feet deep and 50 to 200 feet long. Sandstone and limestone fragments make up 15 to 30 percent of the surface layer and 5 to 20 percent of the subsoil.

This soil is neutral in reaction. It has high natural fertility and shows slight to moderate response to fertilizer. The organic-matter content is high. The available water capacity is moderate. The root zone is 3 feet or more in thickness.

This soil can be tilled within only a narrow range of moisture content. It is well suited to hay and pasture crops, but stones interfere with the establishment of stands, and the stones and strong slopes interfere with the operation of farm machinery. This soil is not suited to row crops. It is poorly suited to all trees except redcedar. It is moderately well suited to native grasses and forbs. Most of the acreage is timber. Most cleared areas are idle. Runoff is very rapid. The erosion hazard is severe. (Capability unit VIIs–4; woodland group 11; wildlife group 8; Claybreak Shale range site)

Taloka Series

The Taloka series consists of somewhat poorly drained, very slowly permeable soils. These soils developed under grass vegetation, in thin silty deposits that mantled clayey deposits. The slope range is 0 to 3 percent. Some areas are mounded.

Taloka soils are associated with Jay, Summit, Samba, and Captina soils. In comparison with Jay soils, they have a claypan instead of a fragipan, are more poorly drained, and have gray mottles in the upper part of the subsoil. They have a thicker surface layer than Samba soils, and their subsoil shows a more abrupt increase in clay content. They are more acid than Summit soils and are coarser textured in the upper part of the profile and lighter colored in the upper part of the subsoil. They have a darker colored surface layer and are more poorly drained than Captina soils. Taloka soils have a thicker subsoil than Cherokee soils and a darker colored surface layer and higher base saturation than Leaf soils.

Representative profile (Taloka silt loam, 0 to 1 percent slopes, in a pasture; SW¼SE¼SE¼ sec. 10, T. 15 N., R. 31 W.):

Ap1—0 to 3 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable; abundant roots; few, small, dark-colored concretions; medium acid; abrupt, smooth boundary.

Ap2—3 to 12 inches, very dark gray (10YR 3/1) heavy silt loam; common, medium, distinct, yellowish-brown mottles; moderate, medium, granular structure; friable; many roots; few, small, dark-colored concretions; medium acid; abrupt, smooth boundary. Ap horizon 8 to 14 inches thick.

A21g—12 to 16 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, distinct, pale-brown mottles and few, distinct, yellowish-brown mottles; moderate, medium, subangular blocky structure; friable; slightly brittle; common, medium, dark-colored concretions; medium acid; clear, wavy boundary. 2 to 6 inches thick.

A22g—16 to 23 inches, grayish-brown (10YR 5/2) silt loam; common, fine, distinct, yellowish-brown mottles; moderate, medium, subangular blocky structure; firm; slightly brittle; common, fine to coarse, dark concretions; common vesicular and tubular pores; medium acid; clear, smooth boundary. 4 to 12 inches thick.

Btg—23 to 60 inches +, variegated clay; 50 percent light grayish brown, 25 percent yellowish red, and 25 percent yellowish brown; moderate, medium, angular blocky structure; firm; plastic; few roots; clay films in pores and on some ped faces; few, medium, dark-colored concretions in upper part of horizon; strongly acid. 15 to 50 inches thick.

The Ap horizon is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or very dark brown (10YR 2/2). The A2g horizon is dark gray (10YR 4/1), grayish brown (10YR 5/2), dark grayish brown (10YR 4/2), or light brownish gray (10YR 6/2) mottled with yellowish brown or pale brown. The Btg horizon begins at a depth of 16 to 28 inches and is silty clay or clay. It is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) mottled with yellowish brown (10YR 5/6) and yellowish red (5YR 4/6). In places there is a subhorizon of silty clay loam. In places there is, at a depth of 45 to 70 inches, a C horizon of silty clay or silty clay loam variegated with the same colors as is the Btg horizon. The depth to shale, siltstone, or cherty limestone ranges from 5 to more than 10 feet. The reaction is medium acid or strongly acid throughout the profile.

Taloka complex, mounded (0 to 1 percent slopes) (Ta).—This complex occurs as broad upland areas that are between 5 and 60 acres in size. Rounded mounds make up 20 to 40 percent of each area. They are 40 to 80 feet in diameter, 1½ to 3 feet high, and 20 to 150 feet apart. The areas between the mounds are Taloka soils, and the mounds are unnamed soils.

The surface layer of Taloka soils is very dark grayish-brown to grayish-brown silt loam 16 to 28 inches thick. The subsoil, which begins at a depth of 16 to 28 inches, is a plastic claypan. It is mottled gray and yellowish brown. The depth to shale, cherty limestone, or siltstone is 5 to more than 10 feet.

The surface layer of the unnamed soils is very dark brown silt loam 15 to 25 inches thick. The subsoil extends to a depth of 50 to 60 inches. The upper part is brown or grayish-brown, friable silt loam. The lower part is mottled gray and brown silty clay or clay.

The soils in this complex are medium acid. They have low natural fertility and respond well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. The root zone is 3 feet or more thick. Roots and moisture penetrate as far down as the claypan, which retards further penetration.

These soils stay wet for long periods after heavy rains. They are moderately well suited to well suited to row crops, small grain, and pasture and meadow crops (fig. 11). The mounds interfere with cultivation and drainage. Runoff is slow. Wetness is a very severe hazard. (Capability unit IVw–1; woodland group 13; wildlife group 2; Loamy Prairie range site)

Taloka silt loam, 0 to 1 percent slopes (TcA).—This soil occurs as broad upland areas that are between 10 and 100 acres in size. Included in mapping were spots of Jay, Summit, and Cherokee soils.

The surface layer is very dark grayish brown and is 16 to 28 inches thick. The subsoil, which begins at a depth of 16 to 28 inches, is a plastic claypan. It is mottled grayish

Figure 11.—**Native bluestem meadow on Taloka complex, mounded.**

brown and yellowish brown. The depth to shale, cherty limestone, or siltstone ranges from 5 feet to more than 10 feet.

This soil is medium acid. It has low natural fertility and responds well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. The root zone is 3 feet or more in thickness. Roots and moisture penetrate easily as far down as the claypan, which retards further penetration.

This soil stays wet for long periods after heavy rains. It is moderately well suited to well suited to pasture and meadow crops, small grain, and row crops. Runoff is slow. Wetness is a severe hazard. (Capability unit IIIw–1; woodland group 13; wildlife group 2; Loamy Prairie range site)

Taloka silt loam, 1 to 3 percent slopes (ToB).—This soil occurs as broad upland areas that are between 10 and 100 acres in size. Included in mapping were small areas of Cherokee, Jay, and Summit soils and spots where the surface layer is grayish brown.

The surface layer is very dark grayish brown and is 16 to 28 inches thick. The subsoil, which begins at a depth of 16 to 28 inches, is a plastic claypan. It is mottled grayish brown and yellowish brown. The depth to shale, cherty limestone, or siltstone ranges from 5 to more than 10 feet.

This soil is medium acid. It has low natural fertility and responds well to lime and fertilizer. The organic-matter content is low. The available water capacity is moderate. The root zone is 3 feet or more in thickness. Roots and moisture penetrate easily as far down as the claypan, which retards further penetration.

This soil stays wet for long periods after heavy rains. It is moderately well suited to well suited to pasture and meadow crops, small grain, and row crops. Runoff is slow. Erosion and wetness are moderate hazards. (Capability unit IIe–4; woodland group 13; wildlife group 2; Loamy Prairie range site)

Use of the Soils for Crops and Pasture [1]

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

[1] W. WILSON FERGUSON, conservation agronomist, Soil Conservation Service, helped prepare this section.

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 special requirements. The soils are classified according to degree and kind of permanent limitation, but without consideration of major and generally expensive land-forming 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 the soils are grouped at three levels: the capability class, the subclass, and the unit. These are discussed in the following paragraphs.

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

Class I. Soils have few limitations that restrict their use. (No class I soils in Washington County.)

Class II. Soils have moderate 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 to esthetic purposes. (No class VIII soils in Washington County.)

Capability Subclasses are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, 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 identified 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 Arabic numerals to the subclass symbol, for example, IIe–1 or IIIw–2. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit.

In the following pages each of the capability units in Washington County is described, and suggestions for use and management are given. The names of soil series represented are mentioned in the description of each unit, but this does not mean that all the soils of a given series are in the unit. The capability unit designation for each soil in the county can be found in the "Guide to Mapping Units."

Capability unit IIe–1

This unit consists of soils of the Captina, Jay, and Savannah series. These are deep, moderately well drained and well drained soils on uplands and stream terraces. The slope range is 1 to 3 percent. The surface layer is friable silt loam. The upper part of the subsoil is firm silt loam to clay loam. At a depth of about 20 to 30 inches is a compact, brittle fragipan.

Natural fertility is low to moderate, and the response to lime and fertilizer is good. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is moderate. Permeability is slow because of the fragipan, which restricts movement of roots and water.

These soils are suited to corn, sorghum, oats, wheat, barley, rye, bermudagrass, tall fescue, orchardgrass, smooth bromegrass, and ryegrass. They are also suited to peaches, apples, grapes, brambleberries, tomatoes, and green beans and other truck crops. They are well suited to sericea lespedeza, annual lespedeza, crimson clover, white clover, and vetch.

Runoff is medium, and the erosion hazard is moderate. If terracing, contour cultivation, proper tillage, and adequate fertilization are practiced, cultivated crops that leave large amounts of residue can be grown year after year. No special management is needed if sown crops are grown year after year.

Capability unit IIe–2

This unit consists of soils of the Razort, Pembroke, and Pickwick series. These are deep, well-drained soils on uplands and stream terraces. The slope range is 0 to 3 percent. The surface layer is friable silt loam or loam. The subsoil is firm silt loam to clay loam.

Natural fertility is moderate, and the response to lime and fertilizer is good. The organic-matter content is low to moderate. The reaction is slightly acid to strongly acid. The available water capacity is high. Permeability is moderate.

These soils are well suited to corn, oats, wheat, barley, rye, sericea lespedeza, white clover, vetch, annual lespedeza, bermudagrass, fescue, orchardgrass, smooth bromegrass, and ryegrass. They are also well suited to peaches, apples, grapes, strawberries, brambleberries, tomatoes, and green beans and other truck crops.

Runoff is medium, and the erosion hazard is moderate. If adequate fertilization and proper tillage are practiced, cultivated crops that leave large amounts of residue can be grown year after year. No special management is needed if sown crops are grown year after year.

Capability unit IIe–3

This unit consists of soils of the Apison and Linker series, which are moderately deep, well-drained soils on uplands. The slope range is 1 to 3 percent. The surface layer is friable loam. The subsoil is firm loam to clay loam. The depth to bedrock is 30 to 48 inches.

Fertility is low, and the response to lime and fertilizer is good. The organic-matter content is low. The reaction is strongly acid. The available water capacity is moderate. Permeability is moderate.

These soils are suited to corn, sorghum, wheat, oats, rye, bermudagrass, johnsongrass, tall fescue, orchardgrass, crimson clover, annual lespedeza, sericea lespedeza, and vetch. They are also suited to peaches, apples, grapes, strawberries, brambleberries, tomatoes, and green beans.

Runoff is medium, and the erosion hazard is moderate. If terracing, contour cultivation, proper tillage, and adequate fertilization are practiced, cultivated crops that leave large amounts of residue can be grown year after year. No special management is needed if sown crops are grown year after year.

Capability unit IIe–4

This unit consists of soils of the Summit and Taloka series. These are deep, moderately well drained soils on uplands. The slope range is 1 to 3 percent. The surface layer is silt loam or sticky silty clay. The subsoil is plastic clay.

In places these soils shrink and crack when dry and swell when wet. Natural fertility is moderate to high, and the response to lime and fertilizer is moderate. The organic-matter content is moderate to high. The reaction is medium acid to neutral. The available water capacity is moderate. Permeability is very slow.

These soils are not well suited to cultivated crops. They can be cultivated within only a narrow range of moisture content, and they are difficult to work into a good seedbed. They are suited to oats, wheat, barley, rye, grain sorghum, white clover, alfalfa, and annual lespedeza and are well suited to bermudagrass, tall fescue, and orchardgrass.

Runoff is medium, and erosion and wetness are moderate hazards. If terracing, proper tillage, contour cultivation, and adequate fertilization are practiced, cultivated crops that leave large amounts of residue can be grown year after year. No special management is needed if sown crops are grown year after year.

Capability unit IIw–1

This unit consists of soils of the Sloan and Razort series. These are deep, moderately well drained and well drained soils on flood plains. The slope range is 0 to 2 percent. The surface layer is friable silt loam or gravelly silt loam. The subsoil is silt loam to loam and is gravelly in some places.

Natural fertility is moderate, and the response to fertilizer is good. The organic-matter content is moderate. The reaction is slightly acid. The available water capacity is moderate to high. Permeability is moderate.

These soils are suited to corn, grain sorghum, oats, wheat, barley, rye, bermudagrass, johnsongrass, orchardgrass, tall fescue, smooth bromegrass, and ryegrass. They are well suited to annual lespedeza, alfalfa, red clover, white clover, sericea lespedeza, and vetch.

Runoff is slow. Overflow is a moderate hazard and occasionally damages crops. If adequate fertilization and proper tillage are practiced, cultivated crops that leave large amounts of residue can be grown year after year. Cross-slope farming is desirable in sloping areas that are under intensive use.

Capability unit IIIe–1

This unit consists of soils of the Captina, Jay, and Savannah series. These are moderately well drained and well drained soils on uplands and stream terraces. The slope range is 3 to 8 percent. The surface layer is friable silt loam. The upper part of the subsoil is firm silt loam to clay loam. At a depth of 16 to 30 inches is a compact, brittle fragipan.

Natural fertility is low to moderate, and the response to lime and fertilizer is moderate to good. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is moderate. Permeability is slow because of the fragipan, which restricts movement of water and roots.

These soils are suited to corn, grain sorghum, wheat, barley, rye, bermudagrass, johnsongrass, smooth bromegrass, orchardgrass, ryegrass, vetch, crimson clover, white clover, annual lespedeza, and sericea lespedeza. They are also suited to grapes, apples, tomatoes, and green beans and other truck crops.

Runoff is medium, and the erosion hazard is severe. If terracing, contour farming, proper tillage, and adequate fertilization are practiced, clean-tilled crops that leave large amounts of residue can be grown year after year.

Capability unit IIIe–2

This unit consists of soils of the Allen, Allegheny, Pembroke, and Pickwick series. These are deep, well-drained soils on uplands and stream terraces. The slope range is 3 to 8 percent. The surface layer is friable silt loam or gravelly loam. The subsoil is firm silty clay loam to gravelly loam.

Natural fertility is low to moderate, and the response to lime and fertilizer is good. The organic-matter content is low. The reaction is medium acid or strongly acid. Permeability is moderate, and the available water capacity is moderate to high.

These soils are suited to corn, grain sorghum, wheat, barley, rye, vetch, crimson clover, white clover, annual lespedeza, and sericea lespedeza. They are well suited to bermudagrass, johnsongrass, smooth bromegrass, orchardgrass, and ryegrass. They are also well suited to grapes, apples, tomatoes, and green beans.

Runoff is medium, and the erosion hazard is severe. If terracing, contour tillage, and adequate fertilization are practiced, clean-tilled crops that leave large amounts of residue can be grown year after year.

Capability unit IIIe-3

The one soil in this unit is Baxter cherty silt loam, 3 to 8 percent slopes. This is a deep, well-drained, cherty soil on uplands. The slope range is 3 to 8 percent. The subsoil is cherty silty clay or cherty clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is moderate. Permeability is moderate.

This soil is suited to oats, wheat and other small grain, bermudagrass, tall fescue, orchardgrass, and ryegrass. It is also suited to peaches, apples, strawberries, and tomatoes. It is well suited to sericea lespedeza, white clover, crimson clover, and annual lespedeza.

Runoff is medium, and the erosion hazard is severe. If terracing, contour farming, proper tillage, and adequate fertilization are practiced, clean-tilled crops that leave large amounts of residue can be grown year after year. Chert fragments interfere with some tillage practices.

Capability unit IIIe-4

This unit consists of soils of the Apison, Fayetteville, and Linker series. These are deep and moderately deep, well-drained, eroded soils on uplands. The slope range is 3 to 8 percent. The surface layer is friable loam, fine sandy loam, or gravelly loam. The subsoil is firm silty clay loam, sandy clay loam, clay loam, or gravelly loam. In places the plow layer is a mixture of the surface layer and material from the subsoil.

Natural fertility is low to moderate. The response to fertilizer is good, and the response to lime is moderate to good. The organic-matter content is low. The reaction is slightly acid to strongly acid. The available water capacity is moderate. Permeability is moderate.

These soils are suited to corn, grain sorghum, wheat, barley, rye, vetch, crimson clover, white clover, annual lespedeza, and sericea lespedeza. They are well suited to bermudagrass, johnsongrass, smooth bromegrass, orchardgrass, and ryegrass. They are also well suited to apples, grapes, tomatoes, and green beans.

Runoff is medium, and the erosion hazard is severe. Clean-tilled crops that leave large amounts of residue can be grown year after year if terracing, contour farming, proper tillage, and adequate fertilization are practiced.

Capability unit IIIe-5

The one soil in this unit is Summit silty clay, 3 to 8 percent slopes, eroded. This is a deep, moderately well drained soil on uplands. The surface layer is sticky. The subsoil is plastic clay.

Natural fertility is high, and the response to fertilizer is moderate. The organic-matter content is high. The reaction is neutral. The available water capacity is moderate. Permeability is very slow because of the high clay content.

This soil shrinks and cracks when dry and swells when wet. It can be cultivated within only a narrow range of moisture content, and it is difficult to work into a good seedbed. Hence, it is not well suited to cultivated crops. It is suited to oats, wheat, barley, rye, grain sorghum, white clover, alfalfa, and annual lespedeza and is well suited to bermudagrass, tall fescue, and orchardgrass.

Runoff is medium, and the erosion hazard is severe. Erosion control, including terracing, contour cultivation, and the use of grasses and legumes in the cropping system, needs to be intensified as the gradient and length of slope increase. Cultivated crops can be grown if the cropping system includes grasses or legumes.

Capability unit IIIw-1

This unit consists of soils of the Taloka and Samba series. These are somewhat poorly drained soils on uplands and stream terraces. The slope range is 0 to 1 percent. The surface layer is friable silt loam. The upper part of the subsoil is mottled silty clay loam or silt loam. At a depth of 16 to 30 inches is a plastic claypan.

Natural fertility is low. The response to fertilizer is good, and generally the response to lime is good. The reaction is medium acid or strongly acid in the root zone but is alkaline below in places. The available water capacity is moderate. Permeability is slow to very slow because of the claypan, which restricts movement of water and roots.

These soils are suited to barley, oats, wheat, bermudagrass, tall fescue, orchardgrass, johnsongrass, white clover, annual lespedeza, and vetch.

Runoff is slow to very slow, and wetness is a severe hazard. Cultivated crops that return large amounts of residue can be grown year after year if adequate fertilization, proper tillage, and adequate drainage, including row arrangement, are practiced.

Capability unit IIIw-2

The one soil in this unit is Johnsburg silt loam. This is a deep, somewhat poorly drained soil on uplands and stream terraces. The slope range is 0 to 2 percent. The surface layer is friable. The upper part of the subsoil is mottled, firm silty clay loam or silt loam. At a depth of 18 to 28 inches is a compact, brittle fragipan.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is medium acid. The available water capacity is moderate. Permeability is slow because of the fragipan, which restricts movement of water and roots.

This soil is suited to sorghum, barley, oats, wheat, bermudagrass, tall fescue, orchardgrass, johnsongrass, white clover, annual lespedeza, and vetch.

Runoff is slow. Erosion is a slight hazard, and wetness is a moderate hazard. Cultivated crops that return large amounts of residue annually can be grown year after year if adequate fertilization, proper tillage, and adequate drainage, including row arrangement, are practiced.

Capability unit IIIw-3

The one soil in this unit, Cleora fine sandy loam, is a deep, well-drained soil on flood plains. The slope range is 0 to 3 percent. The surface layer is friable. The subsoil is friable fine sandy loam. In places it contains strata of sand.

Natural fertility is moderate, and the response to fertilizer is good. The organic-matter content is medium. The reaction is slightly acid. The available water capacity is moderate. Permeability is moderate.

This soil is not well suited to cultivated crops because of the risk of overflow. It is well suited to bermudagrass, johnsongrass, orchardgrass, tall fescue, smooth bromegrass, ryegrass, annual lespedeza, white clover, red clover, sericea lespedeza, and vetch.

This soil can be used as pasture and meadow. Runoff is slow. The overflow hazard is moderate.

Capability unit IIIw–4

This unit consists of soils of the Summit series, which are deep soils on uplands and stream terraces. Most areas are level. Low, dome-shaped mounds make up about 15 to 30 percent of a few areas. The surface layer is sticky silty clay or silty clay loam. The subsoil is sticky, plastic clay.

Natural fertility is high, and the response to fertilizer is moderate. The organic-matter content is medium. The reaction is slightly acid. Permeability is very slow because of the high clay content. The available water capacity is moderate.

These soils are suited to small grain, white clover and other meadow crops, and pasture grasses, including bermudagrass and tall fescue.

Wetness is a severe limitation. Runoff is very slow, and surface water accumulates during wet periods. Supplemental drainage is essential. The soils shrink and crack when dry and swell when wet. They can be cultivated within only a narrow range of moisture content. They can be used in a cropping system consisting of row crops and sown crops that return large amounts of residue annually. Smoothing is needed before row crops are planted in mounded areas.

Capability unit IIIs–1

The one soil in this unit is Nixa cherty silt loam, 3 to 8 percent slopes. This is a deep, moderately well drained upland soil. Its surface layer and the upper part of its subsoil are both cherty silt loam. At a depth of 14 to 24 inches is a compact, cherty fragipan.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is medium acid. Permeability is very slow because of the fragipan. The available water capacity is low because of the chert content.

This soil is suited to corn, oats, wheat, bermudagrass, tall fescue, orchardgrass, white clover, annual lespedeza, and sericea lespedeza.

Although droughtiness, the shallow root zone, and difficulty in tillage are severe limitations, this soil can be used for row crops. In fact, if terraced, tilled on the contour, and adequately fertilized, the lower slopes can be used year after year for clean-titled crops that produce large amounts of residue. Runoff is medium.

Capability unit IVe–1

This unit consists of soils of the Allen, Linker, Pickwick, Fayetteville, and Allegheny series. These are deep, well-drained soils on uplands and stream terraces. The slope range is 8 to 12 percent. The surface layer is friable loam and is generally cherty or gravelly. The subsoil is firm loam to clay loam and is generally gravelly or cherty. In spots the surface layer and the upper part of the subsoil have been mixed by cultivation.

Natural fertility is low to moderate, and the response to lime and fertilizer is moderate to good. The organic-matter content is low. The reaction is slightly acid to strongly acid. The available water capacity is moderate. Permeability is moderate.

These soils are too steep to be suited to row crops, but they are well suited to small grain, sericea lespedeza, annual lespedeza, and bermudagrass.

These soils can be used as permanent pasture, woodland, or wildlife habitat. Cultivated crops can be grown occasionally if contour stripcropping is practiced and the cropping system includes grasses and legumes. Runoff is medium to rapid, and the erosion hazard is very severe.

Capability unit IVe–2

The one soil in this unit is Baxter cherty silt loam, 8 to 12 percent slopes. This is a deep, well-drained soil on uplands. Its surface layer is friable. Its subsoil is firm cherty silty clay or cherty clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is strongly acid. The available water capacity is moderate. Permeability is moderate.

This soil is too steep to be suited to row crops. It is moderately well suited to small grain and is well suited to white clover, sericea lespedeza, annual lespedeza, red clover, bermudagrass, tall fescue, and orchardgrass.

This soil can be used as permanent pasture, woodland, or wildlife habitat. Cultivated crops can be grown occasionally if contour stripcropping is practiced and the cropping system includes grasses and legumes. Chert fragments interfere with some tillage operations. Runoff is medium, and the erosion hazard is very severe.

Capability unit IVe–3

The one soil in this unit is Allegheny stony loam, 8 to 12 percent slopes. This is a deep, well-drained soil on uplands. The surface layer is friable. The upper part of the subsoil is firm clay loam, and the lower part is plastic clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is strongly acid. The available water capacity is moderate. Permeability is moderate.

This soil is poorly suited to clean-tilled crops because of the slope and the stone content. It is well suited to sericea lespedeza, annual lespedeza, and bermudagrass.

This soil can be used as permanent pasture, range, woodland, or wildlife habitat. Runoff is medium to rapid, and the erosion hazard is very severe. Stones interfere with the operation of farm machinery.

Capability unit IVe–4

This unit consists of Hector-Mountainburg gravelly fine sandy loams, 3 to 8 percent slopes. These are shallow, well-drained to somewhat excessively drained soils on uplands. The surface layer is friable. The subsoil is friable gravelly fine sandy loam to gravelly loam. The depth to bedrock is 10 to 20 inches.

Natural fertility is low, and the response to lime and fertilizer is poor to moderate. The organic-matter content is low. The reaction is strongly acid. The available water capacity is low because of shallowness and the high gravel content. Permeability is rapid.

These soils are poorly suited to clean-tilled crops. They are moderately well suited to small grain and are well suited to red clover, annual lespedeza, sericea lespedeza, vetch, bermudagrass, and tall fescue.

These soils are droughty. They can be used as permanent pasture, range, woodland, or wildlife habitat. If terracing and contour cultivation are practiced, they can be used in a cropping system consisting of row crops, grasses, and legumes. Terraces are difficult to construct and maintain. Runoff is medium, and the erosion hazard is very severe.

Capability unit IVe-5

This unit consists of soils of the Enders series. These are deep, moderately well drained, gravelly soils on uplands. The slope range is 3 to 8 percent. The surface layer is friable gravelly loam. The subsoil is plastic clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is very strongly acid. The available water capacity is moderate. Permeability is very slow because of the plastic clay subsoil, which restricts percolation of water and growth of roots.

These soils are poorly suited to row crops. They are moderately well suited to small grain and are well suited to annual lespedeza, sericea lespedeza, bermudagrass, and tall fescue.

These soils can be used as permanent pasture, range, or woodland. If terracing and contour cultivation are practiced, they can be used in a cropping system consisting of row crops, grasses, and legumes. Runoff is rapid, and the erosion hazard is very severe.

Capability unit IVe-6

The one soil in this unit is Summit silty clay, 8 to 12 percent slopes, eroded. This is a deep, moderately well drained soil on uplands. The slope range is 8 to 12 percent. The surface layer is sticky. The subsoil is sticky plastic clay.

Natural fertility is high, and the response to fertilizer is moderate. The organic-matter content is high. The reaction is neutral. The available water capacity is moderate.

This soil is poorly suited to row crops. It is moderately well suited to small grain and is well suited to sericea lespedeza, alfalfa, annual lespedeza, and bermudagrass.

This soil can be used as permanent pasture, range, woodland, or wildlife habitat. It can be used for row crops occasionally if contour stripcropping is practiced and the cropping system includes grasses and legumes. Runoff is rapid, and the erosion hazard is very severe.

Capability unit IVw-1

This unit consists of soils of the Cherokee, Johnsburg, Leaf, Samba, and Taloka series. These are poorly drained and somewhat poorly drained soils on uplands and stream terraces. Most areas are level. Low, dome-shaped mounds make up about 15 to 40 percent of some areas. The surface layer is friable silt loam. The upper part of the subsoil is mottled silty clay loam or silt loam. At a depth of 16 to 30 inches is a plastic claypan or compact, brittle fragipan.

Natural fertility is low. The response to fertilizer is good, and generally the response to lime is good. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is moderate. Permeability is slow to very slow because of the pan, which restricts movement of water and roots.

These soils are poorly suited to cultivated crops. They are moderately well suited to small grain and are well suited to bermudagrass, tall fescue, white clover, and vetch.

These soils can be used as permanent pasture and range. If proper tillage, adequate fertilization, and adequate drainage are practiced, they can be used in a cropping system consisting of row crops and sown crops that return large amounts of residue annually. Runoff is slow to very slow. Wetness is a very severe hazard.

Capability unit IVs-1

The one soil in this unit in Nixa cherty silt loam, 8 to 12 percent slopes. This is a deep, moderately well drained soil on uplands. The upper part of its subsoil is cherty silt loam. At a depth of 14 to 22 inches is a compact, cherty fragipan.

Natural fertility is low, and the response to lime and fertilizer is poor to moderate. The organic-matter content is low. The reaction is medium acid. The available water capacity is low because of the chert content. Permeability is very slow because of the fragipan, which restricts movement of water and roots.

This soil is poorly suited to most crops. It is poorly suited to moderately well suited to small grain. It is moderately well suited to sericea lespedeza, annual lespedeza, bermudagrass, and fescue.

This soil can be used as permanent pasture, range, or woodland. Also, it can be used for small grain occasionally if contour cultivation or cross-slope farming is practiced and the cropping system includes grasses and legumes. The available water capacity, the shallow root zone, and difficulty in tillage are very severe limitations. Runoff is rapid.

Capability unit IVs-2

The one soil in this unit, Guin cherty silt loam, 3 to 8 percent slopes, is a well-drained soil on alluvial fans and foot slopes. Its surface layer is brown and is 8 to 15 inches thick. Its subsoil is brown to yellowish-brown cherty silt loam 30 to 60 inches thick.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is medium acid. The available water capacity is low because of the chert content. Permeability is moderately rapid.

This soil is poorly suited to most crops. It is moderately well suited to small grain. It is well suited to sericea lespedeza, annual lespedeza, bermudagrass, and fescue. It is also well suited to trees, because the deep roots absorb seepage water.

This soil can be used as permanent pasture or woodland. It can be used in a cropping system consisting of small grain, grasses, and legumes. It can also be used for row crops if contour cultivation or cross-slope farming is practiced. The low available water capacity and difficulty in tillage are very severe limitations. Runoff is slow.

Capability unit Vw-1

This unit consists of soils of the Elsah series. These are deep, somewhat excessively drained to excessively drained, stony and gravelly soils on bottom lands. Both the surface layer and subsoil are gravelly or stony silt loam or loam. The gravel or stone content of these soils is 75 to 95 percent.

Natural fertility is low, and the response to lime and fertilizer is poor to moderate. The organic-matter content is medium. The reaction is medium acid. The available water capacity is low to very low because of the stone and gravel content. Lateral seepage from streams furnishes some water for deep-rooted plants. Permeability is moderately rapid.

These soils can be used as pasture, woodland, and wildlife habitat. They are suited to bermudagrass, tall fescue, white clover, and annual lespedeza. They are not suited to

cultivated crops. Runoff is slow. A severe overflow hazard is the chief limitation.

Capability unit VIe–1

This unit consists of soils of the Allen and Fayetteville series. These are deep, well-drained soils on uplands. The slope range is 8 to 20 percent. The surface layer is friable loam or fine sandy loam. The subsoil is firm loam to clay loam. In places both layers are gravelly or stony.

Natural fertility is low to moderate, and the response to lime and fertilizer is moderate to good. The organic-matter content is low. The reaction is slightly acid or medium acid. The available water capacity is moderate. Permeability is moderate.

These soils can be used as pasture, woodland, or wildlife habitat. They are suited to annual lespedeza, sericea lespedeza, and white clover and are well suited to bermudagrass and tall fescue. They are not suited to cultivated crops. Under intensive conservation, including contour cultivation and a continuous cover crop, they can be used for berries, tree fruits, and other special crops. Runoff is rapid, and the erosion hazard is severe.

Capability unit VIe–2

The one soil in this unit is Baxter cherty silt loam, 12 to 20 percent slopes. This is a deep, well-drained soil on uplands. Its surface layer is friable. Its subsoil is firm cherty silty clay or cherty clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is strongly acid. The available water capacity is moderate. Permeability is moderate.

This soil can be used as pasture, woodland, or wildlife habitat. It is moderately well suited to bermudagrass, tall fescue, white clover, annual lespedeza, and sericea lespedeza. Under intensive conservation, including contour cultivation and a continuous cover crop, it can be used for strawberries, tree fruits, and other special crops. Runoff is medium to rapid, and the erosion hazard is severe.

Capability unit VIe–3

This unit consists of soils of the Hector, Mountainburg, and Montevallo series. These are shallow, gravelly and stony, well-drained to excessively drained soils on uplands. The slope range is 3 to 12 percent. The surface layer is friable gravelly or stony fine sandy loam or stony loam. The subsoil is gravelly or stony silty clay loam to fine sandy loam. The depth to bedrock is 8 to 20 inches.

Natural fertility is low, and the response to lime and fertilizer is poor. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is low because of shallowness and the gravel content. Permeability is moderate to rapid.

These soils can be used as pasture, range, or woodland. They are suited to bermudagrass, sericea lespedeza, and annual lespedeza. They are not suited to cultivated crops. Runoff is rapid, and the erosion hazard is severe.

Capability unit VIe–4

This unit consists of soils of the Enders series. These are deep, moderately well drained, gravelly soils on uplands. The slope range is 8 to 12 percent. The surface layer is friable gravelly loam, and the subsoil is plastic clay.

Natural fertility is low, and the response to fertilizer is moderate. The organic-matter content is low. The reaction is very strongly acid. The available water capacity is moderate. Permeability is very slow because of the plastic clay subsoil, which restricts movement of water and roots.

These soils can be used as pasture, range, woodland, and wildlife habitat. They are poorly suited to moderately well suited to bermudagrass, tall fescue, annual lespedeza, and sericea lespedeza. They are not suited to clean-tilled crops. Runoff is rapid, and the erosion hazard is severe.

Capability unit VIs–1

This unit consists of soils of the Enders and Summit series. These are deep, moderately well drained, stony soils on uplands. The slope range is 3 to 12 percent. The surface layer is friable stony loam or stony silty clay. The subsoil is plastic clay.

Natural fertility is low to high, and the response to fertilizer is moderate. The organic-matter content is low to high. The reaction is very strongly acid to neutral. The available water capacity is moderate. Permeability is very slow because of the plastic clay subsoil, which restricts movement of water and roots.

These soils can be used as pasture, range, woodland, and wildlife habitat. They are poorly suited to moderately well suited to bermudagrass, tall fescue, annual lespedeza, and sericea lespedeza. They are not suited to clean-tilled crops. Stoniness is a severe limitation in the use of farm equipment.

Capability unit VIIe–1

This unit consists of soils of the Allen, Fayetteville, and Allegheny series. These are deep, well-drained, stony soils on uplands. The slope range is 8 to 55 percent. The surface layer is friable stony loam or stony fine sandy loam. The subsoil is firm stony loam to stony clay loam.

Natural fertility is low to moderate. The organic-matter content is low. The reaction is strongly acid or medium acid. The available water capacity is moderate. Permeability is moderate.

These soils can be used as pasture, range, woodland, and wildlife habitat. They are suited to bermudagrass, sericea lespedeza, and annual lespedeza. They are not suited to clean-tilled crops. The stones and steep slopes interfere with the operation of farm machinery. Runoff is medium to rapid, and the erosion hazard is very severe.

Capability unit VIIe–2

The one soil in this unit is Baxter cherty silt loam, 20 to 45 percent slopes. This is a deep, well-drained soil on uplands. The surface layer is friable. The subsoil is firm cherty silty clay or cherty clay.

Natural fertility is low, and the response to lime and fertilizer is moderate. The organic-matter content is low. The reaction is strongly acid. The available water capacity is moderate. Permeability is moderate.

This soil can be used as pasture, range, woodland, or wildlife habitat. It is moderately well suited to bermudagrass, tall fescue, white clover, annual lespedeza, and sericea lespedeza. It is not suited to cultivated crops. Runoff is rapid, and the erosion hazard is very severe.

Capability unit VIIs–1

The one soil in this unit is Clarksville cherty silt loam, 12 to 60 percent slopes. This is an excessively drained soil on uplands. It is 50 to 90 percent chert. Both the surface

layer and the subsoil are cherty silt loam.

Natural fertility is low, and the response to lime and fertilizer is poor. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is low because of the high chert content. Permeability is moderately rapid.

This soil can be used as pasture, range, woodland, or wildlife habitat. It is suited to bermudagrass, sericea lespedeza, and annual lespedeza. It is not suited to cultivated crops. Droughtiness is a very severe limitation.

Capability unit VIIs–2

This unit consists of soils of the Hector, Mountainburg, and Montevallo series. These are shallow, well-drained to somewhat excessively drained, stony soils on uplands. The slope range is 3 to 55 percent. The surface layer is friable stony fine sandy loam to stony loam. The subsoil is stony silt loam to stony fine sandy loam. The depth to bedrock is 8 to 20 inches.

Natural fertility is low, and the response to lime and fertilizer is poor. The organic-matter content is low. The reaction is medium acid or strongly acid. The available water capacity is low because of shallowness and stoniness. Permeability is moderate to rapid.

These soils can be used as pasture, range, woodland, or wildlife habitat. They are suited to bermudagrass, sericea lespedeza, and annual lespedeza. They are not suited to cultivated crops. Droughtiness is a very severe limitation.

Capability unit VIIs–3

This unit consists of one land type, Rock land, and one soil, Sogn rocky silt loam. Both are shallow and excessively drained, and both are on uplands. The slope range is 3 to 60 percent. In places there are vertical limestone bluffs. These areas are made up chiefly of limestone fragments as much as several feet in diameter and limestone outcrops. Soil material of silt loam texture makes up a small part of the mass.

The reaction is medium acid to neutral. The available water capacity is low because of shallowness and rockiness. Permeability is moderate to rapid.

These areas can be used as range and as wildlife habitat. Droughtiness is a very severe limitation.

Capability unit VIIs–4

This unit consists of soils of the Enders and Summit series. These are deep, moderately well drained, stony soils on uplands. The slope range is 8 to 40 percent. The surface layer is friable stony loam or stony silty clay. The subsoil is plastic clay.

Natural fertility is high to low. The reaction is very strongly acid to neutral. The available water capacity is moderate. Permeability is very slow because of the plastic clay subsoil, which restricts movement of water and roots.

These soils can be used as pasture, range, woodland, and wildlife habitat. They are suited to bermudagrass and annual lespedeza. They are not suited to cultivated crops. Stoniness is a very severe limitation in the use of farm equipment. Runoff is rapid to very rapid.

Predicted Yields

Predicted yields of the principal crops grown in Washington County, under two levels of management, are shown in table 2. The predictions are based on information obtained from farmers and those who work with farmers.

The "A" columns in table 2 show the yields that can be expected under average management. Under such management, crops are not rotated according to a definite plan, the amounts and kinds of commercial fertilizer needed are not determined by soil tests, and little is done to control erosion or provide adequate drainage.

The "B" columns show the yields that can be expected under improved management. Improved management includes such practices as (1) returning crop residue to the soil; (2) applying fertilizer in amounts determined by soil tests and on the basis of past experience; (3) choosing well-suited, high-yielding varieties for planting; (4) preparing a good seedbed; (5) planting or seeding at recommended rates at the proper time; (6) inoculating legumes when necessary; (7) using shallow cultivation; (8) controlling weeds, insects, and diseases; (9) providing adequate surface drainage in level areas; (10) terracing and cultivating on the contour in sloping areas; and (11) controlling grazing.

Use of the Soils in Engineering [2]

Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, facilities for water storage, erosion control structures, drainage systems, and sewage disposal systems. The properties most important to engineers are permeability, shear strength, compaction characteristics, drainage, shrink-swell characteristics, particle size, plasticity, and reaction. Depth to the water table, depth to bedrock, and topography also are important.

The information in this publication can be used to—

1. Make studies that will aid in selecting and developing industrial, business, residential, and recreational sites.
2. Make preliminary estimates of the engineering properties of soils in planning agricultural drainage systems, irrigation systems, dams, and other structures for conservation of soil and water.
3. Make preliminary evaluations that will aid in selecting locations for highways, airports, pipelines, reservoirs, and farm ponds, and in planning detailed investigations at the selected locations.
4. Locate probable sources of sand and gravel and other construction material.
5. Correlate performance with soil mapping units to develop information that will be useful in planning engineering practices and in designing and maintaining engineering structures.
6. Make preliminary evaluations to determine the suitability of soils for cross-country movement of vehicles and construction equipment.
7. Supplement other published information, such as maps, reports, and aerial photographs, that is used in preparation of engineering reports for a specific area.

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[2] GUY D. CUNNINGHAM, agricultural engineer, Soil Conservation Service, helped prepare this section.

TABLE 2.—*Predicted average yields per acre of principal crops under two levels of management*

Figures in columns A indicate yields under average management; figures in columns B indicate yields under improved management. Absence of figure indicates the crop is not suited to or is not commonly grown on the soil specified]

Soil	Corn		Oats		Green beans		Grapes		Apples		Alfalfa		Pasture			
													Fescue		Hybrid bermudagrass	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]
Allegheny gravelly loam, 3 to 8 percent slopes	30	50	30	55			3	5	300	400			5	7	5	7
Allegheny gravelly loam, 3 to 8 percent slopes, eroded	28	48	28	52			3	5	300	400			5	7	5	7
Allegheny gravelly loam, 8 to 12 percent slopes, eroded													4	6	4	6
Allegheny stony loam, 8 to 12 percent slopes													3	4	3	4
Allegheny stony loam, 12 to 40 percent slopes													2	4	3	4
Allen loam, 3 to 8 percent slopes, eroded	32	52	32	57			4	6	350	450			5	7	5	7
Allen loam, 8 to 12 percent slopes, eroded													4	6	4	6
Allen loam, 12 to 20 percent slopes, eroded													4	6	3	5
Allen soils, 8 to 20 percent slopes													3	4	3	5
Allen stony loam, 12 to 35 percent slopes													3	4	3	4
Allen-Hector complex, 20 to 40 percent slopes:																
Allen soils													3	4	3	4
Hector-Mountainburg soils													2	3		
Allen-Hector complex, 40 to 55 percent slopes:																
Allen soils													3	4	3	4
Hector-Mountainburg soils													2	3		
Apison loam, 1 to 3 percent slopes	30	50	30	55	3	4	3	5	400	500			5	7	6	8
Apison loam, 3 to 8 percent slopes, eroded	28	48	25	50	1. 5	2. 5	3	5	350	450			5	7	5	7
Apison gravelly loam, 3 to 8 percent slopes, eroded	22	42	20	45			2	4	300	400			4	6	4	6
Baxter cherty silt loam, 3 to 8 percent slopes	30	55	30	58			3	5	350	450	1. 5	2. 3	5	7	5	7
Baxter cherty silt loam, 8 to 12 percent slopes													4	6	4	6
Baxter cherty silt loam, 12 to 20 percent slopes													4	6	3	5
Baxter cherty silt loam, 20 to 45 percent slopes													4	6	3	5
Captina silt loam, 1 to 3 percent slopes	35	65	35	65	3	4	4	6	400	500			6	8	6	8
Captina silt loam, 3 to 6 percent slopes	32	60	32	50	2	3	4	6	350	450			5	7	5	7
Captina silt loam, 3 to 6 percent slopes, eroded	30	50	30	48	2	3	4	6	350	450			5	7	5	7
Cherokee silt loam													5	7	3	5
Cherokee complex, mounded													5	7	3	5
Clarksville cherty silt loam, 12 to 60 percent slopes													3	5	2	4
Cleora fine sandy loam	45	70	40	60							3. 5	4. 5	7	9	7	9
Elsah cobbly soils													3	5	3	5
Elsah gravelly soils													5	7	4	7
Enders gravelly loam, 3 to 8 percent slopes													3	5	3	5
Enders gravelly loam, 3 to 8 percent slopes, eroded													3	5	3	5
Enders gravelly loam, 8 to 12 percent slopes													3	5	3	5
Enders gravelly loam, 8 to 12 percent slopes, eroded													3	5	3	5
Enders stony loam, 3 to 12 percent slopes													3	4	3	5

TABLE 2.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Green beans		Grapes		Apples		Alfalfa		Pasture			
													Fescue		Hybrid bermudagrass	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]
Enders-Allegheny complex, 8 to 20 percent slopes:																
Enders soils													2	4	3	4
Allegheny soils													3	5	3	5
Enders-Allegheny complex, 20 to 40 percent slopes:																
Enders soils													2	3	3	4
Allegheny soils													3	5	3	5
Fayetteville fine sandy loam, 3 to 8 percent slopes, eroded	30	60	30	65	2	3	4	6	450	550	2.0	3.0	5	8	7	9
Fayetteville fine sandy loam, 8 to 12 percent slopes, eroded									350	450			4	7	6	8
Fayetteville fine sandy loam, 12 to 20 percent slopes, eroded													3	4	5	7
Fayetteville stony fine sandy loam, 12 to 35 percent slopes													3	4	4	5
Fayetteville-Hector complex, 20 to 40 percent slopes:																
Fayetteville soils													3	4	4	5
Hector-Mountainburg soils													2	3		
Guin cherty silt loam, 3 to 8 percent slopes	25	50	25	50									5	7	5	7
Hector-Mountainburg gravelly fine sandy loams, 3 to 8 percent slopes													3	5	3	5
Hector-Mountainburg gravelly fine sandy loams, 8 to 12 percent slopes													2	4	3	4
Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes													2	3		
Jay silt loam, 1 to 3 percent slopes	35	70	35	65	3	4	4	6	350	450	2.5	3.5	6	8	6	8
Jay silt loam, 3 to 8 percent slopes	32	55	32	57	2	3	4	6	300	400	1.5	2.3	5	7	5	7
Johnsburg silt loam	25	55	30	62	2	3							5	7	4	7
Johnsburg complex, mounded													5	7	4	6
Leaf silt loam													5	7	3	5
Leaf complex, mounded													5	7	3	5
Linker loam, 1 to 3 percent slopes	28	48	28	53	3	4	3	5	400	500			5	7	6	8
Linker loam, 3 to 8 percent slopes, eroded	25	45	22	47	1.5	2.5	3	5	350	450			5	7	5	7
Linker gravelly loam, 3 to 8 percent slopes, eroded	22	42	20	45			2	5	300	400			4	6	4	6
Linker gravelly loam, 8 to 12 percent slopes													4	6	4	6
Montevallo soils, 3 to 12 percent slopes													2	4	2	4
Montevallo soils, 12 to 25 percent slopes													2	4	2	4
Nixa cherty silt loam, 3 to 8 percent slopes							3	5					5	7	5	7
Nixa cherty silt loam, 8 to 12 percent slopes													4	6	4	6
Pembroke silt loam, 1 to 3 percent slopes	37	73	37	68	3	4	4	6	400	500	2.5	3.5	6	8	6	8
Pembroke silt loam, 3 to 6 percent slopes, eroded	33	65	33	58	2	3	4	6	400	500	1.5	2.3	5	7	6	8
Pembroke gravelly silt loam, 3 to 8 percent slopes, eroded	30	60	30	55			3	5	300	400			5	7	5	7
Pickwick gravelly loam, 3 to 8 percent slopes, eroded	27	55	30	55			3	5	300	400			5	7	5	7
Pickwick gravelly loam, 8 to 12 percent slopes, eroded													4	6	4	6
Pickwick silt loam, 1 to 3 percent slopes	32	67	32	57	3	4	4	6	400	500	2.5	3.5	6	8	6	8
Pickwick silt loam, 3 to 8 percent slopes, eroded	30	60	30	55	2	3	4	6	350	450	1.5	2.3	5	7	5	7
Razort silt loam, occasionally flooded	45	80	40	70	3	4					2.5	3.5	7	10	7	10
Razort gravelly silt loam, occasionally flooded	40	70	35	65							2.0	3.0	6	9	6	9
Razort loam	35	70	32	65	3	4	4	6	400	500	2.0	4	7	9	7	9
Rock land																

TABLE 2.—*Predicted average yields per acre of principal crops under two levels of management*—Continued

Soil	Corn		Oats		Green beans		Grapes		Apples		Alfalfa		Pasture			
													Fescue		Hybrid bermudagrass	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]	*A.U.M.*[1]
Samba silt loam													5	7	3	5
Samba complex, mounded													5	7	3	5
Savannah fine sandy loam, 1 to 3 percent slopes	35	65	30	55	3	4	4	6	400	500			6	8	6	8
Savannah fine sandy loam, 3 to 8 percent slopes, eroded	25	50	25	48	2	3	4	6	350	450			5	7	5	7
Sloan silt loam	40	75	35	65							2. 0	3. 0	6	9	6	9
Sogn rocky silt loam																
Summit complex, mounded													5	7	3	5
Summit silty clay, 0 to 1 percent slopes													5	7	3	5
Summit silty clay, 1 to 3 percent slopes											2	3	5	7	4	5
Summit silty clay, 3 to 8 percent slopes, eroded											2	3	5	7	5	6
Summit silty clay, 8 to 12 percent slopes, eroded													4	6	4	6
Summit stony silty clay, 3 to 12 percent slopes, eroded													4	6	4	6
Summit stony silty clay, 12 to 25 percent slopes, eroded													4	6	4	6
Taloka complex, mounded													5	7	4	7
Taloka silt loam, 0 to 1 percent slopes	25	60	30	62									5	7	5	7
Taloka silt loam, 1 to 3 percent slopes	27	62	32	65									5	7	5	7

[1] Animal-unit-months. The figures represent the number of months that 1 acre will provide grazing for 1 animal (1,000 pounds live weight), or the number of months the pasture can be grazed multiplied by the number of animal units an acre will support. For example, 1 acre of Allen loam, 12 to 20 percent slopes, eroded, in a pasture of fescue, under improved management, will provide grazing for 2 animals for 3 months, so it has a rating of 6 animal-unit-months.

With the soil map for identification of soil areas, the engineering interpretations reported here can be useful for many purposes. It should be emphasized, however, that these interpretations may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depth of layers here reported.

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

Engineering Classification Systems

Most highway engineers classify soil material in accordance with the system approved by the American Association of State Highway Officials (AASHO) (*1*).[3] In this system all soil material is classified in seven principal groups. The groups range from A–1, which consists of soils that have the highest bearing capacity, to A–7, which consists of soils that have the lowest strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index number. The numbers range from 0, for the best material, to 20 for the poorest. The group index number is shown in parentheses following the soil group symbol.

Some engineers prefer to use the Unified classification system (*15*). In this system soils are identified according to their texture and plasticity and their performance as engineering construction material. They are identified as coarse grained—gravels (G) and sands (S); fine grained—silts (M) and clays (C); and highly organic (O). SW and SP identify clean sands; SM and SC, sands that contain fines of silt and clay; ML and CL, silts and clays that have a low liquid limit; and MH and CH, silts and clays that have a high liquid limit.

The textural classification system used by the U.S. Department of Agriculture (*11*) is primarily for agricultural use but is also important in engineering. In this system the texture of the soil depends on the proportional amount of the different sized mineral particles. The sizes are designated as cobblestones, gravel, sand, silt, and clay. The textural classes range from the fine-textured clays, silty clays, and sandy clays to the coarse-textured loamy fine sands, loamy sands, sands, and coarse sands.

Table 3 shows the AASHO and the Unified classification of specified soils in the county, as determined by laboratory tests. Table 4 shows the estimated classification of all the soils in the county according to all three systems of classification.

[3] Italic figures in parentheses refer to Literature cited, p. 92.

Engineering Test Data

Soil samples taken from 16 profiles in the county were tested in accordance with standard procedures to help evaluate the soils for engineering purposes. Each soil was sampled to a depth of about 5 feet. The results of these tests are given in table 3.

The engineering classifications given in table 3 are based on the data obtained by mechanical analysis and on the liquid limit and plasticity index. The mechanical analysis was made by combined sieve and hydrometer methods.

Estimated Properties

Estimates of soil properties that are significant in engineering are listed in table 4. The estimates are based on data shown in table 3, on tests of similar soils in this county or other counties, and on past experience in engineering construction. Since the estimates are for modal soils, considerable variation from the values shown in table 4 should be anticipated. More information on the range of properties of the soils can be obtained from the sections "Descriptions of the Soils" and "Formation and Classification of the Soils."

The column headed "Permeability" indicates the rate at which water moves through undisturbed soil material. The estimates are based on soil structure and porosity. Mechanically developed features, such as plowpans and surface crusts, have not been considered.

The column headed "Available water capacity" gives estimates of the amount of capillary water in soil that is wet to field capacity. At the wilting point of plants, this amount of water will wet the soil material described to a depth of 1 inch without deeper percolation.

Reaction, which refers to the degree of acidity or alkalinity of a soil, is expressed in pH values. The degrees of acidity or alkalinity are described under "Reaction" in the Glossary.

The column headed "Shrink-swell potential" indicates the volume change to be expected of the soil material with changes in moisture content. This potential is based on volume-change tests or on observable physical properties or characteristics of the soil. For example, soil material taken from the layer at a depth of 43 to 74 inches in Allegheny gravelly loam is very sticky when wet and develops extensive shrinkage cracks when dry; hence, it has high shrink-swell potential. Conversely, material taken from the surface layer of Captina silt loam is nonplastic, and it therefore has a low shrink-swell potential.

Engineering Interpretations

Estimates of the suitability of the soils for various engineering uses are given in table 5. Features or characteristics that are likely to affect various engineering practices were considered, and evaluations were based on test data and field performance.

All kinds of soil material are used as road fill. Some soils, such as sandy clays and sandy clay loams, offer few problems in placement or compaction. Clays have a high shrink-swell potential and require special compaction techniques and close moisture control both during and after construction. Sands compact well but are difficult to confine in a fill.

Normally, only the surface layer of a soil is rated for topsoil. The suitability of this layer depends largely on its texture and depth. Topsoil material must be friable enough to be worked into a good seedbed for seeding or sodding, yet be clayey enough to resist erosion on steep slopes. The depth of suitable material determines the practicality of removal.

Some soils have features that limit their use as reservoir sites and as sources of embankment material for construction of farm ponds. These unfavorable features should be carefully evaluated in selecting reservoir and embankment sites. Greater than normal water loss can be expected if reservoirs are located on soils that have rapid permeability and excessive seepage. Soils that have slow permeability generally make suitable sites. Soil material used for construction of embankments should have at least moderate strength and stability.

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

Generally, only the most productive soils should be irrigated. Best results are obtained on well-drained soils that have moderate to moderately rapid infiltration and high available moisture capacity. A sprinkler system is the most suitable means of irrigation in this county.

Terraces and waterways for control of erosion generally are suited to the cultivable uplands. Stones, shallowness, and irregular and steep topography are among the unfavorable soil features. A slope of 10 percent or more makes it difficult to construct and maintain terraces. In addition, the erodibility of the soil interferes with shaping, seeding, and establishing waterways, and a seasonal high water table limits the use of equipment.

Clay Mineralogy of Selected Soils[4]

The presence of clay in soils is an important factor in engineering because clay influences the retention and movement of water and the stability of soils as foundation material.

Samples of Allen, Fayetteville, Jay, Johnsburg, and Savannah soils, engineering test data for which are shown in table 3, were tested by chemical analysis, X-ray diffraction, and other analytical techniques according to standard procedures (*3*, *4*, *5*). The results of these tests provide the basis for the data reported in table 6, page 64.

Except for Jay soils, which occur on prairies in the extreme western part of the county, these soils are in the Boston Mountains. All formed in a mixture of material derived from sandstone, siltstone, and shale. Consequently, they have several mineralogical properties in common. For example, in each of the soils the fine silts have essentially the same mineralogy. The particles within this size range are approximately 80 percent quartz, 10 percent illite, 8 percent kaolinite, and 2 percent feldspar. These proportions vary only slightly, either between one soil and another or at different depths in the same soil. Kaolinite or vermiculite and interlayered vermiculite and illite make up 60 to 75 percent of the clay minerals in the coarse clays.

[4] By M. E. Horn, associate professor, and W. R. Coston, graduate assistant, University of Arkansas Agricultural Experiment Station.

TABLE 3.—

[Tests performed by Arkansas State Highway Department in cooperation with Bureau of Public Roads (BPR)

Soil name and location	Parent material	Arkansas report number (S6372)	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			In.		*Lb. per cu. ft.*	*Pct.*
Allen loam:						
SE¼SE¼ sec. 17, T. 13 N., R. 30 W. (Nonmodal.)	Colluvium from sandstone and shale.	12–1	0–8	Ap	118	12
		12–4	29–39	B22t	115	15
		12–5	39–45	B23t	114	15
NE¼SE¼ sec. 18, T. 14 N., R. 29 W. (Nonmodal.)	Colluvium from sandstone and shale.	13–1	0–5	Ap	115	13
		13–3	12–20	B22t	110	16
		13–4	20–66	B23t	108	19
SW¼ sec. 28, T. 14 N., R. 29 W. (Modal.)	Colluvium from sandstone and shale.	6–1	0–6	Ap	110	16
		6–4	26–39	B22t	112	17
		6–5	39–67	B23t	113	16
Captina silt loam:						
SW¼NW¼ sec. 30, T. 18 N., R. 30 W. (Modal.)	Silt mantle over cherty limestone.	5–1	0–8	Ap	109	15
		5–3	12–20	B22t	108	16
		5–5	26–54	Bx	108	18
SE¼SE¼ sec. 9, T. 16 N., R. 32 W. (Nonmodal.)	Silt mantle over cherty limestone.	9–1	0–7	Ap	108	15
		9–2	7–20	B21t	110	16
		9–3	20–28	Bx	106	18
Fayetteville fine sandy loam:						
SE¼SE¼ sec. 18, T. 14 N., R. 32 W. (Modal.)	Sandstone.	7–1	0–9	Ap	116	12
		7–3	16–25	B1	115	15
		7–5	36–67	B22t	116	15
NE¼NE¼ sec. 19, T. 17 N., R. 28 W. (Nonmodal.)	Sandstone.	14–1	0–5	Ap	120	11
		14–3	14–31	B2t	114	14
		14–4	31–56	C	115	15
Jay silt loam:						
NE¼NW¼ sec. 36, T. 16 N., R. 32 W. (Modal.)	Silt mantle over siltstone or shale.	4–1	0–9	Ap	110	14
		4–3	16–25	B2t	111	16
		4–5	29–56	B'x	111	16
NE¼SW¼ sec. 35, T. 16 N., R. 32 W. (Nonmodal.)	Silt mantle over siltstone or shale.	8–1	0–8	Ap	107	16
		8–3	16–22	B2t	112	16
		8–4	22–46	B'x	115	15
Johnsburg silt loam:						
NW¼NW¼ sec. 26, T. 16 N., R. 29 W. (Modal.)	Alluvium from sandstone and shale (stream terraces).	1–2	5–8	Ap2	115	14
		1–4	16–23	B21t	116	13
		1–5	23–58	Bx	114	15
SW¼NE¼ sec. 12, T. 15 N., R. 29 W. (Nonmodal.)	Alluvium from sandstone and shale (stream terraces).	16–1	0–6	Ap	111	14
		16–3	9–20	B21t	110	16
		16–4	20–40	Bx	115	14
Savannah fine sandy loam:						
NW¼NE¼ sec. 4, T. 15 N., R. 28 W. (Modal.)	Colluvium from acid sandstone and shale.	3–1	0–5	Ap	109	14
		3–3	11–22	B21t	113	15
		3–5	29–70	Bx	115	15
SE¼SE¼ sec. 29, T. 16 N., R. 29 W. (Nonmodal.)	Colluvium from acid sandstone and shale.	11–1	0–6	Ap	112	13
		11–3	10–20	B21t	117	14
		11–4	20–30	Bx	118	14
SW¼SW¼ sec. 4., T. 16 N., R. 32 W. (Nonmodal.)	Colluvium from acid sandstone and shale.	15–2	2–7	Ap2	120	10
		15–4	12–22	B21t	122	12
		15–5	22–32	Bx	127	11

Footnotes at end of table.

Engineering test data

in accordance with standard procedures of the American Association of State Highway Officials (AASHO) (*1*)]

Mechanical analysis [2]					Liquid limit	Plasticity index	Classification	
Percentage passing sieve—								
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 00 (0.074 mm.)			AASHO	Unified [3]
					Pct.			
100	97	95	90	58	[4] NP	NP	A–4(5)	ML
	100	98	94	75	33	7	A–4(8)	ML
100	97	94	90	70	32	15	A–6(9)	CL
100	99	98	95	80	21	3	A–4(8)	ML
100	99	99	97	89	40	16	A–6(10)	ML–CL
	100	99	98	88	43	17	A–7–6(11)	ML–CL
100	97	93	88	67	31	6	A–4(6)	ML
100	99	98	97	24	37	14	A–2–6(0)	SM–SC
100	97	92	85	62	37	16	A–6(8)	CL
	100	98	94	89	NP	NP	A–4(8)	ML
	100	99	97	92	35	12	A–6(9)	ML–CL
	100	98	95	83	37	16	A–6(10)	CL
100	98	94	90	78	NP	NP	A–4(8)	ML
100	97	91	88	81	35	13	A–6(10)	ML–CL
[5] 79	59	51	48	44	37	13	A–6(3)	GM–GC
100	96	90	83	69	NP	NP	A–4(0)	ML
	100	99	98	40	29	10	A–4(1)	SC
	100	99	98	41	28	11	A–6(2)	SC
	100	99	98	44	NP	NP	A–4(2)	SM
		100	99	60	34	18	A–6(8)	CL
	100	99	99	58	33	14	A–6(6)	CL
100	99	96	92	81	NP	NP	A–4(8)	ML
	100	99	96	90	29	9	A–4(8)	CL
	100	99	97	88	31	10	A–4(8)	ML–CL
	100	98	96	87	NP	NP	A–4(8)	ML
100	99	96	92	80	28	6	A–4(8)	ML–CL
100	97	91	82	70	30	9	A–4(7)	ML–CL
100	99	98	96	61	23	4	A–4(5)	ML–CL
100	99	97	95	65	23	6	A–4(6)	ML–CL
	100	98	95	54	32	16	A–6(6)	CL
100	99	98	96	77	NP	NP	A–4(8)	ML
100	99	99	97	82	28	9	A–4(8)	CL
100	97	95	93	75	25	7	A–4(8)	ML–CL
100	99	97	95	60	NP	NP	A–4(5)	ML
	100	99	96	73	30	10	A–4(8)	CL
	100	98	97	72	29	8	A–4(7)	ML–CL
100	98	94	89	63	NP	NP	A–4(6)	ML
100	98	94	90	68	30	14	A–6(8)	CL
100	98	96	91	68	27	10	A–4(7)	CL
100	98	95	92	52	NP	NP	A–4(4)	ML
100	96	88	85	56	23	8	A–4(4)	CL
[6] 100	89	72	67	40	22	7	A–4(1)	SM–SC

TABLE 3.—*Engineering*

Soil name and location	Parent material	Arkansas report number (S6372)	Depth	Horizon	Moisture-density [1]	
					Maximum dry density	Optimum moisture
			In.		*Lb. per cu. ft.*	*Pct.*
Savannah fine sandy loam—Cont.						
NE¼SE¼ sec. 31, T. 17 N., R. 29 W. (Nonmodal.)	Alluvium from sandstone and shale (stream terraces).	2–2	5–13	A3	118	12
		2–4	17–25	B22t	114	15
		2–6	30–57	Bx	112	15
SW¼NE¼ sec. 12, T. 15 N., R. 29 W. (Nonmodal.)	Alluvium from sandstone and shale (stream terraces).	10–1	0–8	Ap	112	13
		10–3	13–20	B21t	115	14
		10–5	23–38	Bx	114	15

[1] Based on AASHO Designation: T 99–57, Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data used in this table are not suitable for naming textural classes for soils.

TABLE 4.—*Esti-*

Soil and map symbol	Depth from surface	Classification
		USDA texture
	In.	
Allegheny:		
Gravelly loam (AeC, AeC2, AeD2).	0–13	Gravelly loam
	13–43	Stony clay loam
	43–74	Clay
Stony loam (AgD, AgF).	0–13	Stony loam
	13–43	Stony clay loam
	43–72	Clay
Allen:		
Loam (AlC2, AlD2, AlE2, AnE).	0–6	Loam
	6–18	Silt loam
	18–72	Clay loam
Stony loam (AoF, AhF, AhG).	0–8	Stony loam
For properties of Hector soils in mapping units AhF and AhG, refer to Hector stony fine sandy loam.	8–68	Stony clay loam
Apison (ApB, ApC2, AsC2).	0–6	Loam
	6–13	Loam
	13–33	Silty clay loam
	33	Sandstone.
Baxter (BaC, BaD, BaE, BaF).	0–10	Cherty silt loam
	10–17	Cherty silty clay loam
	17–60	Cherty clay
Captina (CaB, CaC, CaC2).	0–8	Silt loam
	8–20	Silty clay loam
	20–54	Silty clay loam (fragipan)
	54–60	Chert.
Cherokee (Ch, Ck).	0–24	Silt loam
	24–72	Clay or silty clay

test data—Continued

Mechanical analysis [2]					Liquid limit	Plasticity index	Classification	
Percentage passing sieve—							AASHO	Unified [3]
¾-in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)				
					Pct.			
	100	99	96	77	24	6	A–4(8)	ML–CL
	100	98	96	80	32	11	A–6(8)	CL
100	99	95	89	67	32	10	A–4(6)	ML–CL
	100	97	93	72	NP	NP	A–4(7)	ML
	100	98	94	89	29	9	A–4(8)	CL
	100	98	96	81	31	12	A–6(9)	CL

[3] SCS and BPR have agreed to consider that all soils having plasticity indexes within 2 points of the A-line are to be given a borderline classification. (Examples of borderline classifications obtained by this use are ML–CL, SM–SC, and GM–GC.)

[4] Nonplastic.

[5] An estimated 25 percent of material was larger than 3 inches in diameter and was discarded in field sampling. An estimated 100 percent passed the 2-inch sieve.

[6] An estimated 20 percent of material was larger than 3 inches in diameter and was discarded in field sampling.

mated properties

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200				
					In. per hr.	*In. per in. of soil*	*pH*	
ML	A–4	70–80	55–65	50–60	2. 0–6. 3	0. 14	5. 5–6. 5	Low.
CL	A–6	70–80	60–70	50–60	0. 2–0. 63	. 15	4. 5–6. 0	Medium.
CH	A–7	80–90	70–80	60–70	<0. 2	. 17	4. 5–6. 0	High.
ML	A–4	70–80	55–65	50–60	2. 0–6. 3	. 13	5. 5–6. 5	Low.
CL	A–6	70–80	60–70	50–60	0. 2–0. 63	. 14	4. 5–6. 0	Medium.
CH	A–7	80–90	75–85	70–80	<0. 2	. 17	4. 5–6. 0	High.
ML	A–4	90–100	85–95	58–80	2. 0–6. 3	. 14	5. 5–6. 5	Low.
ML	A–4, A–6	90–100	90–100	75–90	0. 63–2. 0	. 16	5. 0–6. 0	Low.
CL, ML, SM, SC	A–6, A–2, A–7	90–100	90–100	20–90	0. 2–0. 63	. 17	5. 0–6. 0	Medium.
CL or ML	A–4	85–95	85–95	60–75	2. 0–6. 3	. 12	5. 5–6. 5	Low.
CL	A–6	85–95	85–95	70–80	0. 2–0. 63	. 15	5. 0–6. 0	Medium.
ML	A–4	95–100	90–100	65–80	2. 0–6. 3	. 17	5. 5–6. 5	Low.
ML	A–4	95–100	90–100	65–80	0. 2–0. 63	. 19	4. 5–5. 5	Low.
ML	A–4	95–100	90–100	70–80	0. 2–0. 63	. 19	4. 5–5. 5	Medium.
ML	A–4	80–90	80–90	60–70	0. 63–2. 0	. 17	5. 0–6. 5	Low.
CL or GC	A–6	75–85	50–60	40–50	0. 2–0. 63	. 15	4. 5–5. 5	Low.
GC	A–6, A–2	45–55	30–40	30–40	<0. 2	. 15	4. 5–5. 5	Medium.
ML	A–4	95–100	95–100	80–95	0. 63–2. 0	. 19	5. 0–6. 5	Low.
ML, CL	A–6	95–100	95–100	85–95	0. 2–0. 63	. 21	4. 5–5. 5	Medium.
CL, GM–GC	A–6	95–100	95–100	40–90	<0. 2	. 15	4. 5–5. 5	Low.
ML	A–4	95–100	90–100	90–100	0. 2–0. 63	. 21	5. 0–6. 5	Low.
MH or CH	A–7 or A–6	95–100	90–100	90–100	<0. 2	. 19	4. 5–5. 5	Medium.

TABLE 4.—*Estimated*

Soil and map symbol	Depth from surface	Classification
		USDA texture
	In.	
Clarksville (ClG).	0–32	Cherty silt loam
	32	Chert bed.
Cleora (Cr).	0–45	Fine sandy loam
	45–72	Loamy fine sand
Elsah (Ec, Eg).	0–72	Gravelly silt loam
Enders (EnC, EnC2, EnD, EnD2, EoD, ErE, ErF).	0–9	Stony loam
For properties of Allegheny soils in mapping units ErE and ErF, refer to Allegheny stony loam.	9–22	Stony clay
	22–84	Clay
Fayetteville:		
Fine sandy loam (FaC2, FaD2, FaE2).	0–9	Fine sandy loam
	9–72	Sandy clay loam
Stony fine sandy loam (FeF, FhF).	0–8	Stony fine sandy loam
For properties of Hector soils in mapping unit FhF, refer to Hector stony fine sandy loam.	8–55	Stony fine sandy loam
Guin (GuC).	0–10	Cherty silt loam
	10–52	Cherty silt loam
Hector:		
Gravelly fine sandy loam (HmC, HmD).	0–7	Gravelly fine sandy loam
	7–17	Gravelly loam
	17	Sandstone.
Stony fine sandy loam (HoF).	0–6	Stony fine sandy loam
	6–15	Stony loam
	15	Sandstone.
Jay (JaB, JaC).	0–16	Silt loam
	16–25	Silty clay loam
	25–72	Silty clay loam (fragipan)
Johnsburg (Jo, Js).	0–12	Silt loam
	12–23	Silty clay loam
	23–72	Silty clay loam (fragipan)
Leaf (Le, Lf).	0–12	Silt loam
	12–17	Silty clay loam
	17–72	Silty clay or clay
Linker:		
Loam (LkB, LkC2).	0–5	Loam
	5–34	Loam
	34	Sandstone.
Gravelly loam (LnC2, LnD).	0–6	Gravelly loam
	6–32	Gravelly loam
	32	Bedrock.
Montevallo (MoD, MoE).	0–8	Stony loam
	8–15	Stony silt loam
	15	Shale.
Mountainburg:		
For properties of Mountainburg soils, refer to Hector soils.		
Nixa (NaC, NaD).	0–16	Cherty silt loam
	16–32	Cherty silt loam (fragipan)
	32–40	Chert.

properties—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200				
					In. per hr.	*In. per in. of soil*	*pH*	
GM	A–2	40–50	30–40	20–30	2. 0–6. 3	. 07	5. 0–6. 0	Low.
SM or ML	A–4	90–100	80–95	45–55	0. 63–2. 0	. 14	5. 5–6. 5	Low.
SM	A–4	90–100	70–80	40–50	0. 63–2. 0	. 14	5. 5–6. 5	Low.
GM	A–2	15–25	10–20	10–20	2. 0–6. 3	. 10	5. 5–6. 5	Low.
ML	A–4	80–90	55–60	50–60	0. 63–2. 0	. 13	5. 0–6. 0	Low.
MH or CH	A–7	80–100	75–90	75–90	<0. 2	. 16	4. 0–5. 5	Medium.
MH–CH	A–7	90–100	90–100	90–100	<0. 2	. 17	4. 0–5. 5	Medium.
SM	A–2	90–100	90–100	30–45	2. 0–6. 3	. 13	5. 5–6. 5	Low.
SC	A–2 or A–4	90–100	90–100	35–45	0. 63–2. 0	. 17	5. 5–6. 5	Medium.
ML or SC	A–4, A–2	90–100	85–95	30–75	2. 0–6. 3	. 12	5. 5–6. 5	Low.
SC or CL	A–6, A–2	90–100	90–100	35–60	0. 63–2. 0	. 16	5. 5–6. 5	Medium.
GM	A–2	40–60	25–35	20–30	0. 63–2. 0	. 13	5. 5–6. 5	Low.
GM	A–2	40–60	25–35	20–30	0. 63–2. 0	. 14	5. 0–6. 0	Low.
GM	A–2	40–50	30–40	20–30	2. 0–6. 3	. 12	5. 0–6. 5	Low.
GM	A–2	40–50	30–40	20–30	0. 63–2. 0	. 13	4. 5–5. 5	Low.
GM	A–2	40–50	30–40	20–30	2. 0–0. 63	. 12	5. 0–6. 5	Low.
GM	A–2	40–50	30–40	20–30	0. 63–2. 0	. 13	4. 5–5. 5	Low.
ML	A–4	95–100	95–100	80–90	0. 63–2. 0	. 19	5. 0–6. 5	Low.
CL or ML	A–4	95–100	95–100	70–90	0. 2–0. 63	. 21	4. 5–6. 0	Medium.
ML or CL	A–4	95–100	95–100	70–90	<0. 2	. 15	5. 0–6. 5	Low.
ML or ML–CL	A–4	95–100	95–100	60–80	0. 63–2. 0	. 19	5. 5–6. 5	Low.
CL or ML–CL	A–4	95–100	95–100	65–85	0. 2–0. 63	. 17	4. 5–6. 0	Medium.
CL or ML–CL	A–6, A–4	95–100	95–100	50–80	<0. 2	. 17	4. 5–6. 0	Low.
ML	A–4	95–100	95–100	70–80	0. 2–0. 63	. 17	5. 0–6. 0	Low.
ML	A–4	95–100	95–100	75–85	0. 2–0. 63	. 19	4. 0–5. 5	Medium.
CH	A–7	95–100	90–100	80–90	<0. 2	. 17	4. 0–5. 5	High.
ML or CL	A–4	90–100	90–100	70–80	2. 0–6. 3	. 17	5. 0–6. 0	Low.
ML	A–4	90–100	95–100	75–85	0. 2–0. 63	. 19	4. 5–5. 5	Medium.
GM	A–4	65–70	45–55	35–40	2. 0–6. 3	. 16	5. 0–6. 0	Low.
GC	A–4	65–70	55–65	45–50	0. 2–0. 63	. 18	4. 5–5. 5	Medium.
GM	A–4	60–70	45–55	40–50	0. 63–2. 0	. 13	5. 5–6. 5	Low.
GM	A–4	60–70	45–55	40–50	0. 63–2. 0	. 13	5. 0–6. 0	Low.
GM	A–2	30–40	25–35	20–30	0. 63–2. 0	. 14	5. 5–6. 5	Low.
GC	A–2	20–30	15–25	10–20	<0. 2	. 14	5. 0–6. 0	Low.

TABLE 4—*Estimated*

Soil and map symbol	Depth from surface	Classification
		USDA texture
	In.	
Pembroke:		
Silt loam (PeB, PeC2).	0–13	Silt loam
	13–42	Silty clay loam
	42–60	Mostly chert and cobblestones.
Gravelly silt loam (PgC2).	0–12	Gravelly silt loam
	12–60	Gravelly silty clay loam
Pickwick:		
Gravelly loam (PkC2, PkD2).	0–13	Gravelly loam
	13–50	Gravelly clay loam
Silt loam (PsB, PsC2).	0–15	Silt loam
	15–64	Silty clay loam
	64	Bedrock.
Razort:		
Silt loam or loam (Ra, Rk).	0–19	Silt loam or loam
	19–72	Silt loam
Gravelly silt loam (Rg).	0–10	Gravelly silt loam
	10–72	Gravelly silt loam
Rock land (Ro).	(1)	(1)
Samba (Sa, Sb).	0–12	Silt loam to silty clay loam
	12–72	Clay or silty clay
Savannah (SfB, SfC2).	0–5	Fine sandy loam
	5–22	Loam
	22–70	Loam (fragipan)
Sloan (Sn).	0–17	Silt loam
	17–72	Silt loam
Sogn (So).	0–10	Rocky silt loam
	10	Limestone.
Summit:		
Silty clay (Sp, SsA, SsB, SsC2, SsD2).	0–12	Silty clay
	12–72	Clay
Stony silty clay (StD2, StE2).	0–12	Stony silty clay
	12–60	Stony clay
Taloka (Ta, ToA, ToB).	0–23	Silt loam
	23–60	Clay

[1] Variable and unclassified.

The medium clays vary considerably in composition, both between one soil and another and at different depths in the same soil. Amorphous material and montmorillonite are dominant in the fine clays.

Some properties of the soils studied in Washington County are summarized in the following paragraphs, and the relationship of clay mineralogy to the engineering properties of each soil is described.

Allen loam.—In some areas Allen soils contain appreciable amounts of coarse sandstone fragments, but the profile sampled was essentially free of fragments more than 3 inches in diameter. The fine earth, or clay-size material, was derived chiefly from sandstone or from siltstone and shale.

In all horizons, kaolinite is the dominant clay mineral in the coarse clays and vermiculite is abundant. In the B22t and C horizons, interlayered vermiculite and montmorillonite are fairly abundant in the medium clays, and montmorillonite is abundant in the fine clays. These minerals account for the higher plasticity index in these horizons. A low content of expanding clay minerals and good internal drainage make this soil desirable as engineering material, but locally its use is limited by topography and content of coarse fragments.

Fayetteville fine sandy loam.—Fayetteville soils formed in residuum weathered from Hale sandstone. This sandstone, which is calcareous in most places, is abundant in iron-bearing minerals. Consequently, the weathered ma-

properties—Continued

Classification—Continued		Percentage passing sieve—			Permeability	Available water capacity	Reaction	Shrink-swell potential
Unified	AASHO	No. 4	No. 10	No. 200				
					In. per hr.	*In. per in. of soil*	*pH*	
ML	A–4	90–100	85–95	80–90	0. 63–2. 0	. 19	5. 5–6. 5	Low.
CL	A–6	80–90	80–90	70–80	0. 2–0. 63	. 21	5. 0–6. 0	Medium.
GM	A–4	65–75	45–55	35–40	0. 63–2. 0	. 16	5. 5–6. 5	Low.
GC	A–6	65–75	45–65	45–50	0. 2–0. 63	. 16	5. 0–6. 0	Medium.
GM	A–4	65–75	45–55	35–40	0. 63–2. 0	. 16	5. 5–6. 5	Low.
GC	A–6	65–75	55–65	45–50	0. 2–0. 63	. 16	5. 0–6. 0	Medium.
ML	A–4	95–100	95–100	80–95	0. 63–2. 0	. 19	5. 5–6. 5	Low.
CH	A–7	95–100	95–100	85–95	0. 2–0. 63	. 21	5. 0–6. 0	Medium.
ML	A–4	90–100	85–95	80–90	0. 63–2. 0	. 19	6. 0–7. 0	Low.
ML	A–4	80–90	75–85	70–80	0. 63–2. 0	. 19	5. 5–6. 5	Low.
GM	A–4	65–70	45–55	35–40	0. 63–2. 0	. 16	6. 0–7. 0	Low.
GM	A–4	65–70	55–65	40–50	0. 63–2. 0	. 16	5. 5–6. 5	Low.
(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
ML	A–4	95–100	95–100	90–100	0. 2–0. 63	. 22	5. 0–6. 0	Medium.
CH	A–7	95–100	95–100	95–100	<0. 2	. 19	4. 5–6. 0	High.
ML or ML–CL	A–4	90–100	85–100	50–80	2. 0–6. 3	. 19	5. 0–6. 5	Low.
CL or ML	A–4, A–6	90–100	85–100	50–80	0. 2–0. 63	. 19	4. 5–5. 5	Medium.
ML–CL, CL, or SM	A–4, A–6	90–100	85–100	40–45	<0. 2	. 15	4. 5–5. 5	Low.
ML	A–4	95–100	95–100	80–90	0. 63–2. 0	. 22	5. 5–6. 5	Low.
ML	A–4	95–100	95–100	80–90	0. 2–0. 63	. 22	5. 5–6. 5	Low.
CL	A–6	90–100	85–95	80–90	0. 2–0. 63	. 17	6. 5–7. 8	Medium.
CH	A–7	95–100	90–100	85–95	<0. 2	. 16	5. 5–7. 3	High.
CH	A–7	95–100	90–100	85–95	<0. 2	. 16	6. 0–7. 8	High.
CH	A–7	95–100	90–100	85–95	<0. 2	. 14	5. 5–7. 3	High.
CH	A–7	95–100	90–100	85–95	<0. 2	. 14	6. 0–7. 8	High.
ML	A–4	95–100	95–100	70–80	0. 2–0. 63	. 21	5. 5–6. 5	Low.
CH	A–7	95–100	90–100	80–90	<0. 2	. 16	5. 5–6. 5	Medium.

terial contains fairly large amounts of free iron oxide. These soils and the underlying regolith are ordinarily 6 to 12 feet deep or more, but in places they have bedrock that is soft and easily fractured at a depth of about 4 feet.

Kaolinite and vermiculite are present in about equal amounts and make up about 60 percent of the clay minerals in the coarse clays throughout the B horizon. Amorphous material and montmorillonite are dominant in the medium and fine clays. Montmorillonite and other expanding clays make up only 6 to 8 percent of the entire soil mass in the B horizon; hence, the plasticity index is low. The low plasticity index and good internal drainage make this soil very well suited for use as foundation material.

Jay silt loam.—Jay soils developed under prairie grasses and have a thick, dark-colored A horizon that is high in organic-matter content. The profile sampled overlies siltstone that contains interbedded shale. In other areas Jay soils overlie alluvium and residuum weathered from cherty limestone.

Interlayered vermiculite and illite are the dominant clay minerals in the coarse clays of the soil sampled, and the percentage of these minerals increases with increasing depth. Kaolinite and illite are abundant. Amorphous material and interlayered vermiculite and montmorillonite are dominant in the medium and fine clays. The average content of expanding clays in the entire soil mass is less than 6 percent. Hence, this soil generally has a low plastic-

TABLE 5.—*Engineering*

Soil and map symbol	Suitability as source of—			Suitability for winter grading
	Road subgrade and fill	Topsoil	Gravel	
Allegheny:				
Gravelly loam (AeC, AeC2, AeD2)	Good	Poor	Poor	Good
Stony loam (AgD, AgF)	Fair: stony	Poor	Poor	Good
Allen:				
Loam (AlC2, AlD2, AlE2)	Good	Fair to good	Poor	Good
Stony loam and gravelly loam (AnE, AoF, AhF, AhG) For properties of Hector soils in mapping units AhF and AhG, refer to Hector-Mountainburg soils.	Good	Poor	Poor	Good
Apison (ApB, ApC2, AsC2)	Good	Good: poor in gravelly spots.	Poor	Good
Baxter (BaC, BaD, BaE, BaF)	Good	Poor	Fair	Good
Captina (CaB, CaC, CaC2)	Good	Good	Poor	Fair
Cherokee:				
Silt loam (Ch)	Poor	Fair	Poor	Poor: water table.
Complex, mounded (Ck)	Poor	Fair	Poor	Poor: water table.
Clarksville (ClG)	Good	Poor	Fair	Good
Cleora (Cr)	Good	Good	Poor	Good
Elsah (Ec, Eg)	Good	Poor	Fair	Fair
Enders:				
Gravelly loam (EnC, EnC2, EnD, EnD2)	Poor: unstable; sloughs.	Poor	Poor	Fair
Stony loam (EoD, ErE, ErF) For properties of Allegheny soils in mapping units ErE and ErF, refer to Allegheny stony loam.	Poor: unstable; sloughs.	Poor	Poor	Fair
Fayetteville:				
Fine sandy loam (FaC2, FaD2, FaE2)	Good	Good	Poor	Good
Stony fine sandy loam (FeF, FhF) For properties of Hector soils in mapping unit FhF, refer to Hector-Mountainburg soils.	Good	Poor: stony	Poor	Good
Guin (GuC)	Good	Poor	Fair	Good
Hector-Mountainburg (HmC, HmD, HoF)	Poor: shallow over bedrock.	Poor	Poor	Good

interpretations

Soil features affecting—					
Farm ponds		Land leveling	Agricultural drainage	Irrigation	Terraces and diversions
Reservoir area	Embankment				
No limiting features	No limiting features	Slopes	Good drainage	Slopes	Slopes.
No limiting features	No limiting features	Steep slopes; stones	Good drainage	Steep slopes; stones	Steep slopes; stones.
High seepage rate	High seepage rate	Steep slopes	Good drainage	Slopes	Most slopes too steep.
Steep slopes; high seepage rate.	High seepage rate	Steep slopes; stones	Good drainage	Steep slopes; stones	Steep slopes.
Moderate depth to bedrock.	Moderate seepage rate.	Slopes; moderate depth to bedrock.	Good drainage	Slopes	No limiting features.
High seepage rate; steep slopes.	High seepage rate; steep slopes.	Slopes; coarse fragments.	Good drainage	Slopes	Most slopes too steep.
Limited depth to bedrock in some areas.	No limiting features.	Gentle slopes	Moderately good drainage.	Gentle slopes	No limiting features.
No limiting features	Low strength and stability.	Mounds; poor drainage.	Seasonally high water table; slow permeability.	Poor drainage	Nearly level.
No limiting features	Low strength and stability.	Poor drainage; nearly level.	Poor drainage; nearly level.	Poor drainage	Nearly level.
High seepage rate; steep slopes.	High seepage rate; steep slopes.	Steep slopes; coarse fragments.	Excessive drainage.	Slopes; coarse fragments.	Steep slopes.
Moderate flood hazard; high seepage rate.	Moderate flood hazard; high seepage rate.	Moderate flood hazard.	Good drainage; moderate flood hazard.	Moderate flood hazard.	Nearly level.
High seepage rate; severe flood hazard.	High seepage rate; severe flood hazard.	Severe flood hazard.	Excessive drainage.	Severe flood hazard.	Nearly level; severe flood hazard.
Low seepage rate; adequate depth.	Sloughs; low seepage rate; low strength and stability.	Slopes; thin topsoil	Moderately good drainage.	Slopes	Most slopes too steep.
Low seepage rate; adequate depth.	Sloughs; low seepage rate; low strength and stability.	Steep slopes; thin topsoil.	Moderately good drainage.	Steep slopes	Steep slopes.
High seepage rate	High seepage rate	Slopes too steep	Good drainage	Gentle slopes suitable for sprinkler.	Some slopes too steep.
High seepage rate; steep slopes.	High seepage rate	Steep slopes	Good drainage	Steep slopes	Steep slopes.
High seepage rate	High seepage rate	Slopes	Good drainage	Slopes	No limiting features.
Shallow over bedrock; high seepage rate.	Limited borrow material; high seepage rate.	Shallow over bedrock; slopes.	Good drainage to somewhat excessive drainage.	Poor agricultural soil.	Shallow over bedrock; stones.

TABLE 5.—*Engineering*

Soil and map symbol	Suitability as source of—			Suitability for winter grading
	Road subgrade and fill	Topsoil	Gravel	
Jay (JaB, JaC)	Good	Good	Poor	Fair
Johnsburg (Jo, Js)	Fair: water table.	Fair	Poor	Fair: water table.
Leaf (Le, Lf)	Poor	Fair	Poor	Poor
Linker (LkB, LkC2, LnC2, LnD)	Good	Good; poor in gravelly spots.	Poor	Good
Montevallo (MoD, MoE)	Poor: shallow over bedrock.	Poor: stones	Poor	Good
Nixa (NaC, NaD)	Good	Poor	Fair to poor	Good
Pembroke:				
Silt loam (PeB, PeC2)	Good	Good to fair	Poor: gravel below a depth of 3 feet.	Good
Gravelly silt loam (PgC2)	Good	Poor	Fair	Good
Pickwick:				
Gravelly loam (PkC2, PkD2)	Good	Poor	Fair	Good
Silt loam (PsB, PsC2)	Good	Good to fair	Poor	Good
Razort:				
Silt loam and loam (Ra, Rk)	Good	Good	Poor	Good
Gravelly silt loam (Rg)	Good	Poor	Fair	Good
Rock land (Ro)	Poor	Poor	Poor	Poor
Samba (Sa, Sb)	Poor	Fair	Poor	Poor
Savannah (SfB, SfC2)	Good	Good	Poor	Fair
Sloan (Sn)	Good	Good	Poor	Fair

interpretations—Continued

Soil features affecting—					
Farm ponds		Land leveling	Agricultural drainage	Irrigation	Terraces and diversions
Reservoir area	Embankment				
No limiting features	No limiting features	Gentle slopes	Good drainage	Slopes	No limiting features.
No limiting features	No limiting features	Somewhat poor drainage.	Slow permeability; seasonally high water table.	Somewhat poor drainage; slow permeability.	No limiting features; gentle slopes.
No limiting features	Low strength and stability.	Poor drainage; some areas mounded.	Very slow permeability; seasonally high water table.	Poor drainage; very slow permeability.	Nearly level.
Moderate depth to bedrock.	Moderate seepage rate.	Slopes; moderate depth to bedrock.	Good drainage	Slopes	No limiting features.
Shallow over bedrock; high seepage rate.	Limited borrow material; high seepage rate.	Shallow over bedrock; slopes.	Somewhat excessive drainage.	Poor agricultural soil.	Shallow over bedrock; stones.
Coarse fragments	Coarse fragments; high seepage rate.	Slopes; coarse fragments.	Moderately good drainage.	Coarse fragments; low water capacity.	Coarse fragments.
Moderate seepage rate.	Moderate seepage rate.	Slopes	Good drainage	Slopes	No limiting features.
Moderate to high seepage rate.	Moderate to high seepage rate.	Slopes	Good drainage	Slopes	No limiting features.
Moderate to high seepage rate.	Moderate to high seepage rate.	Slopes	Good drainage	Slopes	No limiting features.
Limited depth to bedrock in places.	Moderate seepage rate.	Slopes	Good drainage	Slopes	No limiting features.
High seepage rate	High seepage rate	Moderate flood hazard in places.	Good drainage; moderate flood hazard in places.	No limiting features	Nearly level.
High seepage rate	High seepage rate	Moderate flood hazard; coarse fragments.	Good drainage; moderate flood hazard.	Coarse fragments	Nearly level.
Boulders; rock outcrops.	Boulders; rock outcrops.	Boulders; rock outcrops.	Excessive drainage	Boulders; rock outcrops.	Boulders; rock outcrops.
No limiting features	No limiting features	Seasonally high water table; mounds in places.	Poor drainage; very slow permeability; mounds.	Poor drainage; mounds in places.	No limiting features.
No limiting features	No limiting features	Slopes	Moderately good drainage.	Slopes	No limiting features.
Moderate flood hazard; high seepage rate.	Moderate flood hazard; high seepage rate.	Moderate flood hazard.	Moderate flood hazard.	Moderate flood hazard.	Nearly level.

TABLE 5.—*Engineering*

Soil and map symbol	Suitability as source of—			Suitability for winter grading
	Road subgrade and fill	Topsoil	Gravel	
Sogn (So)	Poor	Poor	Poor	Good
Summit:				
Silty clay (Sp, SsA, SsB, SsC2, SsD2)	Poor: high shrink-swell potential.	Poor	Poor	Poor
Stony silty clay (StD2, StE2)	Poor: high shrink-swell potential.	Poor	Poor	Fair
Taloka (Ta, ToA, ToB)	Fair	Poor	Poor	Poor

ity index. The clay mineralogy indicates no serious limitation to its use as engineering material.

Johnsburg silt loam.—Johnsburg soils are somewhat poorly drained and have a fragipan. They formed in silty material.

Vermiculite and kaolinite are the dominant clay minerals. As shown in table 6, profile 72–1 contains slightly more kaolinite than profile 72–16 and less montmorillonite and interlayered vermiculite and montmorillonite in its medium and fine clays. The content of expanding clays is not high, and both profiles have a low plasticity index.

Savannah silt loam.—Savannah soils are similar to Johnsburg soils except that they are moderately well drained.

As shown in table 6, the mineralogy of the two profiles sampled is essentially a mixture of vermiculite and kaolinite. Vermiculite is dominant in the coarse clays of profile 72–2, and kaolinite is the more abundant in the coarse clays of profile 72–3. Illite, interlayered vermiculite and illite, and quartz make up the rest of the coarse clay

TABLE 6.—*Clay mineralogy*

[Dashed lines mean

Soil	Sample number	Horizon	Depth from surface	Fine silt (5 to 2 microns)		Coarse clay (2 microns to 0.2 micron)	
				Percentage of sample	Mineralogy	Percentage of sample	Mineralogy
			In.				
Allen loam.	S–63–Ark–72–12–1	Ap	0–8	4. 6	80 percent quartz, 15 percent illite, 3 percent kaolinite, 2 percent potash feldspar.	4. 9	40 percent kaolinite, 25 percent illite, 20 percent vermiculite, 15 percent quartz.
	S–63–Ark–72–12–4	B22t	29–39	4. 3	80 percent quartz, 15 percent illite, 4 percent kaolinite, 1 percent potash feldspar.	16. 3	45 percent kaolinite, 30 percent vermiculite, 15 percent illite, 8 percent quartz, 2 percent gibbsite.
	S–63–Ark–72–12–5	C	39–45	5. 8	80 percent quartz, 12 percent illite, 5 percent kaolinite, 2 percent potash feldspar, 1 percent plagioclase feldspar.	12. 0	40 percent kaolinite, 30 percent vermiculite, 18 percent illite, 8 percent quartz, 2 percent montmorillonite, 2 percent gibbsite.

interpretations—Continued

Soil features affecting—					
Farm ponds		Land leveling	Agricultural drainage	Irrigation	Terraces and diversions
Reservoir area	Embankment				
Rocks; shallow over bedrock.	Rocks; limited borrow material.	Slopes; rocks; shallow over bedrock.	Excessive drainage	Poor agricultural soil.	Shallow over bedrock; rocks.
No limiting features	Low seepage rate; low strength and stability.	Slopes too steep in places.	Very slow permeability; ponding in level areas.	Fine texture; slopes.	High shrink-swell potential; slopes.
No limiting features	Low seepage rate; low strength and stability.	Slopes; stones	Moderately good drainage.	Steep slopes; stones	Steep slopes; high shrink-swell potential; stones.
No limiting features	Low seepage rate; low strength and stability.	Mounds or gentle slopes in places.	Very slow permeability.	Mounds or gentle slopes in places.	Mounds or gentle slopes in places.

fraction in each profile. There are significant amounts of montmorillonite or interlayered vermiculite and montmorillonite in the medium clays. Amorphous material and montmorillonite are dominant in the fine clays. The content of expanding clays is about 10 percent; hence, the plasticity index is not high.

Nonfarm Uses of the Soils

Table 7, p. 70, gives the degree and kind of limitation of the soils of Washington County for selected nonfarm uses. The degree of limitation reflects all the features of a given soil, to a depth of 5 feet, that affect a particular use. *Very slight* indicates that there is no limitation or that the limitation is minor and very easily overcome; *slight* indicates that the limitation is not serious and is easily overcome; *moderate* indicates that the limitation generally can be corrected by practical means; *severe*, that the limitation is difficult to overcome; and *very severe*, that the use of the soil for a particular purpose generally is impractical.

of selected soils

absence of data]

Medium clay (0.2 to 0.08 micron)		Fine clay (less than 0.08 micron)		Total percentage of clay	Calculated cation-exchange capacity of clay fraction	Percentage of free iron as Fe_2O_3
Percentage of sample	Mineralogy	Percentage of sample	Mineralogy			
					Meq./100 gm.	
7. 4	70 percent amorphous material, 20 percent kaolinite, 10 percent illite.	(1)		12. 3		1. 4
6. 3	45 percent interstratified vermiculite and montmorillonite, 35 percent amorphous material, 10 percent illite, 10 percent kaolinite.	2. 6	45 percent montmorillonite, 40 percent amorphous material, 10 percent vermiculite and montmorillonite, 5 percent illite.	25. 2	44	2. 1
7. 1	45 percent interstratified vermiculite and montmorillonite, 40 percent amorphous material, 10 percent illite, 5 percent kaolinite.	. 4	45 percent montmorillonite, 30 percent amorphous material, 20 percent interstratified vermiculite and montmorillonite, 5 percent illite.	19. 5	43	2. 0

TABLE 6.—*Clay mineralogy*

Soil	Sample number	Horizon	Depth from surface	Fine silt (5 to 2 microns)		Coarse clay (2 microns to 0.2 micron)	
				Percentage of sample	Mineralogy	Percentage of sample	Mineralogy
			In.				
Fayetteville fine sandy loam.	S–63–Ark–72–7–1	Ap	0–9	2. 5	80 percent quartz, 10 percent illite, 6 percent kaolinite, 3 percent potash feldspar, 1 percent plagioclase feldspar.	6. 6	30 percent kaolinite, 20 percent illite, 20 percent vermiculite, 15 percent quartz, 10 percent illite and vermiculite, 5 percent gibbsite.
	S–63–Ark–72–7–3	B1	16–25	2. 0	75 percent quartz, 15 percent illite, 5 percent kaolinite, 4 percent potash feldspar, 1 percent plagioclase feldspar.	10. 9	30 percent kaolinite, 30 percent vermiculite, 20 percent illite, 10 percent quartz, 5 percent illite and vermiculite, 5 percent gibbsite.
	S–63–Ark–72–7–5	B22t	36–44	1. 1	75 percent quartz, 15 percent illite, 8 percent kaolinite, 2 percent potash feldspar.	13. 3	30 percent kaolinite, 30 percent vermiculite, 20 percent illite, 10 percent illite and vermiculite, 5 percent quartz, 5 percent gibbsite.
	S–63–Ark–72–7–5	B22t	52–67	1. 4	75 percent quartz, 15 percent illite, 8 percent kaolinite, 2 percent potash feldspar.	7. 8	30 percent kaolinite, 30 percent vermiculite, 20 percent illite, 10 percent quartz, 5 percent illite and vermiculite, 5 percent gibbsite.
Jay silt loam.	S–63–Ark–72–4–1	Ap	0–9	2. 1	90 percent quartz, 6 percent illite, 3 percent potash feldspar, 1 percent plagioclase feldspar.	4. 3	35 percent interstratified vermiculite and montmorillonite, 30 percent kaolinite, 20 percent illite, 15 percent quartz.
	S–63–Ark–72–4–3	B2t	16–25	4. 1	75 percent quartz, 15 percent illite, 5 percent kaolinite, 4 percent vermiculite, 1 percent potash feldspar.	1. 2	35 percent interstratified vermiculite and illite, 25 percent illite, 20 percent kaolinite, 10 percent interstratified vermiculite and montmorillonite, 10 percent quartz.
	S–63–Ark–72–4–5	Bx2	29–46	6. 1	65 percent quartz, 20 percent illite, 8 percent kaolinite, 5 percent vermiculite, 2 percent potash feldspar.	7. 9	40 percent interstratified vermiculite and illite, 30 percent kaolinite, 20 percent illite, 10 percent quartz.
	S–63–Ark–72–4–5	Bx2	46–56	-------	70 percent quartz, 15 percent illite, 8 percent kaolinite, 6 percent potash feldspar, 1 percent plagioclase feldspar.	11. 8	45 percent interstratified vermiculite and montmorillonite, 30 percent kaolinite, 15 percent illite, 10 percent quartz.
Johnsburg silt loam.	S–63–Ark–72–1–2	Ap2	5–8	5. 1	75 percent quartz, 10 percent illite, 8 percent kaolinite, 5 percent vermiculite, 1 percent potash feldspar, 1 percent plagioclase feldspar.	7. 8	40 percent kaolinite, 35 percent vermiculite, 15 percent illite, 10 percent quartz.

See footnote at end of table.

of selected soils—Continued

Medium clay (0.2 to 0.08 micron)		Fine clay (less than 0.08 micron)		Total percentage of clay	Calculated cation-exchange capacity of clay fraction	Percentage of free iron as Fe_2O_3
Percentage of sample	Mineralogy	Percentage of sample	Mineralogy			
					Meq./100 gm.	
5. 7	40 percent kaolinite, 40 percent illite, 20 percent amorphous material.	(1)	----------	12. 3	----------	1. 6
3. 7	30 percent montmorillonite, 20 percent vermiculite, 15 percent amorphous material, 15 percent interstratified vermiculite and montmorillonite, 10 percent illite, 10 percent kaolinite.	1. 0	60 percent amorphous material, 20 percent montmorillonite, 10 percent vermiculite, 10 percent interstratified vermiculite and montmorillonite.	15. 6	40	2. 8
6. 7	40 percent amorphous material, 20 percent montmorillonite, 15 percent vermiculite, 10 percent illite, 10 percent kaolinite, 5 percent interstratified vermiculite and montmorillonite.	2. 7	50 percent amorphous material, 50 percent montmorillonite and vermiculite.	22. 7	38	3. 4
30. 3	75 percent amorphous material, 10 percent illite, 10 percent interstratified vermiculite and montmorillonite, 5 percent montmorillonite.	(1)	----------	38. 1	35	4. 3
1. 9	50 percent vermiculite and montmorillonite, 25 percent amorphous material, 15 percent illite, 10 percent kaolinite.	(1)	----------	6. 2	----------	. 8
15. 3	55 percent amorphous material, 30 percent interstratified vermiculite and montmorillonite, 10 percent illite, 5 percent kaolinite.	3. 4	60 percent montmorillonite, 40 percent amorphous material.	19. 9	48	1. 3
8. 4	60 percent amorphous material, 25 percent interstratified vermiculite and montmorillonite, 15 percent illite.	2. 2	55 percent montmorillonite, 45 percent amorphous material.	18. 5	52	1. 6
6. 2	40 percent interstratified vermiculite and montmorillonite, 40 percent amorphous material, 20 percent illite.	3. 6	50 percent amorphous material, 50 percent montmorillonite.	21. 6	53	1. 6
1. 9	50 percent vermiculite, 25 percent interstratified vermiculite and illite, 15 percent kaolinite, 10 percent amorphous material.	1. 7	60 percent amorphous material, 40 percent interstratified vermiculite and montmorillonite.	11. 4	78	. 6

TABLE 6.—*Clay mineralogy*

Soil	Sample number	Horizon	Depth from surface	Fine silt (5 to 2 microns)		Coarse clay (2 microns to 0.2 micron)	
				Percentage of sample	Mineralogy	Percentage of sample	Mineralogy
			In.				
Johnsburg silt loam—Con.	S–63–Ark–72–1–4	B2t	16–23	6. 3	80 percent quartz, 12 percent illite, 7 percent kaolinite, 1 percent potash feldspar.	8. 5	40 percent kaolinite, 20 percent vermiculite, 18 percent illite, 12 percent quartz, 10 percent interstratified vermiculite and illite.
	S–63–Ark–72–1–5	Bxg	23–58	5. 6	75 percent quartz, 17 percent illite, 7 percent kaolinite, 1 percent potash feldspar.	16. 5	40 percent kaolinite, 25 percent vermiculite, 15 percent interstratified vermiculite and illite, 10 percent illite, 10 percent quartz.
Johnsburg silt loam.	S–63–Ark–72–16–1	Ap	0–6	4. 1	75 percent quartz, 15 percent illite, 8 percent kaolinite, 2 percent potash feldspar.	3. 9	35 percent vermiculite, 35 percent kaolinite, 20 percent illite, 10 percent quartz.
	S–63–Ark–72–16–3	Btg	9–20	6. 5	78 percent quartz, 12 percent illite, 9 percent kaolinite, 1 percent potash feldspar.	8. 4	35 percent vermiculite, 35 percent kaolinite, 22 percent illite, 8 percent quartz.
	S–63–Ark–72–16–4	Bxg	20–40	-------	85 percent quartz, 7 percent illite, 5 percent kaolinite, 2 percent potash feldspar, 1 percent plagioclase feldspar.	10. 0	40 percent vermiculite, 35 percent kaolinite, 20 percent illite, 5 percent quartz.
Savannah fine sandy loam.	S–63–Ark–72–2–2	A3	5–13	4. 7	80 percent quartz, 10 percent illite, 9 percent kaolinite, 1 percent potash feldspar.	5. 8	35 percent vermiculite, 30 percent kaolinite, 20 percent illite, 15 percent quartz.
	S–63–Ark–72–2–4	B22t	17–25	5. 3	80 percent quartz, 10 percent illite, 9 percent kaolinite, 1 percent potash feldspar.	13. 6	35 percent vermiculite, 30 percent kaolinite, 15 percent illite, 15 percent quartz, 5 percent montmorillonite.
	S–63–Ark–72–2–6	Bx2	30–57	6. 8	80 percent quartz, 10 percent illite, 8 percent kaolinite, 2 percent potash feldspar.	15. 9	30 percent vermiculite, 30 percent kaolinite, 20 percent illite, 10 percent montmorillonite, 10 percent quartz.
Savannah fine sandy loam.	S–63–Ark–72–3–1	Ap	0–5	3. 4	80 percent quartz, 12 percent illite, 6 percent kaolinite, 2 percent potash feldspar.	4. 4	30 percent kaolinite, 30 percent interstratified vermiculite and illite, 30 percent illite, 10 percent quartz.
	S–63–Ark–72–3–3	B2t	11–22	4. 5	75 percent quartz, 15 percent illite, 7 percent kaolinite, 3 percent potash feldspar.	11. 9	40 percent kaolinite, 20 percent interstratified vermiculite and illite, 15 percent vermiculite, 15 percent illite, 10 percent quartz.
	S–63–Ark–72–3–5	Bx2	29–70	4. 2	75 percent quartz, 16 percent illite, 5 percent kaolinite, 3 percent vermiculite, 1 percent potash feldspar.	15. 3	35 percent kaolinite, 35 percent vermiculite, 10 percent interstratified vermiculite and illite, 10 percent illite, 10 percent quartz.

[1] Trace.

of selected soils—Continued

Medium clay (0.2 to 0.08 micron)		Fine clay (less than 0.08 micron)		Total percentage of clay	Calculated cation-exchange capacity of clay fraction	Percentage of free iron as Fe_2O_3
Percentage of sample	Mineralogy	Percentage of sample	Mineralogy			
					Meq./100 gm.	
2. 7	35 percent vermiculite, 30 percent interstratified vermiculite and illite, 25 percent amorphous material, 10 percent kaolinite.	2. 3	50 percent amorphous material, 50 percent montmorillonite.	13. 5	51	. 6
6. 0	30 percent vermiculite, 30 percent interstratified vermiculite and illite, 20 percent montmorillonite, 10 percent amorphous material, 10 percent kaolinite.	3. 2	50 percent amorphous material, 50 percent montmorillonite.	25. 7	57	1. 5
4. 4	75 percent interstratified vermiculite and montmorillonite, 10 percent kaolinite, 8 percent amorphous material, 7 percent illite.	(1)	----------	8. 3	----------	. 9
7. 5	67 percent interstratified vermiculite and montmorillonite, 15 percent amorphous material, 10 percent kaolinite, 8 percent illite.	1. 3	75 percent montmorillonite, 25 percent amorphous material.	17. 2	57	1. 4
8. 7	40 percent vermiculite, 20 percent interstratified vermiculite and montmorillonite, 15 percent amorphous material, 15 percent illite, 10 percent kaolinite.	3. 0	70 percent montmorillonite, 30 percent amorphous material.	21. 7	53	. 7
17. 4	35 percent amorphous material, 30 percent kaolinite, 25 percent vermiculite, 10 percent illite.	. 3	75 percent amorphous material, 25 percent montmorillonite.	23. 5	42	. 9
5. 9	40 percent interstratified vermiculite and montmorillonite, 30 percent interstratified vermiculite and illite, 10 percent illite, 10 percent kaolinite, 10 percent amorphous material.	3. 4	80 percent amorphous material, 20 percent montmorillonite.	22. 9	46	1. 4
20. 2	40 percent montmorillonite, 20 percent interstratified vermiculite and illite, 15 percent amorphous material, 10 percent interstratified vermiculite and montmorillonite, 10 percent kaolinite, 5 percent illite.	. 4	60 percent amorphous material, 40 percent montmorillonite.	36. 5	47	1. 9
. 9	40 percent interstratified vermiculite and illite, 30 percent kaolinite, 15 percent montmorillonite, 15 percent amorphous material.	(1)	----------	5. 3	124	----------
5. 2	45 percent amorphous material, 30 percent montmorillonite, 20 percent interstratified vermiculite and illite, 5 percent kaolinite.	1. 9	55 percent montmorillonite, 45 percent amorphous material.	19. 0	49	1. 5
3. 8	40 percent amorphous material, 35 percent montmorillonite, 20 percent interstratified vermiculite and illite, 5 percent kaolinite.	1. 9	50 percent montmorillonite, 50 percent amorphous material.	21. 0	49	2. 4

TABLE 7.—*Degree and kind of limitation for building*

Soil	Slope	Dwellings served by public or community sewage system	Dwellings served by septic tank filter fields
	Pct.		
Allegheny:			
(AeC, AeC2)	3 to 8	Slight	Slight
(AeD2, AgD)	8 to 12	Slight	Slight
(AgF)	8 to 40	Severe: slope	Severe: slope
Allen:			
(AlC2, AlD2)	3 to 12	Very slight	Slight
(AlE2, AnE)	8 to 20	Moderate: slope	Severe: slope
(AoF, AhF, AhG) For Hector part of mapping units AhF and AhG, refer to Hector-Mountainburg (HoF).	12 to 55	Severe: slope	Severe: slope
Apison (ApB, ApC2, AsC2)	1 to 8	Slight	Slight
Baxter:			
(BaC)	3 to 8	Slight	Slight
(BaD)	8 to 12	Slight	Slight
(BaE)	12 to 20	Moderate: slope; fractured, partly weathered chert at a depth of 3 to 6 feet.	Moderate: slope; fractured, partly weathered chert at a depth of 3 to 6 feet.
(BaF)	20 to 45	Severe: slope; chert at a depth of 3 to 6 feet.	Severe: slope; chert at a depth of 3 to 6 feet.
Captina (CaB, CaC, CaC2)	1 to 6	Slight	Severe: slow percolation rate.
Cherokee (Ch, Ck)	0 to 1	Very severe: seasonal high water table.	Severe: seasonal high water table; slow percolation rate.
Clarksville (ClG)	12 to 60	Severe: Chert bed at a depth of 2 to 4 feet; slope.	Severe: chert bed at a depth of 2 to 4 feet; slope.
Cleora (Cr)	0 to 3	Severe: seasonal high water table; moderate flood hazard.	Severe: seasonal high water table; moderate flood hazard.
Elsah (Ec, Eg)	0 to 3	Very severe: seasonal high water table; severe flood hazard.	Severe: seasonal high water table; severe flood hazard.
Enders:			
(EnC, EnC2)	3 to 8	Moderate: Moderate bearing capacity; moderate shrink-swell potential.	Severe: slow percolation rate; moderate bearing capacity; moderate shrink-swell potential.
(EnD, EnD2)	8 to 12	Severe: Moderate bearing capacity; moderate shrink-swell potential; slope.	Severe: slow percolation; moderate bearing capacity; moderate shrink-swell potential.
(EoD, ErE, ErF) For Allegheny part of mapping units ErE and ErF, refer to Allegheny (AgF).	3 to 40	Severe: moderate bearing capacity; moderate shrink-swell potential.	Severe: slow percolation rate; moderate bearing capacity; moderate shrink-swell potential.
Fayetteville:			
(FaC2)	3 to 8	Very slight	Slight
(FaD2)	8 to 12	Slight	Slight
(FaE2)	12 to 20	Moderate: slope	Moderate: slope
(FeF, FhF) For Hector part of mapping unit FhF, refer to Hector-Mountainburg (HoF).	12 to 40	Severe: slope	Severe: slope

sites, recreational facilities, and trafficways

Recreation		Light industry	Trafficways
Campsites or picnic areas	Intensive play areas		
Slight	Slight	Slight	Slight.
Slight	Moderate: moderate trafficability.	Moderate: slope	Slight.
Severe: poor trafficability; slope.	Severe: poor trafficabliity; slope.	Severe: slope	Severe: slope; erodibility.
Very slight	Moderate	Very slight	Very slight.
Severe: slope; poor trafficability.	Severe: slope; poor trafficability.	Severe: slope	Moderate: slope; erodibility.
Severe: poor trafficability; slope.	Severe: poor trafficablity; slope.	Severe: slope	Moderate: slope; erodibility.
Very slight	Very slight	Very slight	Very slight.
Slight	Moderate: moderate trafficability.	Slight	Slight.
Moderate: moderate trafficability.	Moderate: moderate trafficability; slope.	Moderate: slope	Slight.
Severe: poor trafficability	Severe: slope; poor trafficability.	Severe: slope; poor trafficability.	Moderate: slope.
Severe: slope; poor trafficability.	Severe: slope; poor trafficability.	Severe: slope; chert at a depth of 3 to 6 feet.	Severe: coarse fragments.
Slight	Slight	Slight	Slight.
Severe: poor trafficability	Very severe: poor trafficability.	Severe: seasonal high water table; low bearing capacity.	Severe: seasonal high water table; low traffic-supporting capacity.
Severe: slope; poor trafficability.	Very severe: slope; poor trafficability.	Severe: chert bed at a depth of 2 to 4 feet; slope.	Severe: chert bed at a depth of 2 to 4 feet; slope.
Severe: poor trafficability	Severe: poor trafficability	Severe: seasonal high water table; moderate flood hazard.	Moderate: seasonal high water table; moderate flood hazard.
Severe: poor trafficability	Severe: poor trafficability	Very severe: seasonal high water table; moderate flood hazard.	Severe: seasonal high water table; severe flood hazard.
Moderate: moderate trafficability; erodibility.	Slight	Severe: moderate bearing capacity; moderate shrink-swell potential.	Severe: low traffic-supporting capacity; erodibility.
Moderate: moderate trafficability; moderate erodibility.	Moderate: slope; moderate trafficability.	Severe: moderate bearing capacity; moderate shrink-swell potential.	Severe: low traffic-supporting capacity; erodibility.
Severe: poor trafficability; erodibility; slope.	Very severe: poor trafficability; slope.	Severe: moderate bearing capacity; slope.	Severe: low traffic-supporting capacity.
Very slight	Slight	Very slight	Slight.
Moderate: moderate trafficability.	Moderate: moderate trafficability; erodibility.	Slight	Slight.
Severe: erodibility; poor trafficability.	Severe: slope	Severe: slope	Moderate: erodibility.
Severe: poor trafficability; erodibility.	Severe: poor trafficability; slope.	Severe: slope	Severe: erodibility; slope.

TABLE 7.—*Degree and kind of limitation for building*

Soil	Slope	Dwellings served by public or community sewage system	Dwellings served by septic tank filter fields
	Pct.		
Guin (GuC)	3 to 8	Slight	Slight
Hector-Mountainburg: (HmC, HmD)	3 to 12	Severe: shallow over rock	Severe: shallow over rock
(HoF)	3 to 40	Severe: shallow over rock	Severe: shallow over rock
Jay (JaB, JaC)	1 to 8	Slight	Severe: slow percolation rate
Johnsburg (Jo, Js)	0 to 2	Severe: seasonal high water table	Severe: slow percolation rate; seasonal high water table.
Leaf (Le, Lf)	0 to 1	Very severe: seasonal high water table.	Severe: slow percolation rate; seasonal high water table.
Linker: (LkB, LkC2, LnC2)	1 to 8	Slight	Slight
(LnD)	8 to 12	Slight	Slight
Montevallo (MoD, MoE)	3 to 25	Severe: shallow over rock	Severe: shallow over rock
Nixa (NaC, NaD)	3 to 12	Slight	Severe: slow percolation rate
Pembroke (PeB, PeC2, PgC2)	1 to 8	Very slight	Slight
Pickwick: (PsB, PsC2, PkC2)	1 to 8	Very slight	Slight
(PkD2)	8 to 12	Slight	Slight
Razort: (Ra, Rg)	0 to 2	Severe: seasonal high water table; severe flood hazard.	Severe: seasonal high water table; severe flood hazard.
(Rk)	0 to 2	Moderate: moderate flood hazard	Moderate: moderate flood hazard
Rock land (Ro)	3 to 60	Very severe: slope; shallow over rock.	Severe: slope; shallow over rock
Samba (Sa, Sb)	0 to 1	Very severe: low bearing capacity; high shrink-swell potential; seasonal high water table.	Severe: slow percolation rate; low bearing capacity; high shrink-swell potential.
Savannah (SfB, SfC2)	1 to 8	Slight	Severe: slow percolation rate
Sloan (Sn)	0 to 3	Severe: severe flood hazard; seasonal high water table.	Severe: severe flood hazard; seasonal high water table.
Sogn (So)	3 to 12	Severe: shallow over rock	Severe: shallow over rock
Summit: (Sp, SsA)	0 to 1	Severe: low bearing capacity; high shrink-swell potential.	Severe: slow percolation rate; low bearing capacity; high shrink-swell potential; seasonal high water table.
(SsB, SsC2, SsD2, StD2, StE2)	1 to 25	Severe: high shrink-swell potential; low bearing capacity.	Severe: slow percolation rate; high shrink-swell potential.
Taloka (Ta, ToA, ToB)	0 to 3	Moderate: moderate bearing capacity; moderate shrink-swell potential; seasonal high water table.	Severe: slow percolation rate; moderate bearing capacity; moderate shrink-swell potential; seasonal high water table.

sites, recreational facilities, and trafficways—Continued

Recreation		Light industry	Trafficways
Campsites or picnic areas	Intensive play areas		
Slight	Slight	Slight	Slight.
Moderate: moderate trafficability.	Severe: poor trafficability	Severe: shallow over rock	Moderate: shallow over rock.
Severe: poor trafficability	Severe: shallow over rock	Severe: shallow over rock	Severe: shallow over rock.
Slight	Slight	Slight	Slight.
Severe: poor trafficability	Severe: poor trafficability	Severe: low bearing capacity; seasonal high water table.	Severe: low traffic-supporting capacity; seasonal high water table.
Severe: poor trafficability	Very severe: poor trafficability.	Severe: seasonal high water table; low bearing capacity.	Severe: seasonal high water table; low traffic-supporting capacity.
Very slight Moderate: moderate trafficability.	Very slight Moderate: moderate trafficability; slope.	Very slight Moderate: slope	Very slight. Slight.
Severe: poor trafficability; erodibility.	Very severe: poor trafficability; shallow over rock.	Severe: shallow over rock	Severe: shallow over rock.
Slight	Moderate: moderate trafficability.	Slight	Slight.
Very slight	Very slight	Very slight	Very slight.
Very slight Slight	Very slight Moderate: slope; moderate trafficability.	Very slight Moderate: slope	Very slight. Slight.
Severe: poor trafficability	Very severe: poor trafficability.	Severe: severe flood hazard	Severe: severe flood hazard; low traffic-supporting capacity.
Slight	Slight	Moderate: flood hazard	Slight.
Very severe: slope; stony and rocky; poor trafficability.	Very severe: slope; stony and rocky; poor trafficability.	Very severe: slope; shallow over rock.	Very severe: slope; shallow over rock.
Very severe: poor trafficability	Very severe: poor trafficability	Very severe: seasonal high water table; low bearing capacity.	Very severe: seasonal high water table; low traffic-supporting capacity.
Slight	Slight	Slight	Slight.
Severe: poor trafficability	Very severe: poor trafficability.	Severe: severe flood hazard; low bearing capacity; seasonal high water table.	Severe: severe flood hazard; low traffic-supporting capacity; seasonal high water table.
Severe: poor trafficability	Very severe: poor trafficability; shallow over rock.	Very severe: slope; shallow over rock.	Very severe: shallow over rock.
Severe: poor trafficability; seasonal high water table.	Very severe: poor trafficability; seasonal high water table.	Very severe: low bearing capacity; high shrink-swell potential; seasonal high water table.	Very severe: high shrink-swell potential; low traffic-supporting capacity.
Severe: poor trafficability	Severe: poor trafficability	Very severe: low bearing capacity; high shrink-swell potential.	Very severe: high shrink-swell potential; low traffic-supporting capacity.
Moderate: moderate trafficability.	Moderate: moderate trafficability.	Moderate: moderate bearing capacity.	Severe: low traffic-supporting capacity.

The features considered significant in determining the limitations of the soils include slope, percolation rate, erosion hazard, water table, flood hazard, shrink-swell potential, bearing capacity, traffic-supporting capacity, depth to rock, coarse fragments, and trafficability.

The percolation rate is a most important consideration if the soils are to be used as septic tank filter fields. A percolation rate slower than 75 minutes per inch constitutes a severe limitation, and a rate of between 45 and 75 minutes per inch a moderate limitation.

The water table is the upper surface of free water in the soil. It may be perched, that is, separated from a lower water table by a dry zone. Both the depth to the water table and the length of time the table remains at that depth are considered. For example, if the water table is below a depth of 15 inches during periods of heavy use, the limitation for use of the soils as trafficways is moderate, but if it is above a depth of 15 inches during any part of this period, the limitation is severe. If the water table is ordinarily below a depth of 30 inches and is never above 15 inches, the limitation for use of the soils for building foundations is slight or very slight. If the water table is within 4 feet of the surface at any time, the limitation for use of the soils as septic tank filter fields is severe.

Shrink-swell potential is the potential change in volume with change in moisture content, that is, the extent to which soil shrinks when dry and swells when wet. This potential change is influenced by the amount and kind of clay in the soil. Damage to buildings is often caused by the shrinking and swelling of the soil after construction.

Bearing capacity is based on estimates of the maximum load that a soil can support when compacted. Engineers and others should not apply specific values to the ratings of bearing capacity given in table 7, page 70.

Traffic-supporting capacity is the ability of undisturbed soil to support moving loads. It indicates the suitability of the soil for use as subgrade.

The trafficability of a soil is determined by the ease with which people can move about on foot or in small vehicles. Loamy soils that have a water table below a depth of 30 inches during periods of heavy use and are not subject to flooding generally have only very slight or slight limitations. Clayey soils have severe limitations.

For dwellings, the degree of limitation depends on percolation rate, stability, flood hazard, natural wetness, depth to water table, topography, and suitability for lawn grasses, shrubs, and trees. If percolation is adequate for the disposal of the septic tank effluent, the limitation is the same for dwellings served by sewerage systems as for those that require septic tanks.

The degree of limitation for use as picnic sites, campsites, playgrounds, and parks depends on productivity, wetness, flood hazard, topography, accessibility, and suitability of the soils for impounding water.

The limitation for light industrial use applies to structures of less than three stories. The degree of limitation depends on bearing capacity, shrink-swell potential, depth to water table, flood hazard, natural drainage, topography, and depth to bedrock.

For trafficways, the degree of limitation depends on potential for corrosion of metal conduits, stability, shrink-swell potential, topography, flood hazard, depth to water table, and permeability. Soils that have a high water table, are slowly permeable, or are subject to flooding require intensive drainage or flood-control measures to make them suitable for heavy construction. A fragipan presents problems of drainage, and a high shrink-swell potential presents problems of stability that may be very difficult to resolve.

The information in this section is intended only as a guide in planning nonfarm uses of the soils and does not eliminate the need for onsite investigation before construction. As much as 15 percent of an area designated on the map as a specific soil may consist of small spots of other soils that have limitations that differ from the specified soil. The kinds and degrees of limitation vary widely within the county. The information in this section will help to locate desirable sites for buildings, residences, and recreation areas. It will also help to determine the feasibility of construction where the limitations are severe or very severe.

Use of the Soils for Woodland [5]

A little more than half of Washington County is woodland. The major forest cover types (7) are (1) white oak-red oak-black oak, (2) post oak-black oak (transition to blackjack oak and hickory), (3) river birch-sycamore, and (4) shortleaf pine-oak.

A suitable secondary use for many areas of woodland is grazing. The grasses, legumes, and forbs and many of the woody plants in the understory of woodland stands can be utilized for forage. Grazing must be controlled so that desirable tree seedlings are not damaged and the forage plants are not overgrazed.

This section gives information both about the production of wood crops and about the production of forage in woodland.

Production of Wood Crops

Table 8 gives information that will help owners and operators of woodland to establish, manage, and harvest tree crops. The information is based on detailed plot studies, measurements of different trees on different soils, published and unpublished records, and the experience and judgment of technicians who work with tree crops in this area.

Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect growth of trees and management of the stands. The soils of Washington County have been assigned to 13 woodland groups. Each group consists of soils that are about the same in suitability for wood crops, potential productivity, and management requirements. These factors depend on such soil characteristics as depth; arrangement of layers in the profile; texture, drainage, color, reaction, and consistence of each layer; content of humus and minerals; degree of erosion; and slope. Also considered was slope aspect, or exposure. Aspect has so much effect on productivity and species suitability that, for some soils, north-facing slopes and south-facing slopes are in different woodland groups.

The column headings in table 8 are explained in the following paragraphs.

[5] MAX D. BOLAR, woodland conservationist, and IVAN R. PORTER, range conservationist, Soil Conservation Service, helped to prepare this section.

Potential productivity: The important wood crops for the soils of each group are listed under this heading, and each is rated according to site index range and average yearly growth. Site index range is the average height of the dominant trees in a stand, to the nearest 5- or 10-foot interval, at age 30 for cottonwood, at age 35 for sycamore, and at age 50 for other species. The higher the site index range, the higher the potential productivity of the soil for wood crops. Site studies indicate that a soil of a given type and slope is more productive of wood crops on cool, or northerly, slopes than on hot, or southerly, slopes. If the slope is more than 8 percent, cool slopes have a 5- to 6-foot higher site index than hot slopes.

Preferred species: Under this heading are listed the kinds of trees to be left in improvement cuttings and the kinds to be chosen for planting in establishing a stand.

Management problems: Under this heading are given the nature and degree of soil-related limitations that present problems in the management of woodland.

Erosion hazard depends on the steepness of the slope, the erodibility of the soil, and the soil depth.

Equipment limitation refers to soil characteristics and topographic features that restrict or prohibit the use of conventional equipment for planting, road construction, control of unwanted vegetation, harvesting of tree crops, and fire control. The limitations in Washington County are caused mainly by slope, texture of the surface layer, wetness, and frequency and duration of overflow. The limitation is slight if the soils are at least moderately well drained and are not subject to overflow or excessive surface water, and if the use of equipment is restricted for only a short period after a heavy rain. The limitation is moderate if the slope is no more than 12 percent, and if equipment can be used from March until late in December. The limitation is severe if the slope is moderately steep and steep, if overflow is frequent or the water table is at or near the surface for extended periods, and if the use of equipment is restricted throughout the year.

Seedling mortality refers to the expected loss of seedlings of the preferred species. Loss of seedlings in this county is caused mainly by droughtiness. Slope and aspect are also major factors. Mortality is slight if less than 30 percent of planted seedlings die and adequate natural regeneration ordinarily occurs. Mortality is moderate if between 30 and 60 percent of planted seedlings die, natural regeneration cannot be relied on without site preparation, and replanting is necessary. Site preparation includes disking, furrowing, and bedding. Mortality is severe if more than 70 percent of planted seedlings die, natural regeneration cannot be relied on, and special site preparation and replanting are necessary.

Production of Forage

The amount of forage produced in a woodland area varies with the age of the trees and the density of the canopy. For the purposes of this survey, five canopy classes are recognized. Under a *dense* canopy, from 56 to 70 percent of the ground is shaded at midday; under a *medium* canopy, 36 to 55 percent; under a *sparse* canopy, 21 to 35 percent; under an *open* canopy, 6 to 20 percent. If 5 percent or less of the ground is shaded at midday, there is considered to be *little or no* canopy. The potential yields of forage, by canopy classes, are shown in the descriptions of woodland groups 1 through 9.

Forage condition is the present state of the understory vegetation as compared with the potential for a particular site. Four classes of forage condition are recognized. They provide a measure of any deterioration that has taken place and a basis for predicting the degree of improvement that can be brought about by management. Excellent forage condition indicates that the present forage is within 76 to 100 percent of its potential for the site.

The information in the following narrative descriptions of the woodland groups relates mainly to the production of understory vegetation that can be used as forage. The kinds and amounts of understory vegetation depend on the nature of the soils and the density of the overstory. The names of the soil series represented are mentioned in the description of each group, but this does not mean that all the soils of a given series are in the group. To find the woodland classification for any given soil, refer to the "Guide to Mapping Units."

Woodland group 1

This group consists of soils of the Cleora, Sloan, and Razort series. These are deep, medium-textured, well drained and moderately well drained, nearly level soils on flood plains and low terraces. Permeability and the available water capacity are moderate. Runoff is medium or slow.

These soils are well suited to hardwoods and pines and are highly productive. Soil-related management problems are only slight. They are caused mainly by short-duration overflow.

If the overstory is light, these soils produce extremely large amounts of understory vegetation. If the forage condition is excellent, the principal plants are big bluestem, little bluestem, eastern gamagrass, Virginia wildrye, switchgrass, Florida paspalum, switchcane, beaked panicum, prairie dock, and compassplant. As these plants decrease under heavy grazing, such plants as sedge, rush, dropseed, low panicum, white snakeroot, ragweed, brier, and other woody plants increase. As the canopy closes, many plants that do not tolerate shade disappear, and switchcane, beaked panicum, wildrye, and sedge increase.

Under a dense canopy, forage production is 500 to 2,000 pounds per acre; under a medium canopy, 1,500 to 3,000 pounds per acre; under a sparse canopy, 2,500 to 5,000 pounds per acre; under an open canopy, 3,000 to 7,000 pounds per acre; and under little or no canopy, 3,500 to 7,500 pounds per acre.

Woodland group 2

This group consists of soils of the Elsah series. These are deep, excessively drained, nearly level soils on flood plains. They are very gravelly or very stony throughout. The depth to bedrock is 3 to 12 feet. The available water capacity is low or very low, but tree roots obtain water that percolates laterally from stream channels. Permeability is moderately rapid or rapid. Runoff is slow.

These soils are moderately productive of native hardwoods. The high content of coarse fragments is a moderate to severe management problem, and frequent, short-duration overflow is a slight to moderate problem.

The understory vegetation on these soils varies considerably from year to year, depending on the severity of droughtiness and the frequency of overflow. The principal plants are Virginia wildrye, switchgrass, broadspike

TABLE 8.—*Woodland groups*

[Dashes indicate data

Woodland group and map symbols	Potential productivity		
	Important wood crops [1]	Estimated site index range [2]	Estimated yearly growth [3]
		Bd. ft./acre Doyle rule	
Group 1 (Cr, Sn, Ra, Rg, Rk).	Red oak	80–85	195–240
	Sweetgum	80–85	215–260
	Black walnut	80–85	---
	Shortleaf pine	80–85	314–386
	Cottonwood	85–90	285–345
	Sycamore	85–90	270–315
Group 2 (Ec, Eg).	Red oak	70–80	120–195
	Shortleaf pine	70–80	210–314
	Black walnut	70–80	---
	Eastern redcedar	50–60	150–170
Group 3 (FaC2, PeB, PeC2, PgC2, PkC2, PkD2, PsB, PsC2).	Red oak	70–75	120–155
	Shortleaf pine	70–75	210–262
	Black walnut	70–75	---
	Eastern redcedar	50–55	150–160
Group 4 (FaD2, FaE2, FeF, FhF).	Red oak	70–75	120–155
	Shortleaf pine	70–75	210–262
	Black walnut	70–75	---
	Eastern redcedar	50–55	150–160
Group 5 (ApB, ApC2, AsC2, BaC, CaB, CaC, CaC2, LkB, LkC2, LnC2, SfB, SfC2).	Red oak	60–65	70–95
	Shortleaf pine	60–65	127–168
	Black walnut	60–65	---
	Eastern redcedar	40–45	120–140
Group 6 (AlC2, AlD2, AlE2, BaD, ClG, GuC, AeC, AeC2, AeD2, LnD, NaD).	Red oak	60–65	70–95
	Shortleaf pine	60–65	127–168
	Black walnut	60–65	---
	Eastern redcedar	40–45	120–140
Group 7 (AhF, AhG, AnE, AoF, BaD, BaE, BaF, ErE, ErF, AgD, AgF).	Red oak	60–65	70–95
	Shortleaf pine	60–65	127–168
	Black walnut	60–65	---
	Eastern redcedar	40–45	120–140
Group 8 (Ch, Ck, Jo, Js, Le, Lf).	Shortleaf pine	60–65	127–152
	Water oak	65–70	90–95
	Sweetgum	65–70	95–120
	Red oak	60–65	70–95
Group 9 (Sa, Sb, Sp, SsA).	Sweetgum	60–65	85–115
	Water oak	60–65	70–95
	Red oak	60–65	70–95
Group 10 (AhF, AhG, ClG, EnC, EnC2, EnD, EnD2, EoD, ErE, ErF, FhF, HmC, HmD, HoF, NaC, NaD).	Shortleaf pine	50–55	53–80
	Eastern redcedar	30–35	90–100
Group 11 (MoD, MoE, SsB, SsC2, SsD2, StD2, StE2).	Water oak	50–55	---
	Sweetgum	50–55	---
	Red oak	50–55	---
Group 12 (Ro, So).	Shortleaf pine	30–50	10–53
	Eastern redcedar	---	---
Group 13 (JaB, JaC, Ta, ToA, ToB).	None	---	---

[1] Red oak means black oak, southern red oak, northern red oak, scarlet oak. Water oak means water oak, willow oak.

[2] Site index ratings are based on soil-site studies performed by the U.S. Soil Conservation Service, the U.S. Forest Service, and the Arkansas State Forestry Commission.

[3] Yields shown for pine are for fully stocked, unmanaged, even-aged stands to age 60 (*9*); yields shown for cottonwood are for well-stocked, even-aged, managed stands to age 30; yields shown for sycamore are for well-stocked, even-aged, managed stands to age 35; those shown for other species are for well-stocked, even-aged,

and factors in management

not available]

Preferred species—		Management problems		
In existing stands	For planting	Erosion hazard	Equipment limitation	Seedling mortality
Red oak, sweetgum, water oak, black walnut, sycamore, cottonwood, black locust, shortleaf pine, white ash, black cherry, white oak.	Red oak, Shumard oak, black walnut, shortleaf pine, cottonwood, black locust.	Slight	Slight	Slight.
Red oak, black walnut, white oak, Shumard oak, eastern redcedar, black locust, water oak, sweetgum, cottonwood, sycamore, white ash.	Sweetgum, red oak, eastern redcedar, black locust, black walnut, cottonwood, sycamore, white ash, Shumard oak, shortleaf pine.	Slight	Moderate	Severe.
Shortleaf pine, Shumard oak, black walnut, eastern redcedar, white oak, black locust, sweetgum, red oak.	Shortleaf pine, red oak, eastern redcedar, black locust, Shumard oak, black walnut.	Slight	Slight	Slight.
Red oak, shortleaf pine, black walnut, eastern redcedar, sweetgum, black locust, white oak, Shumard oak.	Shortleaf pine, red oak, Shumard oak, eastern redcedar, black walnut, [4] black locust. [4]	Moderate	Severe	Slight.
Shortleaf pine, red oak, white oak, eastern redcedar, black locust, black walnut.	Shortleaf pine, eastern redcedar, red oak, [4] white oak. [4]	Slight	Slight	Slight.
Shortleaf pine, eastern redcedar, red oak, [4] black walnut, black locust. [4]	Shortleaf pine, eastern redcedar, red oak, [5] black locust, [4] black walnut. [4]	Moderate	Moderate	Moderate.
Shortleaf pine, eastern redcedar, red oak, [5] black walnut, black locust. [5]	Shortleaf pine, eastern redcedar, red oak, [5] black locust, [5] black walnut. [5]	Severe	Severe	Severe.
Shortleaf pine, sweetgum, water oak, southern red oak.	Sweetgum, water oak, red oak, shortleaf pine. [6]	Moderate	Moderate	Slight.
Sweetgum, water oak, southern red oak, white ash.	Sweetgum, white ash, water oak	Slight	Severe	Severe.
Shortleaf pine, eastern redcedar	Shortleaf pine, eastern redcedar	Severe	Moderate to severe.	Moderate.
Water oak, sweetgum, white ash	Sweetgum, water oak, white ash, catalpa, Osage-orange (bois d'arc), shortleaf pine, eastern redcedar. [7]	Moderate	Moderate	Severe.
Shortleaf pine, eastern redcedar	None	Severe	Severe	Severe.
None	None			

managed stands to age 60. The yields for hardwoods are adapted from published research on southern hardwoods (*12*) and upland central hardwoods (*14*) and tree growth data from soil-site studies by the U.S. Soil Conservation Service.

[4] On cool slopes that are in coves, on beaches, along drains, or in deep pockets.

[5] On all but hot, or southerly, slopes.

[6] On slopes of more than 1 percent.

[7] On slopes of more than 3 percent.

uniola, eastern gamagrass, and broadleaf forbs, such as sunflower, goldenrod, and wild aster. As these plants decrease under heavy grazing, such plants as sedge, low panicum, Kentucky bluegrass, white snakeroot, ragweed, brier, and other woody plants increase. As the canopy closes, many plants that do not tolerate shade disappear.

Under a dense canopy, forage production is 200 to 500 pounds per acre; under a medium canopy, 500 to 2,000 pounds per acre; under a sparse canopy, 1,000 to 3,500 pounds per acre; under an open canopy, 1,500 to 4,500 pounds per acre; and under little or no canopy, 2,000 to 5,000 pounds per acre.

Woodland group 3

This group consists of soils of the Fayetteville, Pembroke, and Pickwick series. These are deep, well-drained, medium-textured soils on uplands and stream terraces. Most of these soils are eroded. The slope range is 1 to 12 percent. The available water capacity is moderate to high, permeability is moderate, and runoff is medium.

These soils are well suited to hardwoods and pines and are highly productive. The slight to moderate problem of establishing seedlings on the steepest parts of eroded slopes is one of the few soil-related management problems.

If the overstory is thinned, these soils produce large amounts of understory vegetation. If the forage condition is excellent, the principal plants are little bluestem, big bluestem, indiangrass, switchgrass, wildrye, and native legumes and forbs. As these plants decrease under heavy grazing, such plants as low panicum, lovegrass, sedge, purpletop, splitbeard bluestem, aster, and goldenrod increase. As the condition deteriorates further, these plants are replaced by broomsedge, three-awn, ironweed, brier, and other unwanted brush. As the canopy closes, many plants that do not tolerate shade disappear.

Under a dense canopy, forage production is no more than 1,000 pounds per acre; under a medium canopy, it is 1,000 to 2,000 pounds per acre; under a sparse canopy, 1,500 to 4,000 pounds per acre; under an open canopy, 2,000 to 5,000 pounds per acre; and under little or no canopy, 2,500 to 5,200 pounds per acre.

Woodland group 4

This group consists of soils of the Fayetteville series. These are deep, medium-textured, well-drained soils on hilltops and hillsides. Some of these soils are eroded. The slope range is 8 to 40 percent. Permeability and the available water capacity are moderate, and runoff is medium or rapid.

These soils are suited to hardwoods and pines and are moderately productive. Moderate to severe management problems are caused by the steep slopes.

If the overstory is thinned, these soils produce fairly large amounts of understory vegetation. If the forage condition is excellent, the principal plants are little bluestem, big bluestem, indiangrass, low panicum, prairie clover, wild lespedeza, tickclover, and broadleaf forbs. As the condition deteriorates, the tall grasses and legumes are replaced by dropseed, splitbeard bluestem, low panicum, broomsedge, annual forbs, and brier.

Under a dense canopy, forage production is no more than 1,000 pounds per acre; under a medium canopy, it is 1,000 to 2,000 pounds per acre; under a sparse canopy, 1,500 to 4,000 pounds per acre; under an open canopy, 2,000 to 5,000 pounds per acre; and under little or no canopy, 2,500 to 5,200 pounds per acre.

Woodland group 5

This group consists of soils of the Apison, Baxter, Captina, Linker, and Savannah series. These are deep, medium-textured, moderately well drained and well drained soils on uplands and stream terraces. Some of these soils are eroded. Some are gravelly or cherty. The slope range is 1 to 8 percent. The available water capacity is moderate, permeability is slow to moderate, and runoff is slow or medium.

These soils are moderately productive of pines (fig. 12) and hardwoods. The soil-related management problems are slight.

If the overstory is thinned, these soils produce large amounts of understory vegetation. If the forage condition is excellent, the principal plants are little bluestem, big bluestem, indiangrass, low panicum, wild lespedeza, tickclover, and other native legumes. As the condition deteriorates, such plants as low panicum, splitbeard bluestem, broomsedge, purpletop, and annual grasses and weeds increase. As the canopy closes, many plants that do not tolerate shade disappear.

Under a dense canopy, forage production is no more than 1,000 pounds per acre; under a medium canopy, it is 1,000 to 2,000 pounds per acre; under a sparse canopy, 1,500 to 4,000 pounds per acre; under an open canopy, 2,000 to 5,000 pounds per acre; and under little or no canopy, 2,500 to 5,200 pounds per acre.

Woodland group 6

This group consists of soils of the Allegheny, Allen, Guin, and Linker series, and the cool, or northerly, slopes of some soils of the Baxter, Clarksville, and Nixa series. Some of these soils are eroded. Some are gravelly or cherty. The slope range is 3 to 60 percent. The available water capacity is low to moderate, permeability is very slow to moderately rapid, and runoff is medium or rapid.

These soils are moderately productive of hardwoods and pines. There are moderate soil-related management problems, caused by the steep slopes. Slope aspect is an additional factor that affects management of these soils. In general, site index and woodland production are higher on the cool, or northerly, slopes.

If the overstory is thinned, these soils produce large amounts of understory vegetation. The potential plant community consists of a mixture of grasses, legumes, and broadleaf forbs. The principal plants are little bluestem, big bluestem, indiangrass, switchgrass, ryegrass, native lespedeza, tickclover, perennial sunflower, and low panicum. As the canopy closes, the bluestems decrease and such plants as longleaf uniola, sedge, and low panicum increase. As the forage condition deteriorates further, these plants are replaced by broomsedge, splitbeard bluestem, dropseed, lovegrass, annual weeds and grasses, briers, and hardwoods.

Under a dense canopy, forage production is no more than 500 pounds per acre; under a medium canopy, it is 500 to 2,000 pounds per acre; under a sparse canopy, 1,500 to 4,000 pounds per acre; under an open canopy, 2,000 to

Figure 12.—A 6-year-old stand of shortleaf pine on Linker loam, 3 to 8 percent slopes, eroded. Seedlings were planted in a field of broomsedge. This soil is in woodland group 5.

5,500 pounds per acre; and under little or no canopy, 2,500 to 6,000 pounds per acre.

Woodland group 7

This group consists of soils of the Allegheny, Allen, and Baxter series, and the hot, or southerly, slopes of a Baxter soil, the northerly slopes of which are in woodland group 6. All are medium-textured, well-drained soils on hillsides and mountain benches. Most are gravelly or stony. The slope range is 8 to 55 percent. Permeability and the available water capacity are moderate, and runoff is medium or rapid.

These soils are moderately productive of hardwoods and pines. The management problems are severe. The steep slopes increase the hazards of erosion and seedling mortality and interfere with the use of equipment in logging operations. Slope aspect is an additional factor that affects management of these soils. In general, site index and woodland production are higher on the cool slopes.

If the hardwood overstory is thinned, these soils produce very large amounts of understory vegetation. If the forage condition is excellent, the principal plants are big bluestem, little bluestem, indiangrass, wildrye, perennial sunflower, silphium, and native lespedeza. As the condition deteriorates, these plants are replaced by purpletop, threeawn, dropseed, low panicum, broomsedge, brier, and other woody plants. As the canopy closes, the understory vegetation is reduced in kinds and amounts.

Under a dense canopy, forage production is no more than 500 pounds per acre; under a medium canopy, it is 500 to 2,000 pounds per acre; under a sparse canopy, 1,500 to 4,000 pounds per acre; under an open canopy, 2,000 to 5,000 pounds per acre; and under little or no canopy, 2,500 to 6,000 pounds per acre.

Woodland group 8

This group consists of soils of the Cherokee, Johnsburg, and Leaf series. These are deep, medium-textured, poorly

drained and somewhat poorly drained, level or mounded soils on uplands and stream terraces. The available water capacity is moderate, permeability is very slow or slow, and runoff is slow.

These soils are only moderately productive of pines and hardwoods. The level soils are better suited to hardwoods than to pines. The mounded soils are suited to both. There are slight to moderate soil-related management problems, caused by a high water table and excess water.

If the overstory is thinned, these soils produce moderate amounts of understory vegetation. The potential plants are switchgrass, Florida paspalum, big bluestem, little bluestem, beaked panicum, sedge, aster, goldenrod, and other forbs. As the plant community deteriorates, the tall grasses are replaced by longspike tridens, low panicum, rush, and sedge. As the canopy closes, the understory vegetation declines in variety and in amount.

Under a dense canopy, forage production is no more than 1,500 pounds per acre; under a medium canopy, it is 1,500 to 3,000 pounds per acre; under a sparse canopy, 3,000 to 4,000 pounds per acre; under an open canopy, 4,000 to 5,000 pounds per acre; and under little or no canopy, 4,500 to 5,800 pounds per acre.

Woodland group 9

This group consists of soils of the Samba and Summit series. These are deep, medium-textured and fine-textured, poorly drained to moderately well drained, level or mounded soils on uplands and stream terraces. The available water capacity is moderate. Permeability and runoff are very slow.

These soils are better suited to hardwoods than to pines. Productivity is moderately low. Severe management problems are caused by a high water table and excess water.

These soils produce only moderate amounts of understory vegetation that is usable as forage. The potential plant community consists of redtop panicum, beaked panicum, switchgrass, velvetgrass, Florida paspalum, sedge, rush, aster, and goldenrod. As the plant community deteriorates, the tall grasses are replaced by sedge, rush, bentgrass, and annual grasses and weeds.

Under a dense canopy, forage production is no more than 800 pounds per acre; under a medium canopy, it is 500 to 2,500 pounds per acre; under a sparse canopy, 2,000 to 4,000 pounds per acre; under an open canopy, 3,500 to 4,500 pounds per acre; and under little or no canopy, 4,000 to 5,000 pounds per acre.

Woodland group 10

This group consists of soils of the Enders, Hector, Mountainburg, and Nixa series, and the hot, or southerly, slopes of a Clarksville and a Nixa soil, the northerly slopes of which are in woodland group 6. These are deep to shallow, moderately well drained to somewhat excessively drained soils on mountainsides. The slope range is 3 to 55 percent. The surface layer of all of these soils is gravelly or stony. The subsoil of the deep soils is very slowly permeable, plastic clay that restricts root development. The subsoil of the shallow soils is a permeable stony loam or stony fine sandy loam. The available water capacity is low in the shallow soils and moderate in the deep soils. Runoff is rapid.

These soils are not productive. They are better suited to pines than to hardwoods. Consideration should be given to managing them for pulpwood and small-diameter logs instead of for large-diameter logs.

For information on forage production, refer to the descriptions of the Chert Hills, Claybreak Shale, and Sandstone Ridge range sites, under the heading "Use of the Soils for Range."

Woodland group 11

This group consists of soils of the Montevallo and Summit series. These are shallow to deep, excessively drained to moderately well drained soils. They occur mostly as broad areas on uplands or as mountain foot slopes. The slope range is 1 to 25 percent. The Montevallo soils are 10 to 20 inches thick over shale. The Summit soils are 36 to 65 inches thick. The available water capacity is low to moderate.

These soils are unproductive of both pines and hardwoods. There are moderate to severe soil-related management problems caused by stoniness and droughtiness.

For information on forage production, refer to the description of the Shale Break range site, under the heading "Use of the Soils for Range."

Woodland group 12

This group consists of Rock land and the excessively drained, shallow, dark-colored Sogn soils. The gradient is gently sloping to steep. The available water capacity is low, and runoff is medium or rapid.

Planting trees is very difficult on these soils. Tree growth is very slow, and there are severe management problems caused by droughtiness, rockiness, and stoniness. Eastern redcedar is now the only kind of tree growing that has any economic value. Both eastern redcedar and shortleaf pine can be planted where the soil is deep enough, but neither is likely to exceed post size. Protecting the existing vegetation is essential for control of erosion.

For information on forage production, refer to the description of Limestone Ledge range site, under the heading "Use of the Soils for Range."

Woodland group 13

This group consists of soils of the Jay and Taloka series. These are somewhat poorly drained or moderately well drained soils on uplands. The slope range is 1 to 8 percent. The surface layer is thick and dark colored. The available water capacity is moderate, permeability is very slow or slow, and runoff is slow or medium.

Managing these soils as woodland is not feasible. Trees do not grow on some of these soils and make only poor growth on others.

For information on forage production, refer to the description of Loamy Prairie range site, under the heading "Use of the Soils for Range."

Use of the Soils for Range [6]

About a third of Washington County is being used or could be used for grazing livestock. Part of this is grazable woodland, which is discussed in the section "Use of the Soils for Woodland," and part is prairie and savannah rangeland.

[6] IVAN R. PORTER, range conservationist, Soil Conservation Service, helped to prepare this section.

On well-managed prairie and savannah rangeland, the vegetation consists of native perennial legumes and forbs and a mixture of tall grasses, chiefly big bluestem, little bluestem, indiangrass, and switchgrass. Much of the potential rangeland in this county is now producing below its capacity. Control of brush and of low-grade hardwoods is needed to improve production and allow the better range plants to recover.

Range Sites and Condition Classes

Different kinds of soils produce different kinds of grass and other vegetation. The soils that have similar climatic and physiographic features and that produce about the same kinds of plants and about equal yields of forage are grouped together for range management purposes. These groups are called range sites. Each range site has its own distinctive potential for producing native plants and retains its ability to reproduce this plant community unless the soils are materially altered or have deteriorated.

Range condition is determined mainly by comparing the kinds and numbers of plants that make up the vegetative cover with those in the potential native plant cover, or climax vegetation, for the same site.

Climax vegetation, or potential native plant cover, is the stabilized plant community on a particular site. It reproduces itself and does not change so long as the environment remains unchanged. *Decreasers* are plants in the climax vegetation that tend to decrease if heavily grazed. These plants generally are the tallest, most productive, and most palatable perennials. *Increasers* are plants in the climax vegetation that normally increase as the decreasers decrease. These plants commonly are the shorter, less productive, less palatable plants. *Invaders* are plants that are not part of the climax vegetation but that become established after the climax vegetation has been heavily grazed. Many invaders are woody plants; some are herbaceous perennials and annuals. They may originate nearby or at a great distance.

Range condition indicates the degree to which the composition of the existing plant community differs from the climax vegetation. Four classes are recognized. A range is in *excellent* condition if 76 to 100 percent of the vegetation is the same kind as that in the original stand; it is in *good* condition if the percentage is between 51 and 75; in *fair* condition if the percentage is between 26 and 50; and in *poor* condition if the percentage is 25 or less.

A range site in excellent condition is at or near its maximum productivity. Its plant cover adequately protects the soil and improves moisture intake and soil fertility. A site in good condition has lost a few decreaser plants, but it is still productive and can be maintained and improved by good management of grazing. A site in fair condition has a severely altered plant community in which increasers dominate and invaders are becoming prominent. Generally, the amount of litter is inadequate for protection against compaction and erosion. Brush control and deferred grazing are needed. A site in poor condition has lost almost all of the desirable forage plants, has few plants that are part of the original vegetation, and has many invaders.

Recognizing changes in the plant cover is one of the most important factors in good range management. Often the changes are overlooked or misunderstood. Growth following heavy rainfall, for example, may appear to improve the condition of the site, when actually the cover is weedy and productivity is declining.

Descriptions of Range Sites

Six range sites are recognized in Washington County. They do not include all the soils of the county but only those used exclusively or mainly as native range. The "Guide to Mapping Units" shows the range site classification of each of these soils.

The six range sites are described in the following pages. The soil series represented are named in the description of each site, but this does not mean that all the soils of a given series are in the site.

Each site description includes estimates of total herbage yield, air-dry weight, one for favorable years and one for unfavorable years. These estimates are based on ground-level clippings taken during a 5-year period from plots in excellent condition. The amount of actual usable forage or of mowed hay is considerably less. After a year or two of favorable rainfall, the total production is likely to be more than the higher estimate, and after a drought, it is likely to be less than the lower estimate.

Chert Hills range site

This range site consists of soils of the Clarksville and Nixa series. These soils contain so much chert that they are low in both natural fertility and available water capacity. Their surface layer is cherty silt loam. Their subsoil is very cherty silt loam that is either rapidly permeable or very slowly permeable. In many areas the subsoil is slightly weathered chert. In other areas there is a dense chert pan at a depth of 15 to 30 inches.

If this site is in excellent condition, the vegetation consists predominantly of big bluestem, little bluestem, and indiangrass in open stands of post oak, blackjack oak, elm, red oak, black oak, and hickory. Desirable forbs and native legumes, such as tickclover and wild lespedeza, are also common. If the site is in poor condition, the better forage plants are replaced by broomsedge, ragweed, persimmon, post oak, blackjack oak, and red oak.

In favorable years, forage production is about 4,500 pounds per acre. In unfavorable years, it is about 2,500 pounds per acre.

Claybreak Shale range site

This range site consists of soils of the Enders and Summit series. The surface layer of these soils ranges from silt loam to silty clay, is 6 to 15 inches thick, and is commonly gravelly or stony. It is underlain by clay beds 2 to 5 feet or more in thickness. The available water capacity is moderate, but the dense clay makes water movement and root penetration so slow that moisture is not readily available to plants. Runoff is rapid after moderate and intense storms, and the soils erode rapidly unless protected by vegetation.

If this site is in excellent condition, the vegetation consists of scattered trees and moderate quantities of little bluestem, big bluestem (fig. 13), indiangrass, wildrye, sensitivebrier, Virginia tephrosia, and native lespedeza. The trees are post oak, winged elm, blackjack oak, northern red oak, and hickory. After heavy continuous grazing, the

Figure 13.—**Little bluestem and big bluestem on Enders part of Enders-Allegheny complex, 8 to 20 percent slopes. Photographed 4 years after area was chemically sprayed for control of unwanted trees. Grasses reseeded naturally.**

better forage plants decrease and are replaced by low panicum, dropseed, goldenrod, aster, broomsedge, and woody plants. Frequently, the woody plants crowd out the understory vegetation.

In favorable years, forage production is about 5,000 pounds per acre. In unfavorable years, it is about 2,240 pounds per acre.

Limestone Ledge range site

This site consists of one land type, Rock land, and one soil, Sogn rocky silt loam, which is 4 to 18 inches thick over limestone. Both have moderate fertility and low available water capacity.

If this site is in excellent condition, the vegetation consists chiefly of big bluestem, little bluestem, sideoats grama, compassplant, black samson, and catclaw sensitivebrier. If the range deteriorates, these plants are replaced by low panicum, poverty oatgrass, three-awn, black-eyed-susan, and annual weeds.

In favorable years, forage production is about 3,000 pounds per acre. In unfavorable years, it is about 1,200 pounds per acre.

Loamy Prairie range site

This range site consists of soils of the Jay and Taloka series. These are deep, somewhat poorly drained to moderately well drained, slowly permeable soils on uplands. Their surface layer is silt loam. Their subsoil contains either a claypan or a silty clay loam fragipan. The available water capacity is moderate.

If this site is in excellent condition, it produces large quantities of big bluestem, little bluestem, switchgrass, indiangrass, gayfeather, ashy sunflower, and leadplant. If it is in poor condition, the better forage plants are replaced by purpletop, dropseed, broomsedge, windmillgrass, ragweed, and ironweed.

In favorable years, forage production is about 5,500

pounds per acre. In unfavorable years, it is about 2,500 pounds per acre.

Sandstone Ridge range site

This site consists of Hector and Mountainburg soils. These are loamy, permeable, shallow and very shallow soils derived from hard, massive sandstone. They have stones and gravel throughout the profile. The soils are low in plant nutrients and have low available water capacity.

If this site is in excellent condition, the vegetation consists predominantly of little bluestem. There are moderate amounts of indiangrass, big bluestem, low panicum, native legumes, and forbs, and scattered post oak, blackjack oak, and hickory trees. Perennial three-awn, dryland sedge, broomsedge, splitbeard bluestem, ironweed, and unwanted woody species are predominant if the range is in poor condition.

In favorable years, forage production is about 4,800 pounds per acre. In unfavorable years, it is about 2,000 pounds per acre.

Shale Break range site

This site consists of soils of the Montevallo series. These are shallow and very shallow, stony or rocky silt loams or fine sandy loams over shale. They have low to moderate fertility and low available water capacity.

This site supports a mixture of tall and mid grasses and scattered forbs. Little bluestem, big bluestem, indiangrass, Canada wildrye, sensitivebrier, and native lespedeza occupy the better parts of a site that is in good condition, and starved panicgrass, little bluestem, and sensitivebrier occupy the poorer parts. As the condition of the range deteriorates, these plants are replaced by three-awn, dropseed, broomsedge, ragweed, white snakeroot, and ironweed.

In favorable years, forage production is about 3,500 pounds per acre. In unfavorable years, it is about 1,500 pounds per acre.

Use of the Soils for Wildlife [7]

Wildlife resources in a given area depend on land use and the kind and amount of vegetation, both of which are governed by characteristics of the soils.

Deer, squirrels, and other forest wildlife are to be found in the Boston Mountains, where large areas of oak-hickory forest are interspersed with small farms. There are also a few wild turkeys. Bobwhites, doves, and cottontail rabbits are scarce in these areas but are abundant in the more intensively farmed areas on the Springfield Plateau. Squirrels are plentiful in the steep, cherty, wooded areas on the plateau. There are a few beaver colonies along the White River and other streams.

Fish resources are abundant in the county. The warmwater varieties include crappie, bluegill, red-ear sunfish, catfish, largemouth bass, and smallmouth bass. There are trout farms below some of the large limestone springs.

Most soils in the county are suitable for small to moderately large farm ponds. For a series of ponds to be used for minnow or catfish production, onsite investigation is needed. There are about 3,400 farm ponds in the county, and several small to moderately large minnow farms are in operation. The quality of the water is moderate on soils derived from acid shale and sandstone and good on soils derived from limestone or cherty limestone.

The soils of Washington County have been assigned to nine groups, according to their suitability as habitat for specified kinds of wildlife. Each of these groups is described in the paragraphs that follow. To find the wildlife group for a specified soil, refer to the "Guide to Mapping Units."

A list of plants that provide food for wildlife is shown in table 9. The suitability of each plant for the soils of each wildlife group is also shown, and the suitability of each plant as food for specified kinds of wildlife.

Wildlife group 1

This group consists of gravelly and nongravelly, moderately well drained to excessively drained soils adjacent to streams. It makes up 7.2 percent of the county. About 70 percent of the acreage is used for row crops, pasture, and meadow, and the rest is woodland. The slope range is 0 to 3 percent. The overflow hazard is slight to severe.

These soils are well suited to wildlife food crops. They are unsuited to fish culture, because they are too permeable for impoundments.

Wildlife group 2

This group consists of moderately well drained to somewhat poorly drained, slowly permeable to very slowly permeable soils on uplands and stream terraces. It makes up 2.8 percent of the county. The native vegetation consisted of tall prairie grasses and forbs. Nearly all of the acreage has been cultivated but is now used for pasture and meadow. The slope range is 0 to 8 percent.

The moderately well drained soils are well suited to wildlife food crops, and the somewhat poorly drained soils are moderately well suited. All are suited to fish culture.

Wildlife group 3

This group consists of gravelly and nongravelly, well drained and moderately well drained soils on uplands and stream terraces. It makes up 21.9 percent of the county. About 95 percent of the acreage is used for small grain, pasture, and meadow. The slope is generally 1 to 8 percent, but the range is 1 to 12 percent.

These soils are well suited to wildlife food crops. They are marginal for fish culture. In some areas they are too shallow over bedrock or too permeable to be suitable for impoundments.

Wildlife group 4

This group consists of moderately well drained to excessively drained cherty soils on uplands. It makes up 15.6 percent of the county. About 75 percent of the acreage is covered with oak-hickory forest. The rest is used mostly for pasture and meadow. The landscape is one of long, narrow, gently sloping ridges separated by steep V-shaped valleys 200 to 800 feet wide. The slope range is 3 to 60 percent.

The gently sloping soils are moderately well suited to wildlife food crops. The steep soils are poorly suited. All are poorly suited or unsuited to fish culture because of slope, high chert content, or rapid permeability.

[7] ROY A. GRIZZELL, JR., biologist, Soil Conservation Service, helped prepare this section.

TABLE 9.—*Suitability of plants for wildlife groups and as food for wildlife*

[The figure 1 indicates that the plant is suited to the soils in the given group; the figure 2, that it is marginally suited; the figure 3, that it is poorly suited or not suited. The letter A indicates that the plant is *choice* (attractive and nutritious) for the given kind of wildlife; the letter B, *fair* (eaten only when choice foods are not available); the letter C, *unimportant* (eaten only in small amounts)]

Plant	Wildlife groups									Food for—								
																Nongame birds [1]		
	1	2	3	4	5	6	7	8	9	Bobwhite	Deer	Dove	Rabbit	Squirrel	Turkey	Fruit eaters	Grain and seed eaters	Nut and acorn eaters
Alfalfa	2	2	2	2	3	3	3	3	3	C	A	C	A	C	C	C	C	C
Amaranth (pigweed)	3	3	1	2	2	3	3	3	3	B	C	A	C	C	C	C	B	C
Ash	1	2	3	3	3	3	3	3	3	B	B	C	C	B	B	C	B	B
Barley	1	1	1	2	2	3	3	3	3	B	B	B	B	A	A	C	B	C
Barnyardgrass	1	1	1	2	1	3	3	3	3	C	C	A	C	C	C	C	B	C
Beautyberry	3	3	1	2	2	1	2	2	3	B	B	C	C	C	C	B	B	C
Blackberry	3	2	1	2	1	2	3	3	3	A	B	C	C	A	A	A	C	A
Blackgum	1	3	2	2	1	1	2	3	3	B	B	C	C	B	A	A	C	C
Black locust	3	3	1	2	2	1	3	3	3	B	C	C	C	C	B	C	C	B
Bristlegrass (setaria)	1	1	1	1	2	1	3	2	3	A	B	A	C	C	B	C	A	C
Browntop millet	1	1	1	2	2	2	3	3	3	A	B	A	A	C	A	C	A	C
Cedar, red	3	3	2	2	2	2	2	1	2	C	B	C	C	C	C	A	C	C
Cherry, black	2	3	1	2	2	1	3	3	3	A	B	C	C	A	B	A	C	C
Corn	2	2	1	2	2	3	3	3	3	A	A	A	A	A	A	C	A	A
Cowpeas	2	2	1	2	2	3	3	3	3	A	A	B	A	C	A	C	C	C
Croton, woolly	2	1	1	1	1	1	2	2	2	A	C	A	C	C	A	C	B	A
Dewberry	1	1	1	2	1	1	3	2	3	A	B	C	B	B	A	A	C	A
Dogwood	3	3	2	1	2	1	2	3	2	A	A	C	C	B	A	A	C	B
Elderberry	1	3	1	2	2	1	3	3	2	C	A	C	C	C	B	A	C	C
Elms	1	1	1	2	2	1	3	3	3	C	B	C	C	A	B	C	B	C
Farkleberry (winter huckleberry)	3	3	3	2	2	2	1	1	1	B	B	C	C	B	B	B	C	C
Fescuegrass	1	1	1	1	1	1	3	2	2	C	B	C	C	C	B	C	C	C
Grape, wild	1	3	1	1	2	1	2	3	2	C	A	C	C	C	B	A	C	C
Greenbrier	1	1	1	1	1	1	2	1	2	C	A	C	C	A	C	B	C	C
Hackberry	1	1	2	2	2	2	3	3	3	B	A	C	C	C	B	A	C	C
Hawthorn	2	2	1	1	2	1	2	3	2	C	B	C	C	C	B	B	C	C
Hickory	1	3	1	1	1	1	2	3	2	C	B	C	C	C	A	C	C	A
Honeysuckle	1	2	1	1	1	1	3	3	2	C	A	C	C	C	C	C	C	C
Honeysuckle and blueberry	2	3	1	2	2	1	2	3	2	B	B	C	C	C	B	B	C	A
Japanese millet	1	1	2	2	1	2	3	3	3	A	C	A	A	C	C	C	A	C
Johnsongrass	1	1	1	3	3	3	3	3	3	B	B	B	C	C	C	C	B	C
Lespedeza, bush	2	2	1	1	2	1	3	3	3	A	A	C	B	B	C	C	C	C
Lespedeza, annual	1	1	1	2	2	2	2	2	2	A	A	B	B	C	B	C	B	C
Lespedeza, sericea	1	1	1	1	2	2	2	3	2	C	C	C	B	C	C	C	C	C
Lespedeza, wild	3	1	2	2	2	1	2	2	2	C	B	C	B	C	C	C	C	C
Maple	1	3	1	2	2	1	3	3	2	C	A	C	C	B	B	C	C	C
Milkpea	3	1	1	2	2	1	2	2	2	A	B	C	A	C	C	C	C	C
Mulberry	1	3	1	2	2	1	3	3	2	A	B	C	C	A	A	A	A	C
Oak (acorns)	1	3	1	1	1	1	2	3	2	A	A	C	C	A	A	C	C	A
Oats	1	1	1	2	2	3	3	3	3	A	A	B	A	A	A	C	A	A
Panicgrass	1	1	1	2	1	1	2	3	2	A	A	B	A	B	A	C	A	C
Partridgepea	3	1	1	1	2	2	1	3	1	A	B	C	C	C	C	C	C	C
Paspalum	1	1	1	2	2	2	3	3	3	A	B	A	C	C	A	C	A	C
Persimmon	1	3	1	1	1	1	2	3	1	C	B	C	C	C	B	B	C	A
Pine (seeds)	1	3	1	1	2	1	2	3	2	A	C	A	C	C	A	A	C	A
Plum	1	2	1	1	2	1	3	3	2	A	B	C	A	C	A	C	B	C
Pokeberry	1	1	1	1	1	1	2	3	2	B	A	A	C	C	C	B	C	C
Privet, common	1	1	1	1	1	1	1	3	2	B	B	C	C	C	C	A	C	C
Ragweed, common	1	2	1	1	1	1	2	3	2	A	B	A	C	C	C	C	A	C
Rose, multiflora	1	1	1	1	2	1	3	3	2	C	C	C	B	C	C	B	C	A
Rye	1	1	1	2	2	1	3	3	2	A	A	B	B	A	A	C	B	A
Ryegrass	1	1	1	2	2	1	3	3	2	C	A	C	A	C	A	C	C	C

See footnote at end of table

TABLE 9.—*Suitability of plants for wildlife groups and as food for wildlife*—Continued

Plant	Wildlife groups									Food for—								
																Nongame birds [1]		
	1	2	3	4	5	6	7	8	9	Bobwhite	Deer	Dove	Rabbit	Squirrel	Turkey	Fruit eaters	Grain and seed eaters	Nut and acorn eaters
Sassafras	1	2	1	1	1	1	2	3	2	B	A	C	C	B	B	A	C	C
Serviceberry	3	3	1	1	2	1	1	3	3	C	B	C	C	B	C	A	C	C
Sorghum	1	1	1	2	2	3	3	3	3	A	A	A	A	A	A	C	A	A
Soybean	2	2	1	3	2	3	3	3	3	B	A	B	B	C	A	C	C	C
Sudangrass	1	1	1	2	2	3	3	3	3	A	C	A	C	B	C	C	A	C
Sumac	2	2	1	1	2	1	2	3	2	B	A	C	B	C	B	A	C	C
Sunflower	2	1	1	2	3	2	3	3	3	A	A	A	C	A	A	A	A	A
Sweetgum	1	3	1	2	2	1	3	3	3	A	B	A	C	B	A	C	C	A
Tickclover (beggarweed)	1	1	1	1	1	1	2	2	2	A	A	C	C	C	B	C	C	C
Vetch (hairy)	1	2	1	2	2	3	3	3	3	A	A	B	B	C	B	C	C	C
Virginia creeper	1	3	1	2	1	1	3	3	2	C	B	C	C	C	B	A	C	C
Walnut	1	3	2	2	2	2	3	3	3	C	C	C	C	A	C	C	C	A
Wheat	1	1	1	2	2	1	3	3	2	A	A	A	A	A	A	C	A	C

[1] Among the fruit eaters are bluebirds, catbirds, robins, and mockingbirds; grain and seed eaters include blackbirds, cardinals, and sparrows; nut and acorn eaters include bluejays, chickadees, grackles, and woodpeckers.

Wildlife group 5

This group consists of poorly drained to somewhat poorly drained soils on uplands and stream terraces. It makes up 3.8 percent of the county. Most of the acreage is used for pasture. Permeability is slow or very slow. The slope range is 0 to 2 percent. Some areas are mounded.

These soils are suited to fish culture and are moderately well suited to most of the wildlife food crops. The somewhat poor drainage limits their use for some crops.

Wildlife group 6

This group consists of moderately steep to steep soils on mountainsides. It makes up 8.9 percent of the county. A large part of the acreage is wooded. Most of the soils are deep, stony, and well drained. Some are shallow and occur as narrow strips along bluffs and ridgetops. The slope range is 12 to 55 percent. Large areas of these soils are in the southern part of the county and are remote from population centers.

These soils are moderately well suited to some wildlife food crops. They are of limited use for cultivated crops because of steepness and stoniness. They are poorly suited to fish culture because of steepness and rapid permeability.

Wildlife group 7

This group consists of gravelly or stony, well-drained to excessively drained, shallow soils on ridgetops, mountainsides, and foot slopes. It makes up 7.5 percent of the county. Most of the acreage is covered with scrubby hardwood timber and is adjacent to the large wooded areas of groups 6 and 9. The slope range is 3 to 40 percent.

Steepness, stoniness, and shallowness make these soils poor for wildlife food crops. These limitations, in addition to rapid permeability, make the soils unsuitable for fish culture.

Wildlife group 8

This group consists of nearly level to steep, deep and shallow soils on mountainsides, foot slopes, or broad uplands. It makes up 1.5 percent of the county. Most of the acreage supports cedar brush and open stands of hardwoods. The shallow soils are stony. The deep soils are ordinarily stone free and have a surface layer of sticky silty clay.

These soils are moderately well suited to crops that provide food for deer, bobwhites, rabbits, and other wildlife, but they are not suited to those that provide food for squirrels. They are poorly suited to fish culture because of steepness or shallowness.

Wildlife group 9

This group consists of deep, moderately well drained to well drained soils on mountainsides. These soils occur as large areas and make up 29.8 percent of the county. About 95 percent of the acreage is cut-over hardwood forest. Most of these soils are stony. Some of the gently sloping soils are gravelly. The slope range is 3 to 40 percent, but the slope is ordinarily more than 12 percent. Many areas are in the southern part of the county and are remote from population centers.

These soils are only moderately well suited to wildlife food crops, because of low fertility, steepness, and stoniness. The benches, foot slopes, and coves, however, are suitable habitat for squirrels. The soils are poorly suited or marginally suited to fish culture because of steepness and stoniness.

Formation and Classification of the Soils

This section describes the major factors of soil formation, tells how these factors have affected the soils of Washington County, and explains some of the principal

processes in horizon development. It also defines the current system for classifying soils.

Factors of Soil Formation

Soil is formed by the interaction of climate, living organisms, parent material, and relief over a period of time. Each of these factors modifies the effect of the other four. Significant differences in any one of the factors result in differences in soil characteristics.

Climate and vegetation are the active forces in soil formation. Relief, mainly by its influence on runoff and temperature, modifies the effect of climate and living organisms. The parent material also affects the kind of profile that can be formed and, in extreme cases, determines it almost entirely. Finally, time is needed for the changing of the parent material into soil.

Climate

The climate of Washington County is characterized by long warm summers, short mild winters, and abundant rainfall. It is relatively uniform throughout the county and consequently does not account for significant differences among the soils. Probably the climate has not changed much while the soils have been developing.

A warm, moist climate promotes rapid chemical reactions and rapid soil formation. Abundant rainfall favors the leaching of soluble and colloidal materials (*10*). Plant remains decompose rapidly, and the organic acids thus produced hasten the removal of bases and the development of clay minerals. Because the soil freezes for only short periods of time, soil formation continues almost the year around.

Living organisms

Native vegetation has had more influence than animal activity on soil formation in the county. On most of the uplands the native vegetation consisted of dense to sparse stands of hardwoods, chiefly red oak, white oak, and hickory. Only the uppermost few inches of the soils in these areas have a significant accumulation of organic matter and are dark colored. The Baxter, Clarksville, Apison, Hector, Mountainburg, Enders, and Linker soils formed on these uplands. They differ primarily in age and degree of weathering and in the nature of their parent material.

The upland prairies supported a luxuriant growth of tall bunchgrasses and forbs. The soils in these areas have a surface layer that has been darkened by organic matter to a depth of 8 to 18 inches. Among these are Jay and Taloka soils. They differ from each other chiefly because of the effects of parent material and relief.

In alluvial areas, the native vegetation consisted of dense stands of hardwoods, mainly hackberry, elm, sycamore, ash, oak, and hickory. Elsah, Cleora, and Sloan soils formed in these areas. These are young, low-lying soils. Their surface layer has been darkened to a depth of 7 to 26 inches, and occasionally they receive fresh deposition from floodwater. The Razort soils are in alluvial areas also, but are at a slightly higher elevation, are derived from older sediments, and have a significant accumulation of clay and more strongly developed horizons.

Parent material

All of the hard-rock parent material in Washington County is of the Pennsylvanian and Mississippian Systems of the Paleozoic Era. On the Springfield Plateau it is cherty limestone. In the Boston Mountains it consists of acid sandstone, siltstone, and shale.

In an area roughly 2 to 10 miles wide along the southern boundary of the county, the soils formed in material weathered from acid sandstone, siltstone, and shale of the Atoka Formation. Of these rocks, the shale is the least resistant to weathering. The mountaintops are capped with the resistant sandstone, which weathers to a sandy regolith. The Linker, the Apison, and the shallow Hector and Mountainburg soils formed in this material.

The soils on benches along the mountainsides formed in friable, loamy and silty material that washed or rolled down from a higher elevation. These are chiefly soils of the Allen and Allegheny series. They are deep, medium textured, acid, and well drained. In most places they are stony or gravelly, because coarse fragments of sandstone have rolled down from the caprock on the bluffs. The soils on benches and slopes where shale was originally exposed formed in a plastic, red and gray mottled, very strongly acid clay that was covered with a thin layer of loamy material and sandstone fragments, both of which washed or rolled down from a higher elevation. Enders soils formed in this material. Thus, they have a surface layer of gravelly or stony loam and a subsoil of plastic, red and gray, very strongly acid clay. Hector and Mountainburg soils formed on the mountainsides in material weathered from sandstone and siltstone.

Northward and at a lower elevation are the Bloyd Shale and the Hale Formation. Allegheny and Enders soils formed in the material weathered from shale. Fayetteville soils formed in material weathered from the Hale Formation, which is a relatively soft, locally calcareous sandstone. These soils are deep, moderately permeable, well drained, and slightly acid or medium acid. They have a higher base saturation than the soils that formed in acid sandstone.

In an irregularly shaped area 1 to 5 miles wide along the northern border of the Boston Mountains is the Fayetteville Formation. It is mainly shale, but the upper part is sandstone. The shale weathers to a very strongly acid, plastic, red and gray mottled clay, and the sandstone to sandy material. Enders soils formed where this sandy material is not more than 4 to 12 inches thick over plastic clay. Allegheny soils have a loamy surface layer and a loam to silty clay loam subsoil that is underlain by red and gray mottled, plastic clay at a depth of 3 to 6 feet. Both soils are gravelly or stony because of the coarse sandstone fragments that break off and wash or roll down the mountainsides.

The soils in the central parts of the nearly level to gently sloping mountaintops, for example, Linker and Apison soils, formed in residuum weathered from acid sandstone and siltstone. Their surface layer is generally loam or silt loam and is gravelly in places. Their subsoil is loam to silty clay loam. These soils are strongly acid or very strongly acid, low in base saturation, and about 2 to 4 feet thick over bedrock. They are mostly well drained and moderately permeable. The shallow Hector and Mountainburg soils formed along margins of the mountaintops,

where geologic erosion has nearly kept pace with weathering.

Soils at the middle and lower elevations of the Boston Mountains formed in material derived from limestone that in places is underlain by calcareous shale. The shale is high in bases and weathers to a slightly acid to mildly alkaline clay or silty clay. Both the shale and the clay are slowly permeable, and the bases leach slowly. Summit soils formed in this material and consequently have high base saturation.

A comparison of Enders and Summit soils shows how parent material influences the reaction, the clay mineralogy, and the base status of soils. The parent material of both of these soils was derived predominantly from shale. The B horizon of the Enders soils formed in material derived from acid shale that was low in bases. It is very strongly acid, has low base saturation, and is high in content of kaolinitic clay. In contrast, Summit soils formed in material derived from calcareous shale. They have the characteristic slightly acid to mildly alkaline reaction, have high base saturation, and are high in content of montmorillonitic clay.

Soils on the steeper slopes of the Springfield Plateau formed in material weathered from cherty limestone of the Boone Formation. The limestone weathers more rapidly than the chert. The chert occurs as beds or nodules in the limestone. The cherty Nixa, Baxter, and Clarksville soils formed in this clayey and silty material.

Soils of the broad, level to gently sloping areas on the Springfield Plateau formed in deep, loamy residual material. They have a surface layer of silt loam and in most places a subsoil of silt loam to silty clay loam. They are mostly free of chert and sandstone fragments. Captina soils formed in this material.

The young alluvial soils of Washington County formed in material that ranges from silt loam to stones. Many of the smaller streams in the hilly or mountainous part of the county are swift flowing and deposit a large number of pebbles and stones on their narrow flood plains. Thus, the Elsah soils along flood plains of small swift streams formed in very gravelly or stony material that contains varying amounts of silt and sand. They are rapidly permeable and excessively drained and have a low available water capacity. The larger streams flow over more gentle slopes, at a lower velocity, and deposit silt and sand. Thus, the soils on the larger flood plains formed in loamy sediments. In general, the soils formed in loamy material—the Cleora and Razort soils, for example—are productive. They are deep and friable, are easily penetrated by roots, and have high base saturation and reaction.

Relief

The slope range in Washington County is predominantly 1 to 60 percent, but there are level spots and nearly vertical bluffs. Except on flood plains, the soils are poorly drained to somewhat poorly drained if the slope is less than 2 percent. They are moderately well drained to well drained if the slope is between 2 and 12 percent, and they are well drained to excessively drained if it is more than 12 percent.

Generally, the steeper slopes and narrow ridges have lost so much soil material through geologic erosion that the soils on them—Nixa, Hector, and Mountainburg soils, for example—are stony or shallow, or both. In contrast, the broad, level or gently sloping areas have lost little soil material, and the soils—Captina and Johnsburg soils, for example—are deep.

Deep soils also occur in coves and on foot slopes and mountain benches, in accumulations of soil material that has washed or slid down from adjoining steep slopes. Allen and Allegheny soils occur in such spots.

In level areas and in depressions on uplands and stream terraces, where surface drainage is slow or ponded, the soils are deep, slowly to very slowly permeable, and somewhat poorly drained to poorly drained. They are gray or have gray mottles and have a high water table. The scattered, low mounds in some of these areas, such as those in Leaf complex, mounded, are additional hindrances to drainage.

Time

The length of time required for formation of soil depends largely upon the other factors of soil formation. Less time is generally required if the climate is warm and humid and the vegetation is luxuriant. Because of the apparent similarity in age of most of the soils in this county, it seems probable that the present land surface formed in a geologic age earlier than the beginning of the formation of any of the soils.

Most of the soils in the county are old, regardless of whether they are on montaintops, mountainsides, or stream terraces. These soils show a fairly high degree of development. The horizons are clearly expressed, there has been considerable weathering and translocation of clay, and a large proportion of the cations has been leached out. Also, iron has been translocated from the surface layer to the subsoil and then oxidized, causing the subsoil to have red, yellow, and strong-brown colors.

The young soils have formed either in recent alluvium on flood plains or in residuum from bedrock where geologic erosion has nearly kept pace with weathering. On the flood plains the parent material has been in place for too short a time for much soil development. In many places the soils are little more than fresh alluvium, and only a small amount of organic matter has accumulated in the uppermost few inches. Cleora soils are examples of young soils. Except for a slight increase in the organic-matter content of their surface layer, these soils retain most of the characteristics of the slightly acid to medium acid, stratified, sandy parent material. Captina soils are examples of older soils. They have a strongly acid B horizon that contains two to three times as much clay as the A horizon. Most of the cations have been leached from Captina soils.

Processes of Soil Formation

Physical weathering of rocks, accumulation of organic matter, leaching of bases, reduction or oxidation and transfer of iron, and formation and translocation of silicate clay minerals have been active processes in the formation of most soils in Washington County.

Sunshine, rain, frost, and wind slowly break large rocks into small pieces. Wetting and drying, heating and cooling, and freezing and thawing all tend to weaken the rock structure. This process has been important in the formation of Linker, Baxter, and Apison soils.

Accumulation of organic matter in the surface layer of the soils has been an important process in horizon development. The A1 horizon is darker colored because

organic matter has been added, and the A2 horizon is lighter colored because organic matter as well as clay minerals and iron oxides have been removed. The Clarksville and Enders soils are examples of soils that have a dark-colored A1 horizon and a lighter colored, leached A2 horizon. The organic-matter content of the soils of this county is medium to low.

Leaching of bases has occurred in nearly all soils in the county. Generally this process precedes translocation of silicate clay materials.

Figure 14 shows soil reaction (pH) as a function of soil depth in Cleora fine sandy loam, a young soil derived from recent, medium acid or slightly acid, stratified alluvium; and in Captina silt loam, an older soil that is strongly acid, is leached, and has undergone significant clay translocation. The Baxter soil is an example of a soil that developed from cherty limestone but has been leached of most of the bases and is strongly acid.

Transfer and oxidation of iron are evident in the moderately well drained and well drained soils in the county. The oxidation of iron, which is indicated by red and yellowish-brown colors in the subsoil, has been important in the formation of Baxter and Linker soils.

Reduction and transfer of iron are evident in the poorly drained and somewhat poorly drained soils. These processes have been important in the formation of Leaf, Cherokee, and Samba soils. Gray colors are evidence of the reduction of iron. Mottles of red, brown, and yellow in some horizons and iron concretions in others indicate the segregation of iron.

Translocation of clay minerals has contributed to horizon development in most of the soils. The eluviated A2 horizon contains less clay and generally is lighter colored than the B horizon. Generally clay has accumulated in the B horizon in the form of clay films in pores and on ped surfaces. The C horizon contains less clay than the B horizon.

The distribution of clay in the profiles of Captina, Cleora, and Razort soils is shown in figure 15. The shape of the curve suggests that translocation of clay is most advanced in Captina soils, least advanced in Cleora soils, and intermediate in Razort soils. Captina soils have been in place the longest. They occur in areas where a large amount of water percolating through the soil carries much of the clay downward and deposits it in the lower horizons. Razort soils are along streams that overflow occasionally. They receive some deposition, but they have been in place long enough that some clay has been moved from the surface layer to the subsoil. Cleora soils are along flood plains of streams that overflow frequently and deposit fresh alluvium. The material has been in place for too short a time for much translocation of the clay minerals.

Classification of the Soils

Classification consists of an orderly grouping of soils according to a system designed to make it easier to remember soil characteristics and interrelationships. Classification is useful in organizing and applying the results of experience and research. Soils are placed in narrow classes

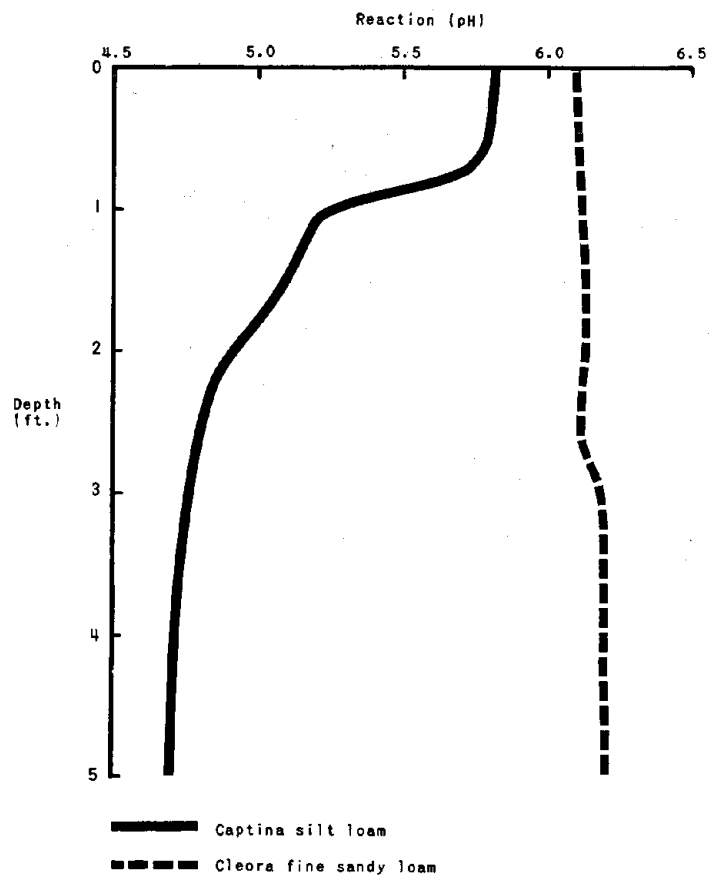

Figure 14.—Relation of soil reaction to depth in two Washington County soils.

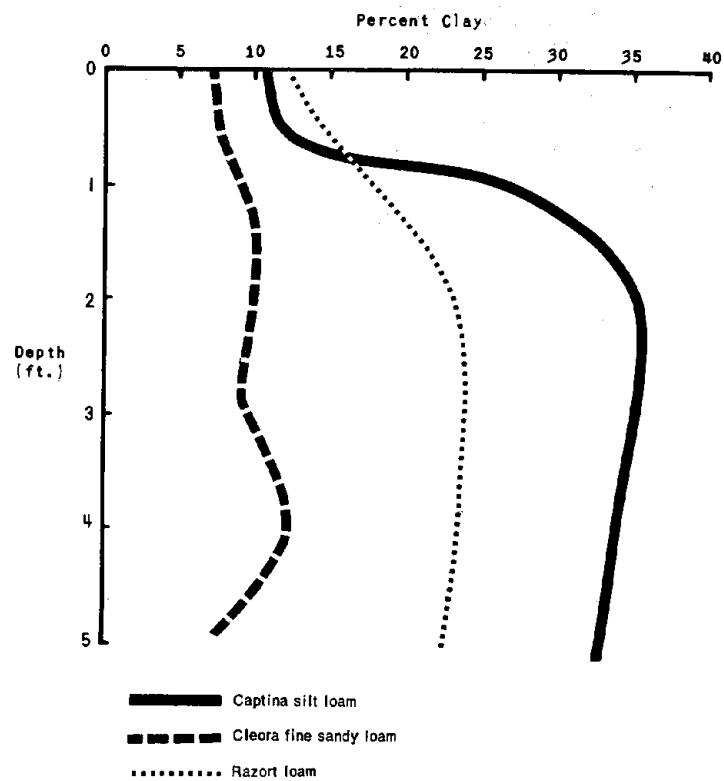

Figure 15.—Distribution of clay in profiles of Captina silt loam, Cleora fine sandy loam, and Razort loam. These soils differ in age.

for discussion in detailed soil surveys and for application of knowledge within farms and fields. The many thousands of narrow classes are then grouped into progressively fewer and broader classes in successively higher categories, so that information can be applied to large geographic areas.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and revised later (*8*). The system currently used by the National Cooperative Soil Survey was adopted in 1965. It is under continual study. Readers interested in the development of the system should refer to the latest literature available (*6, 13*).

The current system of classification has six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are observable or measurable, but the properties are selected so that soils of similar genesis are grouped together. The placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes 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 national, State, and regional levels of responsibility for soil classification results in a judgment that the new series should be established. Most of the soil series described in this publication were established before this survey was made. Four of the series represented in the county, however, are tentative at present. These are the Fayetteville, Mountainburg, Razort, and Samba series.

Table 10 shows the classification of the soil series of Washington County according to the current system. It also shows one category—the great soil group—of the 1938 system.

Following are brief descriptions of each of the categories in the current system.

TABLE 10.—*Soil series classified according to the current system of classification and the 1938 system*

Series	Current classification			1938 classification
	Family	Subgroup	Order	Great soil group
Allegheny [1]	Fine-loamy, mixed, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Allen	Fine-loamy, siliceous, thermic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Apison	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Baxter	Clayey, mixed, mesic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Captina	Fine-silty, mixed, mesic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils (with fragipan).
Cherokee	Fine, mixed, thermic	Typic Albaqualfs	Alfisols	Low-Humic Gley soils.
Clarksville	Loamy-skeletal, siliceous, mesic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils intergrading toward Regosols.
Cleora	Coarse-loamy, mixed, thermic	Fluventic Hapludolls	Mollisols	Alluvial soils.
Elsah	Loamy-skeletal, mixed, nonacid, mesic.	Typic Udifluvents	Entisols	Alluvial soils.
Enders	Clayey, mixed, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Fayetteville	Fine-loamy, mixed, thermic	Rhodultic Paleudalfs	Alfisols	Reddish Prairie soils.
Guin [2]	Sandy-skeletal, siliceous, thermic	Typic Dystrochrepts	Inceptisols	Regosols.
Hector	Loamy, siliceous, thermic	Lithic Dystrochrepts	Inceptisols	Lithosols.
Jay	Fine-silty, mixed, thermic	Mollic Fragiudalfs	Alfisols	Gray-Brown Podzolic soils (with fragipan).
Johnsburg	Fine-silty, mixed, mesic	Aquic Fragiudults	Ultisols	Red-Yellow Podzolic soils (with fragipan).
Leaf	Clayey, mixed, thermic	Typic Ochraquults	Ultisols	Planosols.
Linker	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Montevallo	Loamy-skeletal, mixed, thermic, shallow.	Typic Dystrochrepts	Inceptisols	Lithosols.
Mountainburg	Loamy-skeletal, siliceous, thermic	Lithic Hapludults	Ultisols	Lithosols.
Nixa	Loamy-skeletal, siliceous, mesic	Ochreptic Fragiudults	Ultisols	Red-Yellow Podzolic soils (with fragipan).
Pembroke	Fine-silty, mixed, mesic	Ultic Paleudalfs	Alfisols	Red-Yellow Podzolic soils.
Pickwick	Fine-silty, mixed, thermic	Typic Paleudults	Ultisols	Red-Yellow Podzolic soils.
Razort	Fine-loamy, mixed, mesic	Mollic Hapludalfs	Alfisols	Alluvial soils intergrading toward Gray-Brown Podzolic soils.
Samba	Fine, mixed, thermic	Typic Umbraqualfs	Alfisols	Humic Gley soils.
Savannah	Fine-loamy, mixed, thermic	Typic Fragiudults	Ultisols	Red-Yellow Podzolic soils (with fragipan).
Sloan	Fine-loamy, mixed, noncalcareous, mesic.	Fluventic Haplaquolls	Mollisols	Alluvial soils.
Sogn	Loamy, mixed, mesic	Lithic Haplustolls	Mollisols	Lithosols.
Summit	Fine, montmorillonitic, thermic	Vertic Argiudolls	Mollisols	Brunizems.
Taloka	Fine, mixed, thermic	Mollic Albaqualfs	Alfisols	Planosols.

[1] The soils correlated as Allegheny in Washington County have a darker colored A horizon and are more clayey in the lower part of the B horizon and in the C horizon than is appropriate to the classification shown.

[2] The Guin soils in Washington County are taxadjuncts to the Guin series. The fine-earth fraction is loamy instead of sandy.

ORDER: In the order, soils are grouped according to properties that seem to result from the same processes acting to about the same degree on soil material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Ardisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. Entisols, Inceptisols, Mollisols, Alfisols, and Ultisols are represented in Washington County.

SUBORDER: Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. A suborder has a narrower climatic range than an order. The criteria for suborders reflect either (1) the presence or absence of waterlogging or (2) differences in climate or vegetation.

GREAT GROUP: Each suborder is divided into great groups on the basis of uniformity in kind and sequence of genetic horizons.

SUBGROUP: Each great group is divided into subgroups, one representing the central (typic) concept of the group, and others, called intergrades, representing the soils that have mostly the properties of one great group but also have one or more properties of the soils of another great group, suborder, or order.

FAMILY: Each subgroup is divided into families, primarily on the basis of properties important to plant growth. Some of the properties considered are texture, mineral composition, reaction, soil temperature, permeability, consistence, and thickness of horizons.

SERIES: The series has the narrowest range of characteristics of the categories in the classification system. It is explained in the section "How This Survey Was Made."

General Nature of the County

This section tells something about the farming in Washington County and describes the physiography, drainage, geology, and climate.

Physiography and Drainage

Washington County is in the Boston "Mountains" section and Springfield-Salem plateau section of the Ozark Plateaus province.

The southern part of the county is in the Boston "Mountains" section. Here, the stream valleys are about 1,100 to 1,400 feet above sea level. They range from a little wider than the stream itself to as much as a mile wide. The wider valleys are along a few of the larger streams, on the northern edge of this area. The mountainsides are gravelly and stony and are strongly dissected. They rise from the stream valleys in a series of steep slopes and gently sloping benches. The gradient is between 12 and 65 percent. The mountaintops are mainly gently sloping, long and winding, and 400 feet to 1 mile wide. Most are at an elevation of 1,700 to 2,000 feet. There are a few at 2,300 feet.

The northern part of the county is in the Springfield-Salem plateau section. Part of it is nearly level to gently sloping, and the rest is strongly dissected. The elevation is about 1,000 to 1,450 feet. In the broad, more nearly level areas, for exampe, at Springdale, Tontitown, and Prairie Grove, the gradient is 1 to 8 percent and there are a few V-shaped draws 50 to 150 feet deep and 300 to 600 feet wide. The dissected areas, the largest of which are in the northeastern and northwestern parts of the county, are characterized by steep, V-shaped valleys that are 200 to 800 feet wide and are separated by long, narrow, winding, gently sloping ridges.

There are several small, perennial streams in this county, but no large streams. The natural drainage system consists of many small streams in a dendritic pattern in the upper reaches of several watersheds and an irregular drainage divide in the southern part of the county. The small part of the county south of this divide is drained toward the south into numerous small creeks that eventually flow into the Arkansas River. About a third of the eastern part of the county is drained toward the north into the White River. The western part is drained toward the west through the Illinois River and numerous small streams, the largest of which are Barren Fork, Evansville Creek, Ballard Creek, Cincinnati Creek, and Wildcat Creek. All of these streams eventually flow into the Arkansas River.

Geology

The surface rocks of Washington County are limestone and cherty limestone; acid sandstone, siltstone, and shale; and small amounts of calcareous sandstone and shale. The beds are nearly horizontal but dip slightly to the south. Locally they show considerable folding and faulting. Most of these rocks are of the Pennsylvanian and Mississippian Systems of the Paleozoic Era; a few are Devonian. All are sedimentary rocks that have been uplifted.

Along the southern edge of the county is the Atoka Formation of the Pennsylvanian System. It is dominantly acid shale interbedded with acid sandstone and siltstone. The caprock on the mountaintops in the bluffs on the mountainsides are sandstone. The bluffs are 10 to 50 feet high.

North of the Atoka Formation and at a lower elevation are the Bloyd and Hale Formations of the Pennsylvanian System and the Pitkin Limestone of the Upper Mississippian System. In the southern part of the county, these formations are exposed only in some of the deeper valleys. Northward, they are exposed at progressively higher elevations and are near or at the mountaintops near Cane Hill, West Fork, and Elkins.

The Bloyd Formation is mostly acid shale but contains fairly thin layers of limestone. Below the Bloyd Formation is the Hale Formation, which contains shale and calcareous sandstone. The Hale Formation is underlain by the massive, gray Pitkin Limestone. In many places this limestone is 30 feet or more thick. It is exposed on some of the bluffs along Arkansas Highway 45, near Cane Hill, and along U.S. Highway 71, near West Fork.

North of the Pitkin Limestone and at a lower elevation is the Fayetteville Formation, which is also part of the Mississippian System. The Fayetteville Formation is mostly acid shale, but the upper part of it is Wedington Sandstone, which is exposed on some of the mountaintops in the area. The acid shale is exposed on foot slopes. This formation forms most of the irregular northern border of the Boston "Mountains" section. The border is one of foot slopes and mountains, one of which, Wedington Mountain, extends several miles into the Springfield-Salem plateau section. Outlying remnants of the Fayetteville Formation occur as conspicuous knobs that rise 250 to 350 feet above

the plateau east of Springdale and in the northwestern part of the county.

A few small areas of Chattanooga Shale are exposed at the lowest elevations in the northeastern and northwestern parts of the county. This shale is of the Devonian System and is most likely the oldest exposed geologic formation in the county.

Climate[8]

Table 11 shows, by months, the average daily maximum temperature, the average daily minimum temperature, and the average precipitation for Washington County.

Temperature.—Temperatures are consistently cooler in the northwestern counties than in the rest of the State. The average monthly temperature in Washington County is 4 to 6 degrees lower than in counties to the southeast and 1 to 3 degrees lower than in those to the northeast. Summers are long and are frequently hot for extended periods, but there are fewer summer days with temperatures of 90° F. or higher in this county than in the central part of the State. Fayetteville's record high temperature of 111°, in July, 1954, however, is slightly higher than the highest temperature of record elsewhere in the State. Nighttime temperatures in summer are as low as or lower than they are in any nearby area. Winter cold is accompanied by wind and is more noticeable than elsewhere in the State.

The average growing season in this county is nearly 25 percent shorter than in the southern part of Arkansas. Records from the U.S. Weather Bureau Station in Fayetteville show that the average length of the growing season is 194 days. The average date of the last freezing temperature (32° F.) in spring is April 13, and the average date of the first in fall is October 24. The latest that a temperature of 32° has been recorded is May 4 (in 1944), and the earliest is September 27 (in 1942). The average date of the last 28° reading in spring is April 3, and that of the first in fall is November 1. The latest that a temperature of 28° has been recorded is May 4 (in 1944), and the earliest is October 7 (in 1952).

Precipitation.—Precipitation in this county is ample for farming, even though it is lighter than in most areas of the State. The average warm-season (April through September) precipitation, however, is heavier in the northwestern counties, including Washington County, than in most of the other counties. As shown in table 11, precipitation is lightest in winter. The distribution throughout the year is more like that in neighboring areas in Oklahoma, Kansas, and Missouri than like that in many parts of Arkansas.

Droughts are less frequent in the northwestern part of Arkansas than in most of the Central and Northern Plains States and even in the Ohio River Valley. Severe to extreme droughts—those that only the most drought-resistant native plants can survive—occur no more frequently than once every 10 to 15 years and are of 3 to 5 months duration. The longest drought of recent years was the period 1952 to 1956, during which there were 24 consecutive months of moderate or more serious drought.

The average annual evaporation is about 60 inches, which is in excess of the average total precipitation. In summer, the rate may be as much as a quarter of an inch a day. Thus, a large amount of soil moisture is lost during rain-free periods in the hot summer months.

A measurable amount of snow falls every winter, and the average is 8.8 inches per season. Snow usually remains on the ground only for a short time. A snowfall of 31.7

[8] R. O. REINHOLD, chief, U.S. Weather Bureau, Little Rock, Ark., helped to prepare this section.

TABLE 11.—*Temperature and precipitation*

[All data from Fayetteville, elevation 1,450 feet, for the period 1931 through 1960]

Month	Temperature				Precipitation		
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—		Average total	One 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.	In.	In.	In.
January	48	28	70	4	2. 56	0. 66	5. 48
February	52	31	72	7	3. 04	0. 85	4. 75
March	60	37	78	15	3. 36	1. 52	5. 95
April	70	47	85	28	4. 77	2. 27	7. 11
May	77	55	88	38	5. 98	2. 32	10. 22
June	86	64	99	49	5. 07	0. 74	8. 27
July	91	67	103	55	3. 63	0. 83	6. 62
August	91	66	103	52	3. 38	0. 91	6. 37
September	84	58	99	40	4. 10	0. 87	9. 16
October	74	48	89	28	3. 55	1. 03	6. 33
November	59	36	76	15	3. 23	0. 65	5. 56
December	51	30	69	9	2. 54	0. 58	4. 85
Year	70. 2	47. 2			45. 21		

inches, in 1923–24, is the heaviest that has been recorded. Severe local storms are infrequent, even though Washington County is near the high-frequency tornado areas in Oklahoma. Forty tornadoes were recorded in the 46-year period 1916–61 in Washington County and the 5 adjoining counties in northwestern Arkansas. Thunderstorms occur on an average of 56 days a year.

Water Supply

Washington County is well supplied with streams and lakes, but some streams are dry part of the year. The principal streams are the White River and its west fork and middle fork, the Illinois River, Cincinnati Creek, Cove Creek, Barren Fork, and Richland Creek. The principal lakes include Beaver, Wedington, Fayetteville, Sequoyah, and those in the Muddy Fork Watershed. All the lakes are manmade. Beaver Lake furnishes an ample supply of water for municipal and industrial uses for the northeastern part of the county and attracts many sportsmen, vacationers, and retired people. There are about 3,400 farm ponds in the county.

The supply of underground water is adequate for farmstead water systems but in most areas is inadequate for irrigation. Most of the wells are 80 to 200 feet deep; some are as much as 300 feet deep. The water is generally of good quality but in places is moderately hard and moderately high in iron. Most of it can be used for household purposes. Additives that reduce hardness and lower the iron content improve the quality.

Farming

According to the 1964 census, the total area of Washington County is 616,320 acres. About 57 percent of this acreage is farms. The rest consists mainly of large wooded tracts, part of which is public land in the Ozark National Forest. Most of these wooded tracts are steep, stony mountainsides or hillsides. Some are level and poorly drained, and some are on flood plains that are subject to overflow. There are also wooded areas on many of the farms.

There were 3,072 farms in the county in 1964. Of this number, 1,873 farms were less than 100 acres in size; 1,189 farms were between 100 and 1,000 acres; and 8 farms were 1,000 acres or more. Of the farm operators, 2,550 were full owners, 343 were part owners, 12 were managers, and 167 were tenants. Most of the farms were family-sized units operated by the family and occasional hired help.

Beef cattle and broilers are important in the economy of the county. The cattle industry consists mainly of cow-calf operations. Most of the calves are sold as weaners, and some are sold as stockers the following year. Between 1959 and 1964, the production of cattle and calves increased from 57,741 to 68,604 and the number of milk cows decreased from 13,230 to 8,414. During this same period, the number of broilers produced per year increased from 33,407,793 to 61,688,430.

On most farms, the open land is used mainly for pasture and meadow. Winter small grain is grown to supplement pasture and then is harvested in spring. Only small acreages of corn and other row crops are grown. Some farms produce grapes, apples, and green beans. The total acreage of fruit and vegetable crops is small but is increasing.

Most cattle produced in this county are sold to midwestern feedlots. Most broilers are processed at local plants. Concord grapes are processed into juice at a plant in Springdale, or are made into wine, or are sold as fresh fruit. Canneries at Springdale and Fort Smith are good markets for truck crops. There are good outlets for sawlog timber at local sawmills, but currently there is little local demand for pulpwood because of the expense of transportation.

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Glossary

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

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

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

Base saturation. The degree to which material that has base-exchange properties is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation-exchange capacity.

Clay. As a soil separate, mineral soil particles that are 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.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Colluvium. Soil material, rock fragments, 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 pressure between thumb and forefinger and can be pressed together into a lump.

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

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

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

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

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

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

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

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic matter and clay but is rich in silt or very fine sand. The layer is seemingly cemented when dry, has a hard or very hard consistence, and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Gleyed soil. A soil in which waterlogging and lack of oxygen have caused the material in one or more horizons to be neutral gray in color. The term "gleyed" is applied to soil horizons with yellow and gray mottling caused by intermittent waterlogging.

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

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

A horizon. The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, or 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 (1) distinctive characteristics caused by accumulation of clay, sesquioxides, humus, or some combination of these; (2) prismatic or blocky structure; (3) redder or stronger colors than the A horizon; or (4) some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

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

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

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

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

Parent material. 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. The capacity of the soil to transmit air or water. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

Poorly graded soil. A soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles in poorly graded soil material, density can be increased only slightly by compaction.

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

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values or words as follows:

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

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material from which a soil forms.

Sand. As a soil separate, individual rock or mineral fragments 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz, but sand may be any mineral composition. As a textural class, soil that is 85 percent or more sand and not more than 10 percent clay.

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

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

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

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains,

and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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

Tilth, soil. The condition of the soil, especially of the soil structure, in relation to the growth of plants. 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.

Well-graded soil. A soil or soil material consisting of particles that are well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Other information is given in tables as follows:

Acreage and extent, table 1, page 8. Predicted yields, table 2, page 48. Engineering uses of the soils, tables 3, 4, 5, and 6, pages 52 through 69. Nonfarm uses of the soils, table 7, page 70.

Map symbol	Mapping unit	Described on page	Capability unit		Woodland group		Wildlife group		Range site	
			Symbol	Page	Number	Page	Number	Page	Name	Page
AeC	Allegheny gravelly loam, 3 to 8 percent slopes	9	IIIe-2	42	6	78	3	83	----------	--
AeC2	Allegheny gravelly loam, 3 to 8 percent slopes, eroded	9	IIIe-2	42	6	78	3	83	----------	--
AeD2	Allegheny gravelly loam, 8 to 12 percent slopes, eroded	9	IVe-1	44	6	78	3	83	----------	--
AgD	Allegheny stony loam, 8 to 12 percent slopes	10	IVe-3	44	7	79	6	85	----------	--
AgF	Allegheny stony loam, 12 to 40 percent slopes	10	VIIe-1	46	7	79	9	85	----------	--
AhF	Allen-Hector complex, 20 to 40 percent slopes	12								
	Allen	--	VIIe-1	46	7	79	6	85	----------	--
	Hector and Mountainburg	--	VIIs-2	47	10	80	6	85	Sandstone Ridge	83
AhG	Allen-Hector complex, 40 to 55 percent slopes	13								
	Allen	--	VIIe-1	46	7	79	6	85	----------	--
	Hector and Mountainburg	--	VIIs-2	47	10	80	6	85	Sandstone Ridge	83
AlC2	Allen loam, 3 to 8 percent slopes, eroded	11	IIIe-2	42	6	78	3	83	----------	--
AlD2	Allen loam, 8 to 12 percent slopes, eroded	12	IVe-1	44	6	78	3	83	----------	--
AlE2	Allen loam, 12 to 20 percent slopes, eroded	12	VIe-1	46	6	78	6	85	----------	--
AnE	Allen soils, 8 to 20 percent slopes	12	VIe-1	46	7	79	6	85	----------	--
AoF	Allen stony loam, 12 to 35 percent slopes	12	VIIe-1	46	7	79	6	85	----------	--
ApB	Apison loam, 1 to 3 percent slopes	13	IIe-3	42	5	78	3	83	----------	--
ApC2	Apison loam, 3 to 8 percent slopes, eroded	14	IIIe-4	43	5	78	3	83	----------	--
AsC2	Apison gravelly loam, 3 to 8 percent slopes, eroded	14	IIIe-4	43	5	78	3	83	----------	--
BaC	Baxter cherty silt loam, 3 to 8 percent slopes	14	IIIe-3	43	5	78	4	83	----------	--
BaD	Baxter cherty silt loam, 8 to 12 percent slopes	15	IVe-2	44	--	--	4	83	----------	--
	North slopes	--	------	--	6	78	---	--	----------	--
	South slopes	--	------	--	7	79	---	--	----------	--
BaE	Baxter cherty silt loam, 12 to 20 percent slopes	15	VIe-2	46	7	79	4	83	----------	--
BaF	Baxter cherty silt loam, 20 to 45 percent slopes	15	VIIe-2	46	7	79	4	83	----------	--
CaB	Captina silt loam, 1 to 3 percent slopes	16	IIe-1	41	5	78	3	83	----------	--
CaC	Captina silt loam, 3 to 6 percent slopes	16	IIIe-1	42	5	78	3	83	----------	--
CaC2	Captina silt loam, 3 to 6 percent slopes, eroded	16	IIIe-1	42	5	78	3	83	----------	--
Ch	Cherokee silt loam	17	IVw-1	45	8	79	5	85	----------	--
Ck	Cherokee complex, mounded	17	IVw-1	45	8	79	5	85	----------	--
ClG	Clarksville cherty silt loam, 12 to 60 percent slopes	18	VIIs-1	46	--	--	4	83	Chert Hills	81
	North slopes	--	------	--	6	78	---	--	----------	--
	South slopes	--	------	--	10	80	---	--	----------	--
Cr	Cleora fine sandy loam	18	IIIw-3	43	1	75	1	83	----------	--
Ec	Elsah cobbly soils	19	Vw-1	45	2	75	1	83	----------	--
Eg	Elsah gravelly soils	19	Vw-1	45	2	75	1	83	----------	--
EnC	Enders gravelly loam, 3 to 8 percent slopes	20	IVe-5	45	10	80	9	85	Claybreak Shale	81
EnC2	Enders gravelly loam, 3 to 8 percent slopes, eroded	20	IVe-5	45	10	80	9	85	Claybreak Shale	81
EnD	Enders gravelly loam, 8 to 12 percent slopes	20	VIe-4	46	10	80	9	85	Claybreak Shale	81
EnD2	Enders gravelly loam, 8 to 12 percent slopes, eroded	20	VIe-4	46	10	80	9	85	Claybreak Shale	81
EoD	Enders stony loam, 3 to 12 percent slopes	21	VIs-1	46	10	80	9	85	Claybreak Shale	81
ErE	Enders-Allegheny complex, 8 to 20 percent slopes	21								
	Enders	--	VIIs-4	47	10	80	9	85	Claybreak Shale	81
	Allegheny	--	VIIe-1	46	7	79	9	85	----------	--
ErF	Enders-Allegheny complex, 20 to 40 percent slopes	21								
	Enders	--	VIIs-4	47	10	80	9	85	Claybreak Shale	81
	Allegheny	--	VIIe-1	46	7	79	9	85	----------	--
FaC2	Fayetteville fine sandy loam, 3 to 8 percent slopes, eroded	22	IIIe-4	43	3	78	3	83	----------	--
FaD2	Fayetteville fine sandy loam, 8 to 12 percent slopes, eroded	22	IVe-1	44	4	78	3	83	----------	--
FaE2	Fayetteville fine sandy loam, 12 to 20 percent slopes, eroded	22	VIe-1	46	4	78	6	85	----------	--
FeF	Fayetteville stony fine sandy loam, 12 to 35 percent slopes	23	VIIe-1	46	4	78	6	85	----------	--
FhF	Fayetteville-Hector complex, 20 to 40 percent slopes	23								
	Fayetteville	--	VIIe-1	46	4	78	6	85	----------	--
	Hector and Mountainburg	--	VIIs-2	47	10	80	6	85	Sandstone Ridge	83
GuC	Guin cherty silt loam, 3 to 8 percent slopes	23	IVs-2	45	6	78	4	83	----------	--
HmC	Hector-Mountainburg gravelly fine sandy loams, 3 to 8 percent slopes	24	IVe-4	44	10	80	7	85	Sandstone Ridge	83
HmD	Hector-Mountainburg gravelly fine sandy loams, 8 to 12 percent slopes	24	VIe-3	46	10	80	7	85	Sandstone Ridge	83
HoF	Hector-Mountainburg stony fine sandy loams, 3 to 40 percent slopes	24	VIIs-2	47	10	80	7	85	Sandstone Ridge	83
JaB	Jay silt loam, 1 to 3 percent slopes	25	IIe-1	41	13	80	2	83	Loamy Prairie	82
JaC	Jay silt loam, 3 to 8 percent slopes	25	IIIe-1	42	13	80	2	83	Loamy Prairie	82
Jo	Johnsburg silt loam	26	IIIw-2	43	8	79	5	85	----------	--
Js	Johnsburg complex, mounded	26	IVw-1	45	8	79	5	85	----------	--
Le	Leaf silt loam	27	IVw-1	45	8	79	5	85	----------	--
Lf	Leaf complex, mounded	27	IVw-1	45	8	79	5	85	----------	--
LkB	Linker loam, 1 to 3 percent slopes	28	IIe-3	42	5	78	3	83	----------	--
LkC2	Linker loam, 3 to 8 percent slopes, eroded	28	IIIe-4	43	5	78	3	83	----------	--
LnC2	Linker gravelly loam, 3 to 8 percent slopes, eroded	29	IIIe-4	43	5	78	3	83	----------	--
LnD	Linker gravelly loam, 8 to 12 percent slopes	29	IVe-1	44	6	78	3	83	----------	--
MoD	Montevallo soils, 3 to 12 percent slopes	29	VIe-3	46	11	80	7	85	Shale Break	83
MoE	Montevallo soils, 12 to 25 percent slopes	29	VIIs-2	47	11	80	7	85	Shale Break	83
NaC	Nixa cherty silt loam, 3 to 8 percent slopes	30	IIIs-1	44	10	80	4	83	Chert Hills	81
NaD	Nixa cherty silt loam, 8 to 12 percent slopes	31	IVs-1	45	--	--	4	83	Chert Hills	81
	North slopes	--	------	--	6	78	---	--	----------	--
	South slopes	--	------	--	10	80	---	--	----------	--
PeB	Pembroke silt loam, 1 to 3 percent slopes	31	IIe-2	41	3	78	3	83	----------	--
PeC2	Pembroke silt loam, 3 to 6 percent slopes, eroded	31	IIIe-2	42	3	78	3	83	----------	--
PgC2	Pembroke gravelly silt loam, 3 to 8 percent slopes, eroded	32	IIIe-2	42	3	78	3	83	----------	--
PkC2	Pickwick gravelly loam, 3 to 8 percent slopes, eroded	33	IIIe-2	42	3	78	3	83	----------	--
PkD2	Pickwick gravelly loam, 8 to 12 percent slopes, eroded	33	IVe-1	44	3	78	3	83	----------	--
PsB	Pickwick silt loam, 1 to 3 percent slopes	33	IIe-2	41	3	78	3	83	----------	--
PsC2	Pickwick silt loam, 3 to 8 percent slopes, eroded	33	IIIe-2	42	3	78	3	83	----------	--
Ra	Razort silt loam, occasionally flooded	34	IIw-1	42	1	75	1	83	----------	--
Rg	Razort gravelly silt loam, occasionally flooded	34	IIw-1	42	1	75	1	83	----------	--
Rk	Razort loam	34	IIe-2	41	1	75	1	83	----------	--
Ro	Rock land	34	VIIs-3	47	12	80	8	85	Limestone Ledge	82
Sa	Samba silt loam	35	IIIw-1	43	9	80	5	85	----------	--
Sb	Samba complex, mounded	35	IVw-1	45	9	80	5	85	----------	--
SfB	Savannah fine sandy loam, 1 to 3 percent slopes	36	IIe-1	41	5	78	3	83	----------	--
SfC2	Savannah fine sandy loam, 3 to 8 percent slopes, eroded	36	IIIe-1	42	5	78	3	83	----------	--
Sn	Sloan silt loam	37	IIw-1	42	1	75	1	83	----------	--
So	Sogn rocky silt loam	37	VIIs-3	47	12	80	8	85	Limestone Ledge	82
Sp	Summit complex, mounded	37	IIIw-4	44	9	80	2	83	----------	--
SsA	Summit silty clay, 0 to 1 percent slopes	38	IIIw-4	44	9	80	2	83	----------	--
SsB	Summit silty clay, 1 to 3 percent slopes	38	IIe-4	42	11	80	2	83	Claybreak Shale	81
SsC2	Summit silty clay, 3 to 8 percent slopes, eroded	38	IIIe-5	43	11	80	8	85	Claybreak Shale	81
SsD2	Summit silty clay, 8 to 12 percent slopes, eroded	38	IVe-6	45	11	80	8	85	Claybreak Shale	81
StD2	Summit stony silty clay, 3 to 12 percent slopes, eroded	38	VIs-1	46	11	80	8	85	Claybreak Shale	81
StE2	Summit stony silty clay, 12 to 25 percent slopes, eroded	39	VIIs-4	47	11	80	8	85	Claybreak Shale	81
Ta	Taloka complex, mounded	39	IVw-1	45	13	80	2	83	Loamy Prairie	82
ToA	Taloka silt loam, 0 to 1 percent slopes	39	IIIw-1	43	13	80	2	83	Loamy Prairie	82
ToB	Taloka silt loam, 1 to 3 percent slopes	40	IIe-4	42	13	80	2	83	Loamy Prairie	82

298-763 O - 69 (Face Soil Maps)