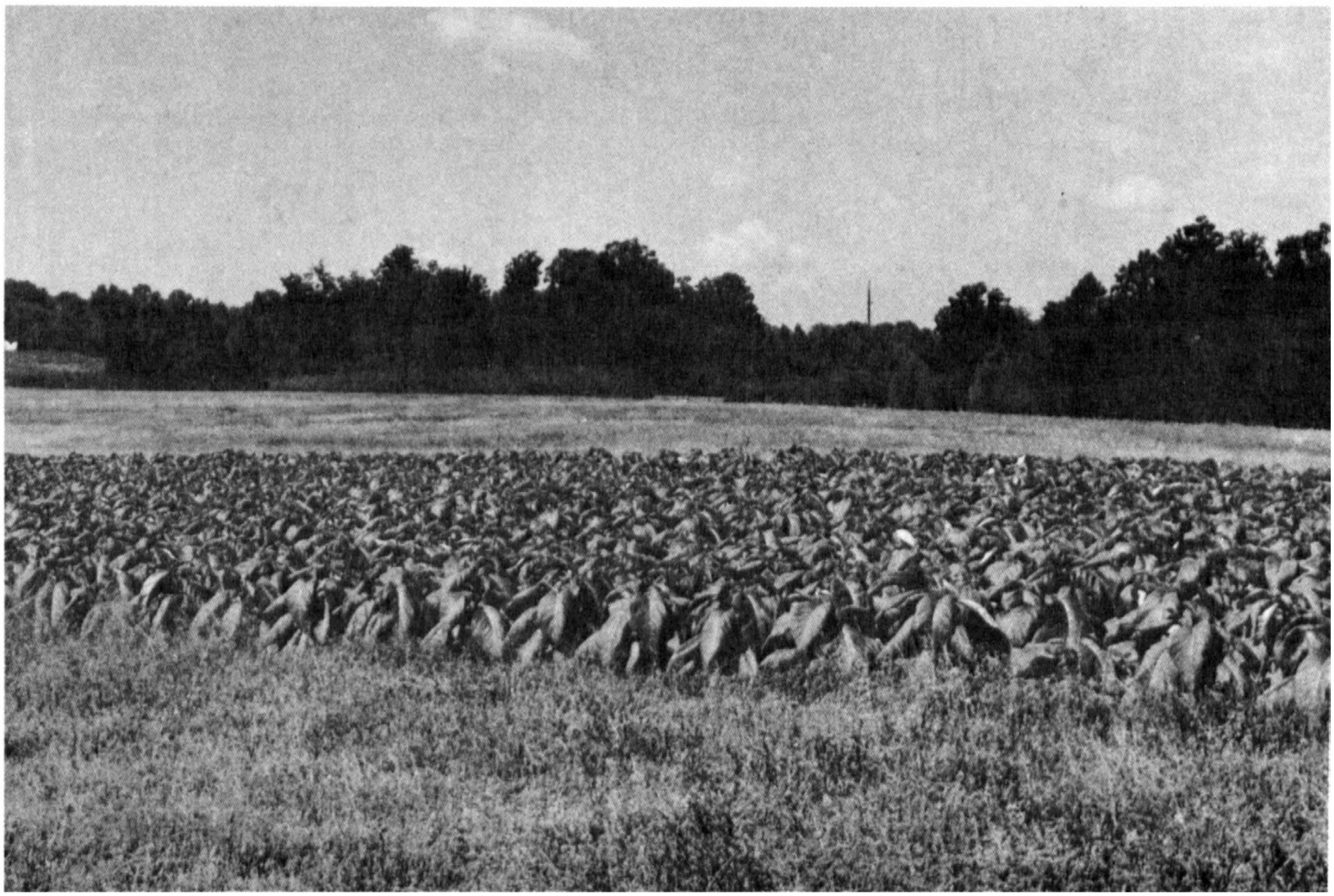
SOIL SURVEY

Robertson County, Tennessee



UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
TENNESSEE AGRICULTURAL EXPERIMENT STATION

Major fieldwork for this soil survey was done in the period 1961-64. Soil names and descriptions were approved in 1965. Unless otherwise indicated statements in the publication refer to conditions in the county in 1964. This survey was made cooperatively by the Soil Conservation Service and the Tennessee Agricultural Experiment Station. The contribution of the Soil Conservation Service is a part of the technical assistance furnished to the Robertson County Soil Conservation District.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Robertson County 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 value of tracts of land for agriculture, industry, or recreation.

Locating Soils

All of the soils of Robertson 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 symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in the survey. This guide lists all of the soils of the county in alphabetic order by map symbol and shows the page where each kind of soil is described. The guide also identifies the capability unit, the woodland group, and the wildlife group of each kind of soil and tells where to find descriptions of these groups.

Individual colored maps showing the relative suitability or limitation of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

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

Foresters and others can refer to the subsection "Management of Soils Used as Woodland," where data on managing groups of soils are given in a table.

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

Engineers and builders will find under "Use of Soils for Engineering" tables that give engineering test data 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 were formed and how they are classified in the section "Formation and Classification of Soils."

Students, teachers, and others will find information about soils and their management in various parts of the text, depending on their particular interest.

Newcomers in Robertson 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," which gives additional information about the county.

Cover picture: Tobacco growing on a narrow area of Staser silt loam. The pastures on either side of the tobacco are mainly on Baxter and Mountview soils.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on next page.

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EXPLANATION

Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas and Eldorado Valleys, Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

SOIL SURVEY OF ROBERTSON COUNTY, TENNESSEE

BY RECTOR H. MONEYMAKER, JAMES F. BRASFIELD, JOHN B. COTHRAN, BOBBY B. HINTON, EUGENE T. LAMPLEY, SOIL CONSERVATION SERVICE, AND J. PAUL SUTTON, JR., TENNESSEE AGRICULTURE EXPERIMENT STATION

UNITED STATES DEPARTMENT OF AGRICULTURE IN COOPERATION WITH THE TENNESSEE AGRICULTURAL EXPERIMENT STATION

ROBERTSON COUNTY is a rolling, productive highland in the north-central part of Tennessee (fig. 1). It is near the center of the Highland Rim and Pennyroyal major land resource area. The elevation ranges from about 350 to 925 feet above sea level. The total area of the county is 304,640 acres, or 476 square miles.

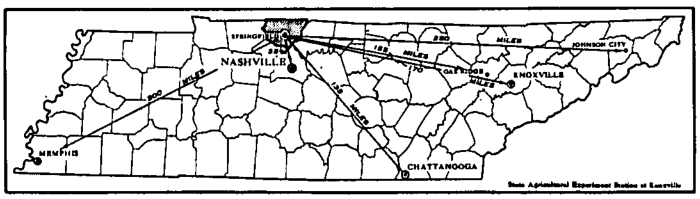

Figure 1.—**Location of Robertson County in Tennessee.**

The county is primarily agricultural. Farming is of the general type. Most of the farmland is used for corn and small grains, but tobacco is the main cash crop.

The extreme southern part of the county forms a belt of hills that have steep sides, narrow tops, and V-shaped valleys. The soils on these uplands are low in fertility, cherty, and mostly shallow over rock. Except along Sycamore Creek, the bottom lands are narrow. Along Sycamore Creek, the bottom lands are productive, but in many areas the soils are cherty, have limited drainage, or are so isolated that farming is not practical.

The rest of the county is nearly level to hilly, except near the streams where slopes are steeper. The soils in these areas range from well drained in the sloping areas to poorly drained in some of the flats. Most of the smoother areas are covered with loess that ranges from a few inches to 3 or 4 feet in thickness. Cherty soils are in large areas having uneven or steep topography. Some of the most productive soils on uplands in the State are in the northern one-third of the county.

General Nature of the County

This section discusses settlement and population, markets and industries, drainage, and climate of Robertson County. It also gives facts about the agriculture. The figures for population and the statistics on agriculture are from reports by the U.S. Bureau of the Census.

Settlement and Population

Robertson County was formed from Tennessee County on April 9, 1796. In 1798, Springfield, located near the center of the county, was named the county seat. The first settlers came to the county from North Carolina, Virginia, and the eastern part of Tennessee.

In 1960, the county had a population of 27,335. Springfield, which is the largest town, had a population of 9,221.

Markets and Industries

Springfield is the main trading center in Robertson County. It is one of the leading tobacco markets in the country and is the only market where all three classes of tobacco—dark-fire cured, dark air-cured (one sucker), and burley—are sold. Since 1950, the manufacturing plants in Springfield have increased in number considerably, and many of those that existed before 1950 have been expanded. The income from trade and industry is increasing, though the main source of income in the county is from the sale of farm products.

Agriculture

Farmland makes up 91.3 percent of Robertson County. Of the 2,067 farms in the county, 44 are 500 acres or more in size and 118 are less than 10 acres. The size of most farms ranges from 50 to 90 acres. The average size of the farms is 134.6 acres.

Row crops, hay, and pasture take up the largest acreage of farmland and are grown mostly on farms of the general type. More acreage is used for corn and small grains than for tobacco, but tobacco is the main cash crop (fig. 2). Dark-fire cured tobacco is the class mostly grown, but there is a sizable acreage of dark air-cured and burley. The acreage of wheat and oats grown for grain is considerable.

The number of acres in both hay and improved pasture has been increased in recent years. The hay crops, in order of decreasing acreages, are annual lespedeza, red clover, mixtures of grasses and clovers, and alfalfa. Most of the pastures consist of tall fescue or orchardgrass mixed with white clover or Ladino clover. Commonly grown for seed are red clover, annual lespedeza, tall fescue, and orchardgrass.

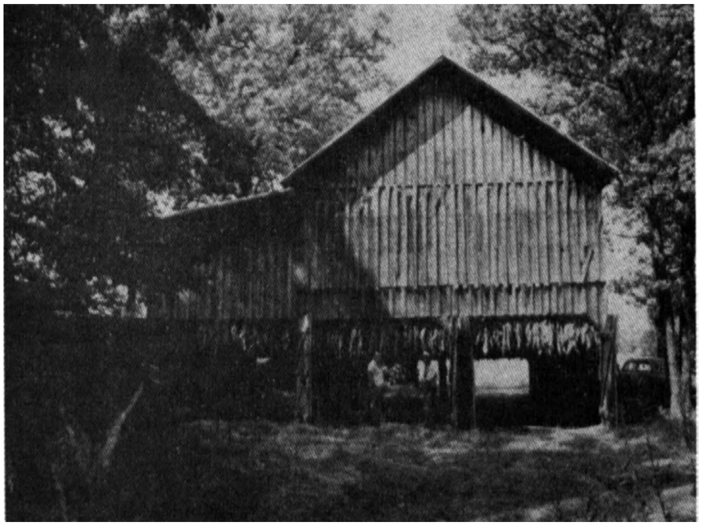

Figure 2.—**Dark-fire cured tobacco ready for curing. The tobacco was grown on a Dickson silt loam.**

Sales of livestock other than sheep, and of dairy products, have increased in recent years.

The Highland Rim Experiment Station is located in this county. It furnishes Robertson County and other counties with information from current research.

Drainage

All of Robertson County is drained by the Red River, the South Fork Red River, and Sulphur Fork. Drainage by the Red River is southwestward; by its south fork, northeastward; and by Sulphur Fork, eastward. Sulphur Fork flows into the Red River at the Montgomery County line. Sycamore Creek and its tributaries drain the extreme southern part of the county. A few areas that contain sinkholes are drained through underground channels in the limestone bedrock.

Climate [1]

Robertson County has relatively mild winters, warm summers, and abundant annual rainfall. The county lies in the paths of cold, dry air from Canada and warm, moist air from the Gulf of Mexico. These masses of air alternate and bring frequent, sizable changes in the weather, both from day to day and from one season to another.

Table 1 gives climatic data at Springfield, near the center of the county. These data apply fairly well to all of the county, though there is some local variation in daily weather. The differences in climate that result from differences in elevation are slight.

Temperature.—The average annual temperature at Springfield is 58° F. Periods of very hot or very cold weather are unusual. Temperatures above 100° in summer or below zero in winter are rare, but a temperature as high as 110° has been recorded at Cedar Hill, and one as low as −18° has been recorded at Springfield. Many warm periods occur in winter, and occasional periods of dry, mild weather relieve the stretches of warm, humid weather in summer.

[1] By Morton Bailey, State climatologist, U.S. Weather Bureau, Nashville, Tennessee.

TABLE 1.—*Climatic data for Springfield*

[Elevation 745 feet; latitude 36° 26 N., longitude 86° 51]

Month	Temperature [1]				Precipitation			
	Average daily maximum [2]	Average daily minimum [2]	Two years in 10 will have at least 4 days with— Maximum temperature equal to or higher than [3]—	Two years in 10 will have at least 4 days with— Minimum temperature equal to or lower than [3]—	Average monthly total [4]	One year in 10 will have— Less than [4]—	One year in 10 will have— More than [4]—	Average snowfall [2]
	°F.	°F.	°F.	°F.	Inches	Inches	Inches	Inches
January	46. 8	28. 3	66	12	5. 26	1. 6	8. 7	2. 0
February	51. 2	30. 6	69	13	4. 95	1. 5	8. 2	1. 6
March	58. 0	37. 5	75	20	5. 03	2. 6	8. 0	1. 3
April	69. 2	47. 4	82	32	4. 02	2. 0	6. 2	(5)
May	77. 7	55. 7	88	41	4. 12	1. 7	6. 2	0
June	85. 9	63. 8	93	53	3. 36	1. 4	6. 9	0
July	88. 9	66. 7	97	58	4. 16	2. 0	7. 8	0
August	88. 5	65. 5	97	57	3. 26	1. 3	5. 9	0
September	82. 7	58. 9	95	45	2. 98	. 6	4. 8	0
October	72. 7	48. 7	86	34	2. 52	1. 0	4. 4	(5)
November	58. 0	37. 2	74	21	3. 85	1. 5	9. 2	(5)
December	47. 7	29. 5	66	14	3. 15	1. 6	7. 7	1. 5
Year	68. 9	47. 5	[6] 98	[6] 1	47. 66	36. 1	56. 8	6. 4

[1] Temperatures referred to in this summary were measured in standard Weather Bureau instrument shelters with thermometer 4.5 feet above the ground. On clear, calm nights temperatures at shelter level usually are about 5 degrees warmer than the air temperature near the ground, and can be as much as 12 degrees warmer.

[2] Period of record, 1944 through 1963.

[3] Period of record, 1947 thorugh 1963.

[4] Period of record, 1938 through 1963.

[5] Trace.

[6] Average annual extremes from 1944 through 1963.

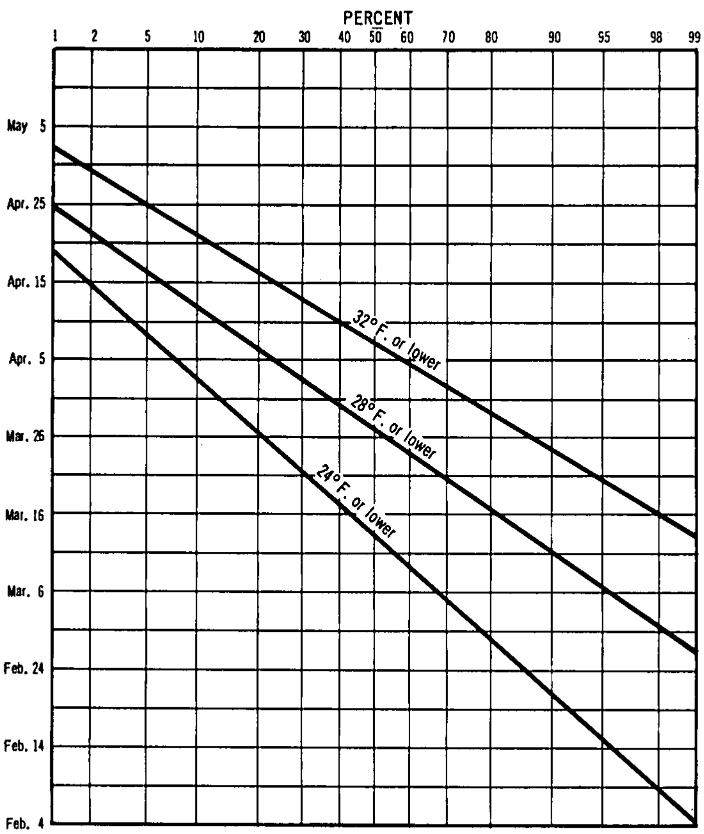

Figure 3.—**Probability that the temperature at Springfield will be 24° F. or lower, 28° or lower, or 32° or lower after any given date in spring.**

As shown in table 1, there is not much difference in the average temperatures of December, January, and February, nor in those of June, July, and August. On the other hand, temperatures trend upward in March, April, and May and trend downward in September, October, and November.

At Springfield, April 7 is the average date of the last freeze in spring and October 30 is the average date of the first freeze in fall. The interval between these dates, which is approximately the growing season, is 206 days.

Figure 3 shows the probability of the temperature dropping to 32°, 28°, and 24° after any given date in spring. To determine, for example, the probability of a temperature of 28° or lower occurring in spring after April 7, first, look at the dates on the left side of the figure and determine approximately where April 7 is on the scale; next, follow a rule horizontally from that point to where the rule intersects the line marked "28° or lower;" then, follow the vertical rule from the point of intersection to the top of figure 3. For this example the probability is *20* percent. In the same manner, you can determine from figure 4 the probability that the temperatures listed will occur before October 30 or any other date in fall.

In this county the growing season is long enough to permit the planting of corn, hay, vegetables, and similar crops to extend over a period of a few weeks because there will be enough time left for these crops to mature. The winters are generally so mild that small grains sown in fall survive and furnish some grazing for livestock in winter. On many days in winter, the average temperature is above 40° and pasture grasses make substantial growth.

Precipitation.—The average annual rainfall in Robertson County is about 48 inches, or enough to supply the needs of farming and general use. During the period 1938 to 1963, the total annual rainfall at Springfield ranged from 33.52 inches in 1941 to 67.56 inches in 1957. As shown in table 1, January, February, and March have the greatest amount of precipitation. In those months low pressure systems, which bring general rains, pass over the area more frequently than during the rest of the year. Precipitation during the summer months is below average for all months except July, when local showers and thunderstorms are most frequent. But average precipitation is lighter in fall because of the frequent presence of high pressure systems. Table 1 indicates that any month of the growing season may have 2 inches or less of rainfall about 1 year in 10 and that rainfall exceeds normal by approximately 2 or 3 inches in any month about 1 year in 10. Thus, in any month of the year, there may be a drought or a period of moderate to excessive rainfall.

The maximum amounts of precipitation recorded in 24 hours were 4.33 inches at Springfield in March 1948 and 10 inches at Cedar Hill in June 1934. Local flooding and soil erosion accompany these heavy rains.

The water balance.—The growth of plants depends to a large degree on the amount of water available in the soil.

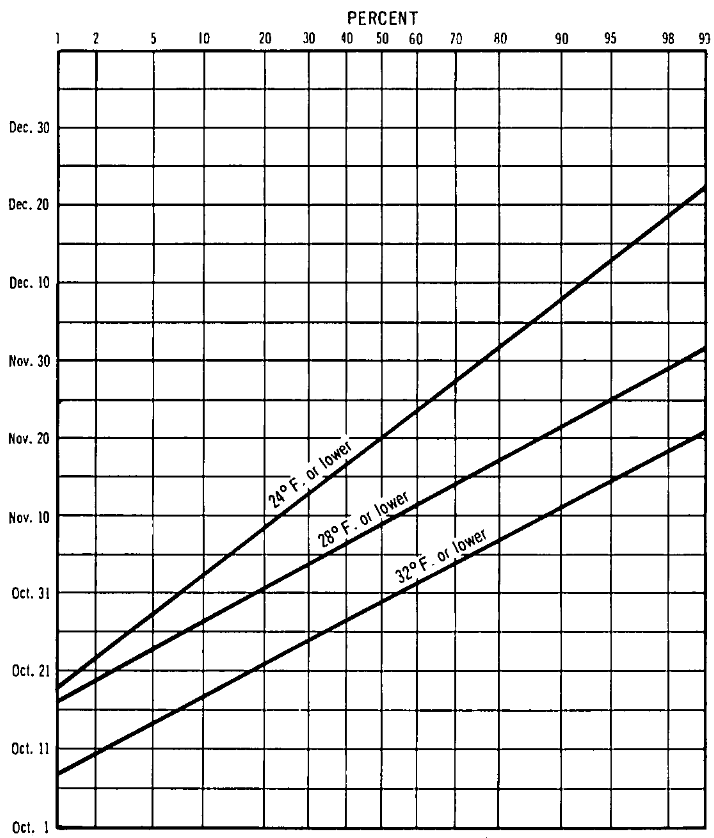

Figure 4.—**Probability that the temperature at Springfield will be 24° F. or lower, 28° or lower, or 32° or lower before any given date in fall.**

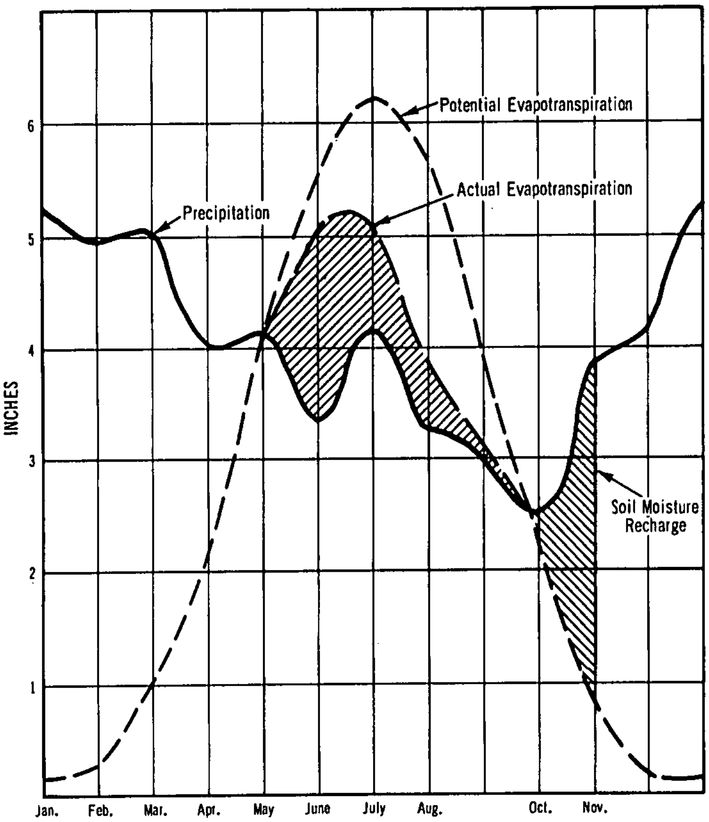

Figure 5.—**Average water balance at Springfield.**

This water decreases when more of it is lost through internal drainage and evapotranspiration than is supplied by precipitation or by irrigation. Figure 5 shows the average water balance at Springfield throughout the year. The data used for figure 5 were computed by the Thornthwaite method (*5*).[2] The available soil moisture at field capacity was assumed to be 4 inches. Field capacity is the largest amount of water that a soil will hold under conditions of free drainage after the excess water has drained away following a rain or an irrigation that has wet the whole soil.

Evapotranspiration is the loss of water from the soil through transpiration by plants and through evaporation. Potential evapotranspiration is the estimate of how much moisture is lost from a moist soil covered with vegetation. Actual evapotranspiration is the actual loss of soil moisture. It is less than potential evapotranspiration because, as a soil dries, the moisture remaining in the soil is more tightly held and, therefore, is less readily removed by transpiration and evaporation.

The precipitation and evapotranspiration curves in figure 5 show moisture conditions at the end of each month, not daily conditions. In the average year from January through May, precipitation is greater than the estimated actual evapotranspiration. From June through September the loss of soil moisture, or estimated actual evapotranspiration, exceeds precipitation, and the soil progressively dries out. By the end of September, on the average, 3.41 inches of the original 4 inches of available moisture has been removed from the soil. This amount is indicated by a sum of the vertical distances from the precipitation line to the points on the June, July, August, and September lines where the actual evapotranspiration curve crosses those lines. During this period from June through September, vigorously growing plants draw heavily on the moisture in the soil. Maximum growth, however, can be maintained if water is supplied by irrigation in June, July, August, and September in amounts indicated by the vertical distances between the actual and potential evapotranspiration curves.

By October precipitation again exceeds evapotranspiration, and the excess water begins to recharge the soil. This recharge is completed in November; then part of the excess water runs off the surface, and part is added to the ground water.

Severe storms.—Severe storms have been fairly infrequent in Robertson County. Only seven tornadoes have been reported in the county from 1916 through 1963. The area is so far inland that tropical storms are not damaging. Hailstorms occur about once or twice a year. Thunderstorms occur on about 55 days a year, mostly late in spring and in summer. Minor windstorms, sometimes accompanying thunderstorms, cause scattered local damage a few times each year. Heavy snowstorms are infrequent, and snow seldom remains on the ground for more than a few days.

Humidity, wind, and clouds.—On basis of data from weather stations around the county, the average annual relative humidity is estimated to be about 70 percent. Relative humidity is highest early in the morning and lowest early in the afternoon. Seasonally it is highest in winter and lowest in spring; the annual variation is fairly small.

The prevailing winds during the year are variable but are from the south about 15 percent of the time. The average monthly speed of wind ranges from about 5 miles per hour in August to about 9 miles per hour in March. The weather is without wind, and is calm, about 8 percent of the time. The lightest winds of the day are generally early in the morning, and the strongest are early in the afternoon.

On the average, clouds cover less than six-tenths of the sky between sunrise and sunset. Cloud cover is considerably less for April through October than during other months of the year. Sunshine is abundant during the growing season because overcast days are few, the clouds are cumulus, and daylight hours are long.

General Soil Map

The general soil map at the back of this survey shows, in color, the soil associations in Robertson 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

[2] Italic numbers in parentheses refer to Literature Cited, p. 60.

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 seven soil associations in Robertson County are described briefly in this section. More detailed information about the individual soils in each association can be obtained from the detailed soil map and from the section "Descriptions of the Soils."

1. Pembroke-Crider Association

Gently sloping, well-drained, dark-brown and brown silty soils

Some of the finest farming land in the State is in this soil association. Large, nearly level fields are bordered by gently rolling ones (fig. 6), and the association is gently rolling or slightly wavy. It amounts to about 10 percent of the county.

Almost all of this association is covered by 2 or 3 feet of loess, or silty windblown material. This loess overlies 2 to 5 feet of red clay, which probably is old alluvium. Red cherty clay that formed from the limestone bedrock is at a depth of 5 to 10 feet.

The Pembroke soils make up about 45 percent of this association; the Crider soils, 20 percent; and a number of minor soils, the remaining 35 percent. The Pembroke soils are well-drained silt loams that have a dark-brown surface layer and a reddish subsoil. Except for having a subsoil that is dark brown, the Crider soils are similar to the Pembroke soils.

The most important minor soils in this association are the Baxter, Mountview, Dickson, Taft, Guthrie, Staser, and Hamblen. The Baxter soils are well-drained, cherty and rocky silt loams or clay loams, and the Mountview soils are well-drained silt loams. The Dickson, Taft, and Guthrie are silt loams that have a fragipan and are less well drained than the Mountview soils. The well drained Staser and the moderately well drained Hamblen are silt loams on bottom lands.

About 95 percent of the association has been cleared, and the rest is in small woodlots. The average-sized farm is about 125 acres. Small grains, corn, red clover, and alfalfa are the most extensive crops, but nearly every farm has a small acreage of tobacco. Varieties of dark-fire cured, burley, and dark air-cured tobacco are grown on most farms, but most of the acreage is in dark-fire cured and burley. Nearly all of this association produces favorable yields of the crops commonly grown in the county. Some fields are so nearly level that row crops can be grown every year. In the other fields row crops can be grown in a short-term cropping system that includes close-growing crops.

***Figure 6.*—A typical landscape of the Pembroke-Crider association.**

2. Pembroke-Baxter-Crider Association

Gently sloping to moderately sloping, well-drained, brown and dark-brown silty soils intermingled with cherty soils that are reddish and clayey

This association is in an area of low, rolling and gently rolling hills (fig. 7) that are pitted in a few places with sinks or depressions. Most of the association is fairly smooth and easy to farm. A few shallow basins have level bottoms of as much as 5 acres into which much surface water empties and seeps downward. Permanent streams are few. This association makes up about 25 percent of the county.

Silty soils cover about two-thirds of this association, and cherty soils that formed from limestone account for much of the rest. The Pembroke soils make up about 30 percent of this association; the Baxter soils, 25 percent; the Crider soils, 10 percent; and minor soils, the remaining 35 percent.

The Pembroke, Crider, and Baxter soils are well drained. The Pembroke and Crider soils are silt loams that occupy the smoothest parts of the association. The Pembroke soils are dark brown to dark red, and the Crider soils are dark brown. The cherty Baxter soils are in hilly areas and have a reddish clayey subsoil.

The most important minor soils in this association are the Staser, Hamblen, Mountview, Dickson, and Sango. The dark-brown, well drained Staser and the moderately well drained Hamblen soils are in the small tracts along drainageways and in the depressions. The well-drained silty Mountview soils are on some of the broad hilltops. The moderately well drained Dickson and Sango soils are in small nearly level areas of the uplands. They have a yellowish subsoil that contains a fragipan at a depth of about 2 feet.

About 85 percent of this association has been cleared, and the rest is in small woodlots. The average-sized farm is about 135 acres. General and beef-cattle farms are common throughout the association. Because permanent streams are few, ponds supply most of the water for livestock. Small acreages of dark-fire cured tobacco and burley tobacco are grown on nearly all farms. The acreage of small grains, mainly wheat, is large, and that of corn is fairly large. Most farms have at least one gently sloping field that can be row cropped in a short-term system. Red clover, alfalfa, lespedeza, orchardgrass, and tall fescue are grown extensively. This association is good for farming, though not quite so good as the Pembroke-Crider association.

3. Dickson-Sango-Guthrie Association

Nearly level silty soils that have a fragipan and are moderately well drained to poorly drained

This association consists of nearly level plains that are broken by fairly large shallow basins. Some of these basins are large enough to contain fields 5 to 10 acres in size, but others are not more than 1 acre. Some of the basins lack

Figure 7.—**A view of Pembroke-Baxter-Crider association. The soils are gently rolling and are suited to many crops.**

drainage outlets, and water flows slowly from others. Almost all of the basins are wet in winter and spring, but they normally dry out in summer and fall. Because the plains, or upland flats, are 10 to 20 feet higher than the basins, the large, nearly level fields are moderately well drained and well drained. This association accounts for only 5 percent of the county and occurs mostly in the northern half.

The Dickson soils make up about 50 percent of this association; the Sango soils, 15 percent; and the Guthrie soils, 15 percent. The remaining 20 percent consists of minor soils, mainly the well-drained Mountview and the somewhat poorly drained Taft.

The Dickson, Sango, and Guthrie soils are pale and silty. Dickson and Sango soils consist of 2 to 4 feet of loess underlain by reddish clay or cherty clay. They are moderately well drained and have a fragipan at a depth of about 2 feet. The Dickson soils are on the level plain, and the Sango soils are normally around the rims of the basins. The grayish Guthrie soils also have a fragipan. They are poorly drained and lie in the lowest part of the basins.

About 60 percent of this association has been cleared, and much of the rest consists of small wooded areas. The largest wooded area, about 50 acres in size, is near Hubertville. In several tracts, trees of high quality grow on the Guthrie and Taft soils. Farms average about 125 acres and are mostly of the general type.

This association is fairly good for farming. Small grains, tall fescue, lespedeza, and tobacco are the most common crops. About three times more dark-fire cured tobacco is grown than burley or dark air-cured, but a few farms grow all three types. Beef cattle and hogs are raised throughout this association. Grasses and most legumes are fair for hay or pasture, but alfalfa is poorly suited. Yields of tobacco, corn, and small grains are considerably less than those on the Pembroke-Crider association.

Many fields in this association dry out slowly in spring. Planting is delayed, and the choice of crops is limited. Open ditches would remove excess surface water and permit earlier preparation of the seedbed, but tile drainage may not be practical, because the fragipan is near the surface and suitable outlets are scarce. The Guthrie and Taft soils, and to some extent the Dickson and the Sango, become dry and powdery late in summer.

4. Baxter-Mountview-Pembroke Association

Gently sloping to steep, well-drained cherty soils that are reddish and clayey intermingled with gently sloping and sloping, well-drained, dark-brown and yellowish-brown silty soils

This association is made up mainly of rolling areas on low hills. Many of the hills are covered by cherty soils and have short side slopes and narrow tops. Others are capped by about 2 or 3 feet of loess and have smooth side slopes and broad, nearly level tops. Some areas are pitted with limestone sinks that lie between narrow, winding ridges. The sinks have short, steep side slopes. The smoothest land is on the broader hilltops, and the steepest is along the permanent streams. Most of this association has a fairly well developed pattern of drainageways, but some of the areas are drained by short drainageways that empty into sinks. This association covers about 18 percent of the county. It is in the northwestern, central, and eastern parts of the county.

The Baxter soils account for about 55 percent of this association; Mountview soils, 10 percent; and Pembroke soils, 5 percent. A number of minor soils make up the remaining 30 percent.

The soils of this association formed from weathered limestone, loess, or a mixture of these. The Baxter soils formed from weathered cherty limestone on the roughest parts of the association. The dark-brown to dark-red Pembroke soils occupy some of the smoothest areas. Their upper part formed in loess, and their lower part formed in alluvium. Pembroke soils contain little, if any, chert. The Mountview soils formed in loess 2 or 3 feet thick. They are mainly on hilltops and on the long, smooth side slopes. Mountview soils are silty and pale colored and have a yellowish-brown subsoil.

Small areas of nearly all the soils in the county occur in the association. The most extensive of these soils are the moderately well drained Dickson, the well drained Staser and Humphreys, and the moderately well drained Hamblen.

About 80 percent of the association is cleared, and the rest is woodlots, few of which are larger than 50 acres. Farms average about 150 acres in size and are mostly of the general type. Tobacco is the chief cash crop; burley, dark-fire cured and dark air-cured are grown. The acreage used for small grains and corn is fairly large, but not nearly so large as that in the Pembroke-Crider association. The more hilly areas of this association are used mainly for pasture (fig. 8). Most farmers raise a few beef cattle for sale and poultry and hogs for home use.

Small areas along the larger streams are suited to continuous row crops, but in much of the association crops can be grown only in a long-term system that includes perennial grasses and legumes. Many of the slopes are long and smooth enough for contour tillage, contour strip-cropping, and terracing, but these practices are not feasible on the steep, irregular slopes or in the areas broken by limestone sinks. Nearly all of the association is suitable for pasture.

5. Baxter-Mountview Association

Sloping to steep, well-drained cherty soils that are reddish and clayey and gently sloping and sloping, well-drained, yellowish-brown silty soils

This association consists mainly of rolling and hilly areas. Slopes are narrow and very steep near the streams, but farther away they are longer and wider, and the hilltops are broad and are capped with 2 to 3 feet of loess. Some areas are pitted with sinks in the limestone. Around the sinks the slopes are narrow and generally steep, but between sinks a few hundred feet apart, the hilltops have mild slopes and are covered with loess. Except in the sinkhole areas, this association has a well-developed drainage pattern and several permanent streams. Except for the area on the Cheatham County line, all parts of this association drain into Sulphur Fork or its tributaries and into the Red River. The area along the Cheatham County line

Figure 8.—**A view of the Baxter-Mountview-Pembroke association. This rolling, hilly area is especially well suited to pasture and the raising of cattle.**

drains into Sycamore Creek. This association makes up about 17 percent of the county.

The Baxter soils account for about 60 percent of this association; the Mountview soils, 15 percent; and minor soils, the remaining 25 percent.

The Baxter soils (fig. 9) are generally on the rougher hillsides and in sinkhole areas. They are deep, have a reddish clayey subsoil, and contain a large amount of chert. The Mountview soils occupy the smoother parts of this association. They are deep, silty, yellowish-brown soils on gently sloping ridgetops and on low, rolling hills.

Other soils in this association include the well drained Staser, Humphreys, Pembroke, and Dewey soils and the moderately well drained Hamblen, Dickson, and Sango soils. The somewhat poorly drained Newark and the poorly drained Guthrie soils occur in small areas.

About 75 percent of the association has been cleared, but the woods remain in the rougher areas or in the wet basins. The potential for timber is good, however, for the steep sides of valleys are better suited to trees than to pasture or crops. Only a few wooded areas now exceed 60 acres. The farms in this association average about 175 acres; most of them are general farms. Tobacco is grown on nearly every farm and is the main cash crop. Small grains and corn are grown on a considerable acreage, but the acreage has decreased in the past few years. Most of the farms do not have streams but border desirable soils on bottom land, and almost every farm has at least one field that can be cultivated fairly often.

Most farmers raise a few beef cattle for sale, and a few sell milk. The soils of this association are well suited to pasture and hay crops, and the number of livestock, especially beef cattle, is increasing. Ponds and wells supply many farms with water, and other water is available from several permanent streams. Not all attempts at impounding water have been successful, because the underlying limestone is cracked and channeled.

6. Mountview-Dickson-Baxter Association

Gently sloping, well drained and moderately well drained, yellowish silty soils and moderately steep cherty soils that are reddish and clayey

This association consists of broad areas where gentle swells rise about 10 to 30 feet above the drainageways. The tops of the swells are nearly flat and are large enough for fields 5 to 10 acres in size. Long gentle side slopes extend to drainageways or shallow basins that average about 10 acres at the bottom. The lowest part of the basin is commonly under a few inches of water late in winter and early in spring. In this association the drainage pattern generally is not well developed, but there are a few permanent streams. The association accounts for about 18 percent of the county.

The Mountview soils make up about 30 percent of the association; Dickson soils, 25 percent; and Baxter soils, 15 percent. Minor soils make up the remaining 30 percent. The minor soils are the moderately well drained Sango, the somewhat poorly drained Taft, and the poorly drained Guthrie.

The Mountview and Dickson soils formed in loess that was deposited in a 2- to 3-foot layer on older material derived from limestone. These soils have a brown surface layer and a yellowish-brown subsoil. The Mountview soils are sloping and well drained. The moderately well drained Dickson soils are on broad nearly level uplands. They have a fragipan at a depth of about 2 feet. The well-drained cherty Baxter soils formed from weathered limestone. They have a reddish clayey subsoil and are commonly on rolling and hilly slopes that surround drainageways and basins.

This association is only fairly good for farming, but about three-fourths of it has been cleared. The soils are acid and low in fertility, but crops on them respond well to additions of fertilizer and lime. Yields of most of the common crops are fair or better if management is good. Farms average about 80 acres in size and are mostly of the general type. Tobacco, mostly dark-fire cured, is grown on almost all farms and is the main cash crop. Small grains and corn are also grown, but not nearly so much as on the Pembroke-Crider and the Pembroke-Baxter-Crider associations. A few beef cattle are raised on nearly every farm. Many of the farmers have jobs in Nashville or Springfield and farm part time.

7. Bodine-Baxter Association

Steep and very steep cherty soils

This association is highly dissected by deep V-shaped hollows that have very steep sideslopes and narrow, winding tops. The bottoms, except along Sycamore Creek, are winding and almost inaccessible. Along Sycamore Creek are bottom lands, generally 500 to 800 feet wide. They are fertile but are frequently flooded. This association has a well-developed drainage system that includes many permanent streams. The association accounts for about 7 percent of the county.

The Bodine soils make up about 60 percent of this association; the Baxter soils, about 15 percent; and minor soils, the remaining 25 percent.

The Bodine soils are cherty, for they formed in material weathered from cherty limestone. Baxter soils are on rolling and hilly ridgetops, above the Bodine soils, which are on steep hillsides. Baxter soils are better suited to farm-

***Figure 9.*—A view of the Baxter-Mountview association. The cherty Baxter soils are on the hillsides, and the silty Mountview soils are on the hilltops.**

ing than Bodine soils. The Baxter soils have a brown cherty silt loam surface layer and a finer textured reddish subsoil. The Bodine soils have a grayish-brown cherty silt loam surface layer and a yellowish-brown cherty silt loam subsoil.

The most extensive of the minor soils are the well drained Staser and the moderately well drained Hamblen soils. These soils are on bottom lands. Small areas of the pale, silty, well-drained Mountview soils are on uplands.

About 85 percent of this association is in trees, 10 percent is in pasture and hay, and the rest is in cultivated crops (fig. 10) or is idle. The average-sized farm contains about 85 acres. In general, this association is poorly suited to farming. A small acreage of corn, hay, and small grains is on the bottom lands along Sycamore Creek. Most of the pasture and hay is on slopes that are too rough and steep for crops.

Most of this association is better suited to trees than to crops or pasture, but the woodland is mainly hardwoods that have been overharvested in most places. Because of this overharvesting, and severe damage by fire, replanting is needed in many areas.

This association, especially the part in the extreme southern part of the county, is suitable for recreational facilities. Artificial lakes suitable for fishing, swimming, and boating can be built in many of the long, deep hollows. Many areas are excellent for campsites, nature trails, and other recreational facilities.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Robertson 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 properties of 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 material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. To use this survey efficiently, it is necessary

Figure 10.—A view of the Bodine-Baxter association. Almost all of the land suitable for cultivation is in narrow strips on bottom lands. The hillsides are in woods or pasture.

to know the kinds of groupings most used in a local soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Crider and Pembroke, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in those characteristics that go with their behavior in the natural, untouched landscape. Soils of one series can differ somewhat in texture of the surface soil and in slope, stoniness, or some other characteristic that affects use of the soils by man.

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

Some types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Pembroke silt loam, 2 to 5 percent slopes, is one of two phases of Pembroke silt loam, a soil type that ranges from very gently sloping to rolling.

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

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

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

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

Descriptions of the Soils

This section describes the soil series (groups of soils) and single soils (mapping units) of Robertson County. The acreage and proportionate extent of each mapping unit are given in table 2.

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

Following the name of each mapping unit, there is a symbol in parentheses. This symbol identifies the mapping unit on the detailed soil map. Listed at the end of each description of a mapping unit is the capability unit in which the mapping unit has been placed. The page on which each capability unit is described can be found by referring to the "Guide to Mapping Units" at the back of this soil survey.

Soil scientists, engineers, students, and others who want detailed descriptions of the soil series should turn to the section "Formation and Classification of Soils." Many terms used in the soil descriptions and other sections are defined in the Glossary and in the "Soil Survey Manual" (7).

Baxter Series

The Baxter series consists of deep, well-drained cherty soils that formed in residuum from cherty limestone. These soils are gently sloping to very steep. Their surface layer is 4 to 8 inches thick and, in most places, consists of cherty silt loam or cherty silty clay loam. The subsoil is generally red cherty clay. Some areas are very rocky. The main layers of a typical soil profile are—

0 to 7 inches, brown, friable cherty silt loam.
7 to 17 inches, yellowish-red, friable cherty silty clay loam.
17 to 40 inches, red cherty clay.
40 to 55 inches, variegated yellow and brown cherty clay.

The depth to bedrock ranges from 4 to 35 feet. The chert fragments (fig. 11) are commonly 3 inches or more

TABLE 2.—*Approximate acreage and proportionate extent of the soils*

Soil	Acreage	Percent	Soil	Acreage	Percent
Baxter cherty silt loam, 2 to 5 percent slopes	913	0. 2	Dewey silty clay loam, 12 to 20 percent slopes, severely eroded	619	. 2
Baxter cherty silt loam, 5 to 12 percent slopes, eroded	45, 030	14. 7	Dickson silt loam, 2 to 5 percent slopes	27, 279	9. 0
Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded	6, 614	2. 2	Dickson silt loam, 5 to 12 percent slopes, eroded	1, 375	. 5
Baxter cherty silt loam, 12 to 20 percent slopes, eroded	28, 669	9. 4	Gullied land	1, 418	. 5
Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	7, 046	2. 3	Guthrie silt loam	5, 332	1. 8
Baxter cherty silt loam, 20 to 30 percent slopes	3, 788	1. 2	Hamblen silt loam	12, 541	4. 1
Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded	936	. 3	Hamblen cherty silt loam	1, 495	. 5
Baxter cherty silt loam, 30 to 50 percent slopes	851	. 3	Humphreys silt loam, 2 to 5 percent slopes	2, 845	. 9
Baxter very rocky soils, 12 to 20 percent slopes	365	. 1	Humphreys silt loam, 5 to 12 percent slopes	435	. 1
Baxter very rocky soils, 20 to 30 percent slopes	1, 610	. 5	Humphreys cherty silt loam, 2 to 5 percent slopes	310	. 1
Bodine cherty silt loam, 12 to 20 percent slopes	3, 314	1. 1	Humphreys cherty silt loam, 5 to 12 percent slopes	699	. 2
Bodine cherty silt loam, 12 to 35 percent slopes, severely eroded	400	. 1	Made land	378	. 1
Bodine cherty silt loam, 20 to 45 percent slopes	10, 041	3. 3	Mountview silt loam, 2 to 5 percent slopes	18, 578	6. 1
Crider silt loam, 2 to 5 percent slopes	12, 596	4. 1	Mountview silt loam, 5 to 12 percent slopes, eroded	11, 817	3. 9
Crider silt loam, 5 to 12 percent slopes, eroded	1, 849	. 6	Mountview silt loam, 5 to 12 percent slopes, severely eroded	2, 867	1. 0
Cumberland cherty silt loam, 5 to 12 percent slopes, eroded	583	. 2	Newark silt loam	2, 954	1. 0
Cumberland cherty silty clay loam, 5 to 12 percent slopes, severely eroded	759	. 2	Nixa cherty silt loam, 2 to 5 percent slopes	219	. 1
Cumberland cherty silt loam, 12 to 20 percent slopes, eroded	270	. 1	Nixa cherty silt loam, 5 to 12 percent slopes	321	. 1
Cumberland cherty silty clay loam, 12 to 20 percent slopes, severely eroded	496	. 2	Pembroke silt loam, 2 to 5 percent slopes	20, 744	6. 8
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded	777	. 3	Pembroke silt loam, 5 to 12 percent slopes, eroded	15, 884	5. 2
Dekoven silt loam	167	. 1	Pickwick silty clay loam, 5 to 12 percent slopes, severely eroded	7, 390	2. 4
Dewey silt loam, 5 to 12 percent slopes, eroded	2, 361	. 8	Rock land	2, 867	. 9
Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	5, 427	1. 8	Sango silt loam	5, 968	1. 9
Dewey silt loam, 12 to 20 percent slopes, eroded	322	. 1	Staser silt loam	18, 610	6. 1
			Staser cherty silt loam	1, 809	. 6
			Taft silt loam	4, 622	1. 5
			Rock Quarries [1]	50	(²)
			Total land area	304, 640	100. 0

[1] Shown by quarry symbols on map but not listed in text.
[2] Less than 0.05 percent.

across, but they are only 1 to 2 inches across in some areas and 6 inches or more in others.

The Baxter soils are more cherty than the Dewey soils. The subsoil of Baxter soils is mostly red cherty clay, but that of the Bodine soils is yellowish very cherty silt loam.

The Baxter soils are low in natural fertility and are strongly acid. Generally, they are well suited to hay and pasture but are only fairly well suited to row crops. Suitable crops respond well to applications of fertilizer and lime and other good management.

Baxter cherty silt loam, 2 to 5 percent slopes (BaB).—This soil is in small areas on tops of hills above steeper Baxter soils. It formed from limestone that contains considerable chert. The plow layer is brown, friable cherty silt loam. It is underlain by yellowish-red cherty silty clay loam that extends to a depth of about 18 inches and grades gradually to red cherty clay that is about 30 inches thick. Underlying this layer is dark-red cherty clay streaked with shades of red, brown, and yellow. This layer is commonly more than 18 inches thick, but its thickness varies a great deal. It generally rests on limestone bedrock, but it is on a discontinuous layer of chert in some areas. Depth to limestone bedrock ranges from 8 to 35 feet.

This soil has medium available water capacity, is strongly acid, and has low natural fertility. The fragments of chert make the soil hard to work. The root zone is deep and well aerated, and crops respond well to good management.

This soil is suited to all crops commonly grown in the county. Because it is in small, oddly shaped areas, it makes up an entire field in only a few places. It is well suited to small grains and all hay and pasture crops. (Capability unit IIIe-3)

Baxter cherty silt loam, 5 to 12 percent slopes, eroded (BaC2).—This soil is on the slopes of low, rolling hills. Some areas are pitted with limestone sinks. The surface layer is about 6 inches thick and consists of friable, brown cherty silt loam. In most places it contains material from the subsoil. The subsoil is yellowish-red cherty silty clay loam in the upper part and red or dark-red cherty clay in the lower part. The depth to bedrock ranges from 4 to 35 feet. In most fields there are small spots where erosion has exposed the reddish subsoil. These spots are difficult to work, and they are hard when dry.

Unless limed, this soil is strongly acid. It is low in natural fertility. Cultivation is somewhat difficult because of the chert fragments. The root zone is deep, but roots penetrate the clayey subsoil rather slowly. Available water capacity is medium.

If this soil is limed and fertilized, it is well suited to small grains and all pasture and hay crops. Tall fescue,

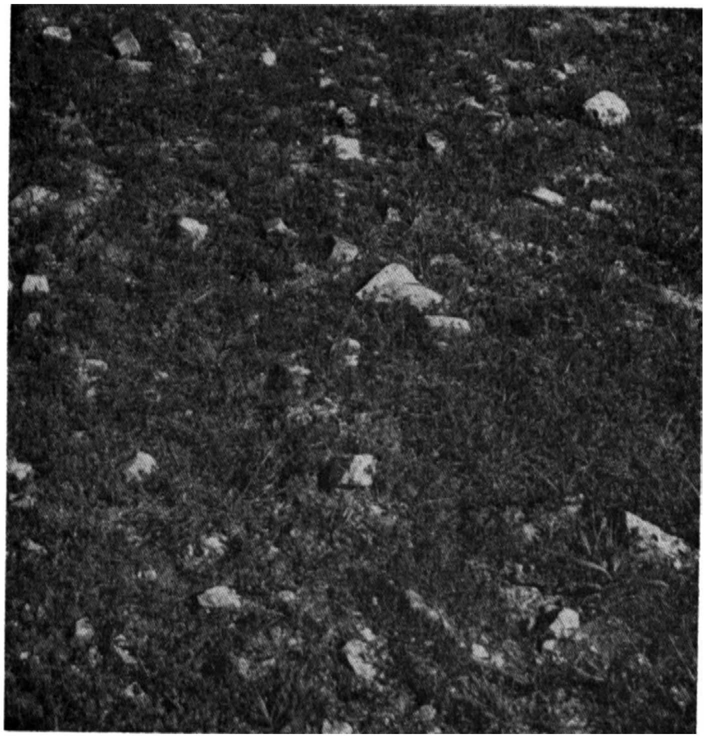

Figure 11.—**A typical view of the surface of a Baxter cherty silt loam.**

orchardgrass, lespedeza, and red and white clover are adapted. Corn, tobacco, and other row crops are only moderately well suited because of slopes and medium available water capacity. (Capability unit IIIe-3)

Baxter cherty silt loam, 12 to 20 percent slopes, eroded (BaD2).—Many areas of this soil are on short hillsides; other areas surround limestone sinks. The plow layer is brown cherty silt loam. Below this is a layer of yellowish-red cherty silty clay loam 3 to 10 inches thick. It is underlain by red cherty clay that commonly is 2 feet thick or more and is underlain by dark-red cherty clay that is streaked with shades of yellow and brown. The dark-red cherty clay extends to limestone bedrock. Depth to bedrock ranges from 4 to 30 feet. Much of the plow layer of this soil is in the original surface layer, but most fields have a few spots where erosion has exposed the subsoil.

This soil is low in natural fertility and is strongly acid. It is deep and well drained, but roots, moisture, and air penetrate into the subsoil rather slowly. An adequate amount of moisture is available for early maturing crops, but late in summer the growth of crops is likely to be reduced by lack of water.

This soil can be used for cultivated crops in long-term cropping systems, but close-growing crops are better suited. Some areas are better suited to pasture than to crops because large pieces of chert interfere with cultivation. Because the soil is sloping and has only medium available water capacity, row crops and other summer annuals are only fairly well suited. (Capability unit IVe-2)

Baxter cherty silt loam, 20 to 30 percent slopes (BaE).—This soil is on steep hillsides, many of which are along stream valleys. The surface layer is dark grayish-brown or brown cherty silt loam about 6 or 7 inches thick. The next layer is yellowish-red cherty silty clay loam that extends to a depth of about 12 inches. Below this is 2 to 3 feet of red cherty clay underlain by several feet of variegated dark-red, yellow, and brown cherty clay. Depth to bedrock ranges from about 4 to 25 feet.

This soil has a deep root zone. Roots, water, and air easily penetrate the surface layer but are slowed by the clayey subsoil. The soil is low in natural fertility and content of organic matter, and it has medium available water capacity.

About 50 percent of this soil is in forest, and the rest is mostly in pasture. Pasture is a better use than row crops because this soil is steep, cherty, and somewhat droughty. (Capability unit VIe-1)

Baxter cherty silt loam, 30 to 50 percent slopes (BaF).—Most areas of this very steep soil are on short slopes along streams. The surface layer is dark grayish-brown cherty silt loam about 4 to 7 inches thick. The fragments of chert average about 6 inches across, but they are 12 inches or more across in some areas. Below the surface layer is yellowish-red cherty clay that is 2 feet thick or more. It is underlain by dark-red cherty clay streaked with shades of brown and yellow. This layer extends to limestone bedrock at a depth of 4 to 25 feet. Included with this soil in mapping were several severely eroded areas that have a plow layer of yellowish-red cherty silty clay loam. Natural fertility is low, and acidity is strong.

This soil is used mainly for pasture and forest. Common pasture plants are lespedeza, tall fescue, and white clover. Pasture plants generally do not grow well because this soil is cherty and droughty. Also, slopes are too steep for the use of farm machinery. (Capability unit VIIs-1)

Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded (BcC3).—This soil is in areas pitted by limestone sinks and on short hillsides. The plow layer, which is almost entirely subsoil material, is yellowish-red or reddish-brown cherty silty clay loam. The subsoil is red cherty clay. Depth to cherty limestone bedrock is 4 to 35 feet. Some areas have a few shallow gullies or places where gullies have been filled. The plow layer is cherty clay in the more eroded spots and is cherty silt loam in scattered patches where some of the original surface layer remains.

This soil is difficult to work because the plow layer contains fragments of chert and much clay. The plow layer is sticky when wet and hard and cloddy when dry. This soil is strongly acid and has low natural fertility and available water capacity.

Few crops grow well on this soil. Small grains, pasture, and hay crops are moderately well suited, and tall fescue, white clover, and lespedeza are well suited. Row crops generally are poorly suited because the soil is driest at the time of year when they ordinarily make most of their growth. (Capability unit IVe-2)

Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded (BcD3).—This soil is on hillsides and around sinks. The original surface layer and, in many areas, part of the subsoil have washed away. The plow layer of yellowish-red or reddish-brown cherty silty clay loam is underlain by about 2 feet of cherty red clay that, in turn, is underlain by dark-red cherty clay streaked with shades of brown and yellow. Depth to limestone bedrock is generally more than 4 feet and is as much as 30 feet in places. Most areas have a few small gullies or scars where deep gullies have been filled. Part of the original brown cherty surface layer remains in a few small tracts.

This soil is hard to work and to keep in good tilth. It is droughty and low in natural fertility. The root zone is deep, but moisture, air, and roots penetrate the plow layer slowly because it contains much clay.

Most of this soil is in pasture. Common pasture plants are tall fescue, white clover, and lespedeza, but stands are generally hard to establish and maintain. Large amounts of lime and fertilizer are required for satisfactory yields. This soil is not well suited to row crops. (Capability unit VIe–1)

Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded (BcE3).—This soil is on steep hillsides. The plow layer is mainly material from the former subsoil. It is yellowish-red or reddish-brown cherty silty clay loam. The subsoil is red cherty clay. The original surface layer of brown or grayish-brown silt loam remains in only a few spots. Some fields have a few shallow gullies and scars where gullies have been filled.

This soil is hard to work and to keep in good tilth. It is sticky when wet and hard and cloddy when dry. The root zone is deep, but available water capacity is too low for good growth of crops.

The soil is used mainly for pasture. Common pasture plants are fescue, white clover, and lespedeza. Some of the more severely eroded areas are probably better suited to trees than to pasture. Because slopes are steep and the available water capacity is low, the soil is poorly suited to row crops. (Capability unit VIe–1)

Baxter very rocky soils, 12 to 20 percent slopes (BkD).—These soils are in narrow bands that are parallel to streams. Limestone rocks cover 10 to 25 percent of the surface. Between the rocks, the surface layer is brown cherty silt loam 5 to 8 inches thick. Below this layer is yellowish-red cherty silty clay loam that extends to a depth of about 16 inches. This layer becomes redder and more clayey with depth. It is underlain by red, plastic cherty clay that, in turn, is underlain by bedrock.

These soils are low in fertility, are droughty, and have a fairly shallow root zone. They contain so much limestone rock and chert gravel that the use of farming machinery is almost impossible.

These soils are used mostly for pasture. Fescue and white clover are probably the best adapted pasture plants. Yields are low because only hand tools can be used for clipping, and weeds and brushy growth are difficult to control. (Capability unit VIs–3)

Baxter very rocky soils, 20 to 30 percent slopes (BkE).—These soils are on steep hillsides. About 10 to 25 percent of each area is covered by limestone rocks. Between the rocks the surface layer is brown cherty silt loam about 5 to 8 inches thick. This layer is underlain by yellowish-red cherty clay that grades to red cherty clay at a depth of about 16 inches. The red cherty clay is generally streaked with shades of brown and yellow. In places this layer is only 1 or 2 feet thick over bedrock. In other areas it is thicker and grades to dark-red cherty clay that extends to bedrock.

Most areas of these soils are used for trees. They are better for trees than for hay or pasture because they are rocky and steep. Adapted trees are oak, hickory, cedar, and locust. (Capability unit VIIs–1)

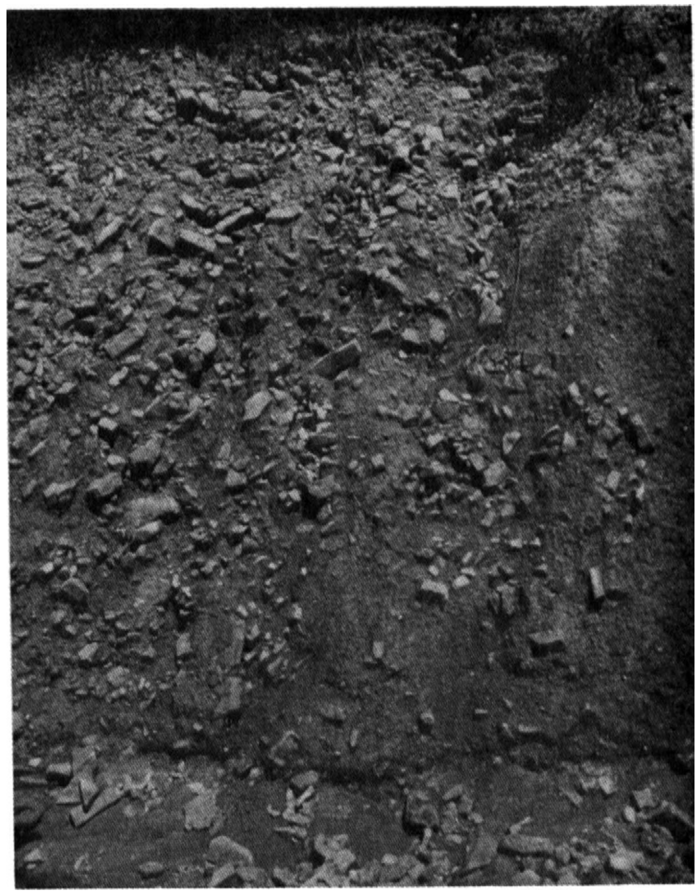

Figure 12.—**A typical profile of a Bodine cherty silt loam.**

Bodine Series

The Bodine series consists of pale-colored cherty (fig. 12) soils that formed in residuum from very cherty limestone on steep hillsides. The landscape is one of deep hollows with very steep side slopes and narrow winding tops. Most of these soils lie along the southern boundary of the county. The main layers of a typical soil profile are—

- 0 to 7 inches, brown or grayish-brown, friable cherty silt loam.
- 7 to 28 inches, yellowish-brown, friable cherty silt loam.
- 28 to 32 inches, variegated yellowish-brown, pale-brown, and yellow very cherty silt loam.
- 32 inches +, bed of chert with a small amount of soil between the pieces of chert.

The depth to hard bedrock ranges from 4 to 10 feet. The fragments of chert are commonly 4 inches or more across, but they are 1 or 2 inches across in some areas and 8 inches or more in others. The slopes range from about 5 to 45 percent, and most of them are steeper than 20 percent.

The Bodine soils are normally on hillsides below the Baxter and Mountview soils. The subsoil of the Bodine soils is yellowish-brown cherty silt loam, whereas the subsoil of the Baxter soils is yellowish-red cherty silty clay loam and red cherty clay.

The Bodine soils are low or very low in natural fertility and are very strongly acid. They are droughty and hard to work because chert takes up about one-half of the soil mass.

Most of the acreage of these soils is in woods, which is a better use than crops. The less steep areas can be used for pasture.

Bodine cherty silt loam, 12 to 20 percent slopes (BoD).—This cherty soil is mostly on hilltops. The plow layer is grayish-brown or brown, friable cherty silt loam. The subsoil is yellowish-brown, friable cherty silt loam that extends to a depth of 20 to 28 inches. This layer is underlain by variegated yellowish-brown, pale-brown, and yellow very cherty silt loam that extends to limestone rock at a depth of 4 to 10 feet. Some areas have a variegated reddish-yellow or yellowish-red clayey layer at a depth of about 24 inches.

Enough chert is in this soil to make it droughty and hard to work. Moisture enters and moves through the soil rapidly. The root zone is moderately deep, but the chert prevents use for most crops. Natural fertility is low, and acidity is very strong.

Most of this soil is in woods, and a few areas are in pasture. Tall fescue, white clover, and lespedeza grow fairly well in spring and early in summer, but stands are difficult to establish and maintain. Cultivated crops are poorly suited. (Capability unit VIs–3)

Bodine cherty silt loam, 12 to 35 percent slopes, severely eroded (BoE3).—This soil occurs in only a few areas. Most of these areas are in the same fields as areas of the more desirable Baxter and Mountview soils. The plow layer consists of yellowish-brown or pale-brown cherty silt loam. It is underlain by layers similar to it, but the chert in these layers increases with depth. Bedrock is at a depth of about 4 to 10 feet. Most areas of this soil contain a few shallow gullies or scars where gullies have been filled. A few uneroded spots have a plow layer of grayish-brown or brown cherty silt loam.

This soil is very strongly acid and very low in fertility and content of organic matter. The root zone is shallow, very cherty, and very low in available water capacity.

This soil is better suited to trees than pasture because available water capacity is very low. Most areas are in locust, hickory, persimmon, scrub oak, and broomsedge. (Capability unit VIIs–1)

Bodine cherty silt loam, 20 to 45 percent slopes (BoF).—This cherty soil is in large wooded tracts on steep hillsides. Slopes average about 30 percent. The surface layer is grayish-brown or brown cherty silt loam 7 inches thick. It is underlain by yellowish-brown cherty silt loam that ranges from 10 to 20 inches in thickness. Below this is variegated yellowish-brown, pale-brown, and yellow very cherty silt loam. Beds of loose chert are at a depth of 20 to 30 inches in some places, and limestone bedrock is at a depth of 4 to 8 feet.

This soil is droughty and low in fertility. It has a shallow to moderately deep root zone and does not hold enough available moisture for even moderate growth of most plants.

Nearly all of this soil is in woods. Trees are better for this soil than crops or pasture because this soil is steep, droughty, cherty, and low in fertility. (Capability unit VIIs–1)

Crider Series

The Crider series consists of deep, well-drained, silty soils that are highly productive. These soils are on smooth uplands in the northern part of the county. The top part of these soils formed in 24 to 40 inches of loess, and the lower part formed in old alluvium. The main layers of a typical soil profile are—

0 to 6 inches, dark-brown, friable silt loam.
6 to 25 inches, dark-brown or brown, friable silt loam.
25 to 30 inches, reddish-brown or yellowish-red silty clay loam streaked with red and gray.
30 to 40 inches, red, friable clay.
40 to 70 inches +, dark-red clay.

At a depth below 25 to 40 inches, a dark-red clayey layer occurs in about 95 percent of the acreage and a yellowish-red or red cherty clay layer occurs in the remaining 5 percent.

In most fields the Crider soils are adjacent to the Pembroke soils. The Crider soils are dark brown just below the plow layer, but the Pembroke soils are reddish brown or yellowish red.

The Crider soils have moderate natural fertility and are easy to work. Under good management, they are well suited to all crops grown in the county.

Crider silt loam, 2 to 5 percent slopes (CrB).—This soil is very deep and well drained. The surface layer is dark-brown, very friable silt loam 6 to 9 inches thick. The subsoil, to a depth of about 25 inches, is dark-brown silt loam slightly tinged with red. Below a depth of about 25 to 40 inches is dark-red, friable clay several feet thick. In a few areas this layer is red cherty clay instead of dark-red clay. Depth to limestone bedrock ranges from 10 to 40 feet. Included in mapping were a few areas that are nearly level.

This is one of the most productive soils in the county. It has a deep, well-aerated root zone and high available water capacity. Crops respond to good management.

All crops suited to the area, especially row crops (fig. 13), grow well on this soil. (Capability unit IIe–1)

Crider silt loam, 5 to 12 percent slopes, eroded (CrC2).—This soil is very deep and well drained. The surface layer is dark-brown, very friable silt loam 4 to 6 inches thick. The subsoil is dark-brown or brown, friable silt loam to an average depth of 24 inches. Below that depth is dark-red clay several feet thick. The depth to dark-red clay ranges from 20 to 40 inches. A few areas are underlain by yellowish-red cherty clay instead of dark-red clay. Depth to bedrock ranges from 10 to 40 feet.

This soil has a deep root zone and high available water capacity. It is easy to work, and crops respond extremely well to fertilization and other management. It is one of the most productive sloping soils in the county and is suited to all crops commonly grown (fig. 14). (Capability unit IIIe–1)

Cumberland Series

The Cumberland series consists of deep clayey soils that are dark red below a depth of 6 inches. These soils formed in old alluvium on rolling to hilly topography, mainly in the northern one-third of the county. Many areas are pitted with sinks and other depressions. Most of the Cumberland soils in this county have a large amount of chert fragments on the surface and in the profile. The depth to bedrock is commonly more than 10 feet. The main layers of a typical soil profile are—

0 to 6 inches, reddish-brown or dark reddish-brown cherty silt loam.

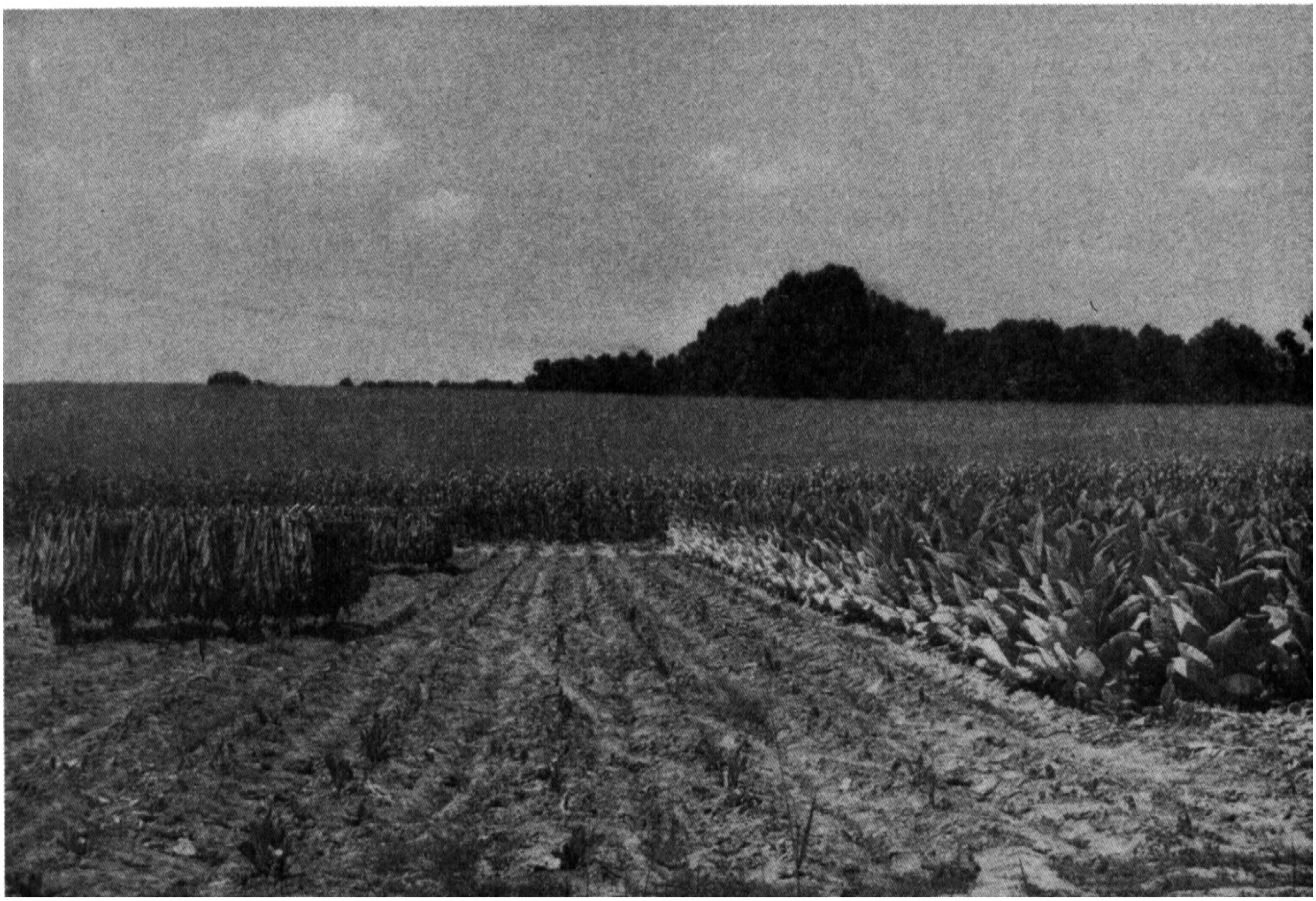

Figure 13.—Burley tobacco on Crider silt loam, 2 to 5 percent slopes. The tobacco is cured in the field for a few days before it is cured in the barn.

6 to 50 inches, dark-red cherty clay that is sticky and plastic when wet.
50 to 60 inches +, dark-red cherty clay streaked with shades of yellow and brown.

The Cumberland soils occur with the Baxter, Dewey, and Pembroke soils. The subsoil of the Cumberland soils is redder than that of the Dewey and Baxter soils, and it contains more clay than the subsoil of Pembroke soils.

Cumberland soils are strongly acid. They are penetrated deeply by the roots of perennials, but the fast-growing roots of annuals are restricted in the subsoil. Crop response to management is fair to good. These soils are especially well suited to hay and pasture.

Cumberland cherty silt loam, 5 to 12 percent slopes, eroded (CsC2).—This deep cherty soil is rolling. Most areas are small and are pitted with limestone sinks. The plow layer is reddish-brown or dark reddish-brown cherty silt loam. It is underlain by dark-red cherty clay that is generally more than 3½ feet thick and, in turn, is underlain by dark-red cherty clay streaked with yellow and brown. This material extends to limestone bedrock at a depth of 10 to 35 feet. The chert fragments are commonly porous and range from about 1 inch to 3 inches in size.

The rapidly growing roots of annual crops are restricted in the subsoil, but the more slowly growing roots of perennials penetrate deeply. The chert fragments are a nuisance, but they do not prevent cultivation. Crop response to management is fair to good.

This soil is in such small and irregularly shaped areas that it makes up a field in only a few places. Where areas are large enough, however, above average yields of small grains, hay, and pasture can be produced. Alfalfa orchardgrass, tall fescue, red clover, and lespedeza grow well. (Capability unit IIIe-3)

Cumberland cherty silt loam, 12 to 20 percent slopes, eroded (CsD2).—This cherty soil generally surrounds limestone sinks, but it is on short hillsides in a few places. Most areas are less than 15 acres in size. The surface layer is reddish-brown or dark reddish-brown cherty silt loam 3 to 7 inches thick. In most places it is a mixture of material from the original surface layer and the upper part of the subsoil. The subsoil is dark-red cherty clay, generally more than 3 feet thick. Underlying the subsoil is dark-red cherty clay that is streaked with shades of yellow and brown. It extends to limestone bedrock at a depth of 10 to 35 feet.

This soil ordinarily contains chert that makes it hard to cultivate, but some small spots contain little chert. The roots of summer annuals do not penetrate deeply into the

Figure 14.—**Red clover on Crider silt loam, 5 to 12 percent slopes, eroded.**

clayey subsoil. Available water capacity is medium, and crops respond fairly well to fertilizer.

Suitable plants are tall fescue, orchardgrass, white clover, alfalfa, and small grains. These plants grow especially well if fertilization and liming are heavy. Most areas are so small or so oddly shaped that they are not used as separate fields. (Capability unit IVe–2)

Cumberland cherty silty clay loam, 5 to 12 percent slopes, severely eroded (CtC3).—This deep, well-drained cherty soil is on short upland slopes and slopes around sinkholes. As a result of cropping for many years, nearly all of the original surface layer, and, in places, the upper part of the subsoil have washed away. In most fields the original dark-brown cherty silt loam surface layer remains in only a few small spots. The plow layer ordinarily is dark-red or dark reddish-brown cherty silty clay loam. The subsoil is dark-red cherty clay that is several feet thick. A few areas are nearly free of chert, and a few have shallow gullies.

Roots and moisture penetrate this soil slowly. Because available water capacity is low, crops do not respond well to fertilizer. This soil can be worked within only a narrow range of moisture content. It clods if worked either when it is too wet or too dry.

The choice of crops that can be profitably grown is limited. Small grains, hay, and pasture crops produce fair to average yields if heavily fertilized and otherwise well managed. (Capability unit IVe–2)

Cumberland cherty silty clay loam, 12 to 20 percent slopes, severely eroded (CtD3).—Most of the original surface layer and, in places, part of the subsoil have been washed from this soil. Some areas have a few shallow gullies. The present plow layer consists mostly of material from the subsoil mixed with a little of the original surface layer. It is dark reddish-brown or dark-red cherty silty clay loam that is sticky when wet. The subsoil is dark-red cherty clay several feet thick. Below the subsoil is dark-red cherty clay streaked with shades of yellow and brown.

This soil is strongly acid, low in natural fertility, and low in available water capacity. Plant roots penetrate the soil slowly. Working this soil and keeping it in good tilth are difficult.

Grasses and legumes for hay and pasture grow fairly well on this soil if it is fertilized and limed. Fescue, orchardgrass, lespedeza, white clover, and alfalfa are suitable, but stands are usually hard to establish and to maintain. Because this soil is steep, droughty, and hard to work, it generally is not suited to row crops. (Capability unit VIe-1)

Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded (CuC3).—This soil lies on short hillsides in the northern part of the county. Most of it is in narrow bands next to Pembroke soils, and some is adjacent to Dewey soils. Erosion has removed all or nearly all of the original surface layer and, in places, part of the subsoil. A few spots, 1/8 to 3/4 acre in size, are gullied, but ordinarily these spots can be filled with farm machinery. The present plow layer is dark-red or dark reddish-brown silty clay loam. The material below is similar to that in the plow layer but ordinarily contains more clay. Bedrock is at a depth of more than 10 feet.

The soil is strongly acid, low in natural fertility, and hard to work. It has medium available water capacity.

This soil produces profitable yields of small grains, hay, and pasture. Alfalfa, orchardgrass, tall fescue, white clover, and lespedeza do well after they start to grow, but good stands are commonly hard to establish because the surface layer contains a large amount of clay. Heavy rates of seeding are required for good stands. Corn, tobacco, and other summer annuals are only moderately well suited, but they may grow well in occasional years when rainfall is exceptionally favorable. (Capability unit IVe-2)

Dekoven Series

The Dekoven series consists of black, somewhat poorly drained soils on level bottom lands. The main layers of a typical soil profile are—

0 to 15 inches, black, friable silt loam.
15 to 30 inches, dark-gray or gray, friable silt loam.
30 to 48 inches, gray silty clay loam.

Dekoven soils are in the lowlands adjacent to areas of Guthrie, Taft, Hamblen, and Newark soils. They are similar to the Newark soils in drainage but are darker colored.

Dekoven soils are medium acid to slightly acid and are moderately high in natural fertility. They have high available water capacity.

These soils are mostly wooded. Excess water is the main limitation to use of these soils for crops.

Dekoven silt loam (De).—This somewhat poorly drained soil is on level bottom lands and in depressions. The surface layer is black silt loam about 15 inches thick. In most places the subsoil is dark-gray or gray, friable silt loam. In a few areas the subsoil is gray and contains much clay, and in a few other areas it is yellow and silty.

This soil is medium acid or slightly acid. It is moderately high in natural fertility and has high available water capacity. If the low flat areas of this soil are not artificially drained, a few inches of water stands on the surface in rainy periods. In summer and fall, however, the water table drops to a depth of several feet.

Unless drainage is improved, this soil is suited only to tall fescue and a few other crops that tolerate wetness, and to soybeans and other crops that can be planted late. Where open ditches or tile is used, corn and small grains are well suited. Even in drained areas, this soil is too wet for alfalfa, and tobacco. Ordinarily, lime is not needed. (Capability unit IIw-1)

Dewey Series

The Dewey series consists of deep, well-drained soils in the uplands. These soils occur throughout the county, but most of the acreage is in the northern half. The areas are small and oddly shaped. Some of them are pitted with limestone sinks, and others are on short hillsides. These soils formed from alluvium or from weathered limestone. Slopes range from 5 to 20 percent, but most areas have slopes of 5 to 12 percent. The main layers of a typical soil profile are—

0 to 6 inches, brown, friable silt loam.
6 to 12 inches, yellowish-red, friable silty clay loam.
12 to 36 inches, silty clay or clay that is red in upper part and dark red in the lower 12 inches.
36 to 48 inches +, dark-red clay streaked with shades of yellow and brown.

Some areas contain a small amount of chert. In many areas a small amount of loess is mixed into the plow layer. Many areas are severely eroded and have a yellowish-red or red silty clay loam plow layer. Depth to limestone bedrock ranges from 5 to 35 feet.

Dewey soils are adjacent to the Baxter and Pembroke soils. Dewey soils contain less chert in their profile than Baxter soils and more clay in their subsoil than the Pembroke soils. Eroded Dewey soils are much like Cumberland soils but are slightly lighter colored in the upper layers.

The Dewey soils have moderate or low natural fertility. They are strongly acid.

The Dewey soils are only fairly well suited to cultivated crops. They are well suited to hay and pasture, and most areas are well suited to small grains.

Dewey silt loam, 5 to 12 percent slopes, eroded (DlC2).—This soil occupies rolling areas 3 to 10 acres in size. Some areas are pitted with sinks and depressions, and others are narrow bands below gently sloping soils.

The surface layer is brown, friable silt loam about 3 to 7 inches thick. The subsoil is yellowish-red silty clay loam that averages about 6 inches in thickness. It is underlain by red silty clay or clay that grades to dark-red clay at an average depth of about 36 inches. This dark-red clay is streaked with shades of yellow and brown and is several feet thick. Depth to limestone bedrock is between 8 and 35 feet.

Included with this soil in mapping were a few yellowish-red clayey spots one-fourth of an acre or less in size. Also included were a few areas that contain almost enough chert to interfere with tillage.

The soil has medium available water capacity and moderate natural fertility. Air and moisture easily enter and pass through the plow layer, but further movement is slowed by a subsoil that contains much clay. Plant roots can grow in the subsoil, but not so well as in the plow layer.

This soil is especially well suited to grasses and legumes for hay and pasture. Among the well-adapted hay and pasture plants are alfalfa, lespedeza, orchardgrass, and fescue. Small grains are also well suited. Row crops can be grown in long-term cropping systems, but they are not so well suited as hay and pasture crops. (Capability unit IIIe-3)

Dewey silt loam, 12 to 20 percent slopes, eroded (DlD2).—This is a deep, well-drained soil. Many of the areas are rough and are covered by numerous limestone sinks and depressions. A few areas contain a small amount of chert.

The surface layer is 4 to 6 inches thick and consists of brown, friable silt loam. The subsoil is red clay that grades to dark-red clay at a depth of about 30 inches. Depth to limestone bedrock is 5 to 25 feet. In most areas there are a few, yellowish-red, clayey spots where the surface layer has washed off.

Because the subsoil contains much clay, annuals develop only shallow roots. The root zone for perennials, however, is several feet deep. Consequently, alfalfa, orchardgrass, and tall fescue are better suited than corn and tobacco. Also, the steep slopes prevent frequent cultivation. Small grains are well suited because they grow when moisture is plentiful. This is one of the better soils in the county for growing alfalfa. (Capability unit IVe-2)

Dewey silty clay loam, 5 to 12 percent slopes, severely eroded (DmC3).—This deep, well-drained soil formed either from material derived from limestone or from a thin layer of alluvium over an older soil that formed from material derived from limestone. It is on short hillsides and in areas that have many sinks. Most areas are small and are in the northern part of the county.

The plow layer, which consists almost entirely of material from the subsoil, is yellowish-red or red silty clay loam. It is underlain by red silty clay or clay about 24 inches thick. This grades to dark-red clay that is streaked with shades of yellow and brown and extends for several feet to bedrock. A few small spots have a red clay plow layer. A few shallow gullies are common in most areas.

This soil has poor tilth because the plow layer contains much clay. It is strongly acid, low in natural fertility, and has medium available water capacity. If worked when too wet or too dry, this soil clods and is hard to work into a seedbed.

This soil is suited to small grains and to grasses and legumes for hay and pasture. Adapted plants are alfalfa, orchardgrass, tall fescue, white clover, and lespedeza. Good stands are often hard to establish because germination in the silty clay loam plow layer is slow. If moisture is not plentiful, many seedlings die. It generally is not practical to use this soil for row crops. (Capability unit IVe-2)

Dewey silty clay loam, 12 to 20 percent slopes, severely eroded (DmD3).—This soil is in the uplands on short hillsides or in areas pitted with sinks. Its plow layer is yellowish-red or red silty clay loam and consists mostly of material from the subsoil mixed with a small amount of material from the original surface layer. It is underlain by red silty clay or clay. This layer becomes redder as depth increases and it grades to dark-red clay at a depth of about 30 inches. The dark-red clay extends to limestone bedrock at a depth ranging from 5 to 25 feet. Some areas have a few gullies, most of which can be crossed and filled with farm machines. Although cherty areas are common, the chert is not in large enough quantities to make cultivation difficult.

This soil is strongly acid and low in natural fertility. Available water capacity is so low that most crops, especially late-maturing row crops, are not suited.

Most areas of this soil are generally farmed with the adjoining soils because they are too small to be farmed separately. Tall fescue, white clover, and lespedeza are probably best adapted, but stands are hard to establish and maintain. Also, large amounts of fertilizer and lime are needed. Row crops are poorly suited. (Capability unit VIe-1)

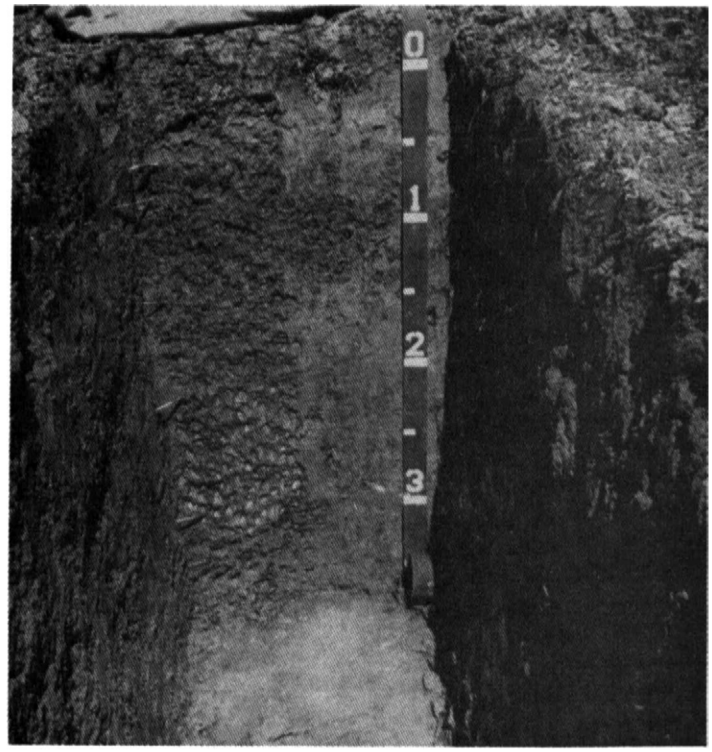

Figure 15.—A profile of a Dickson silt loam. (Courtesy of Paul Sutton, University of Tenn.)

Dickson Series

The Dickson series consists of moderately well drained soils that have a fragipan (fig. 15). These soils formed in a layer of loess that is 2 to 3 feet thick and overlies cherty yellowish-red clay or red clay. This clay formed from limestone residuum or old alluvium. These soils are on broad flats in the uplands. The main layers in a typical soil profile are—

0 to 7 inches, brown, friable silt loam.
7 to 25 inches, yellowish-brown, friable silt loam.
25 to 36 inches, mottled yellowish-brown and gray, compact silt loam; this layer is the fragipan.
36 to 42 inches +, mottled yellowish-red and yellowish-brown silty clay loam.

In some places the subsoil is light yellowish brown. Depth to the fragipan ranges from 20 to 36 inches, and averages about 25 inches.

The Dickson soils are commonly adjacent to Mountview and Sango soils. They are not so well drained as Mountview soils. Both Dickson soils and Sango soils are moderately well drained, but drainage is slightly better in the Dickson than in the Sango. Also, the Sango soils have less clay and more silt in the upper 2 feet of the profile than the Dickson soils.

Dickson soils are easy to work and to keep in good tilth. The soft, friable layers above the fragipan are easily penetrated by roots, air, and moisture. The fragipan, however, is so dense that it cannot be penetrated by most roots, and moisture moves through it extremely slowly. During the rainy season, water moves out of this soil so slowly that the soil is waterlogged and remains so until late in spring.

The Dickson soils are used mainly for crops, but a few areas are in small woodlots. These soils are suited to all crops except those that are not tolerant of excess water in winter and spring.

Dickson silt loam, 2 to 5 percent slopes (DsB).—This moderately well drained soil has a fragipan. Its surface layer ranges from 5 to 8 inches in thickness and is brown, friable silt loam. It is underlain by yellowish-brown, friable silt loam about 15 to 20 inches thick. Next is the fragipan consisting of mottled yellowish-brown and gray silt loam. It is about 12 inches thick and is underlain by yellowish-red cherty clay or red clay.

This soil is low in natural fertility and is very strongly acid. The root zone is limited mainly to the 2 feet above the fragipan. Here the material is silty, friable, and easily penetrated by roots, but the fragipan is so dense that it cannot be penetrated by the roots of most plants and it seriously restricts the movement of water. Because water moves out of this soil slowly, the lower part of the subsoil is waterlogged in winter and early in spring. Waterlogging increases runoff and often delays preparation of the seedbed.

This soil is well suited to nearly all crops, but alfalfa stands are likely to be short lived, and tobacco is poorly suited to flat areas that do not have surface drainage. (Capability unit IIe-3)

Dickson silt loam, 5 to 12 percent slopes, eroded (DsC2).—This soil, which has a fragipan, is on the slopes of very short hills. Water moves easily through the upper 2 feet of soil but moves very slowly through the fragipan. The surface layer is brown, friable silt loam 4 to 7 inches thick. The subsoil to an average depth of 24 inches is a yellowish-brown, friable silt loam. Next is the mottled brown, gray, and yellow fragipan about 12 to 20 inches thick. Below the fragipan in most places is red cherty clay or red clay that formed from limestone residuum. In some areas dark-red clay lies below the fragipan. In a few places the fragipan is very weakly developed.

This soil is very low in natural fertility and is very strongly acid, but crop response to fertilizer and lime is good. Above the fragipan the soil is soft, friable, and easily penetrated by roots. The pan layer is a barrier to the growth of roots and the movement of air and water. Because of the slow drainage through this layer, the lower part of the subsoil is often saturated during rainy seasons.

Almost all hay and pasture plants except alfalfa grow well on this soil, and corn, tobacco, and other row crops grow moderately well. Also well suited are small grains. Alfalfa grows well for about 2 years, but after that the stand is thin. (Capability unit IIIe-4)

Gullied Land

Gullied land (Gd) consists of a network of deep and shallow gullies. Most areas have slopes of 10 to 15 percent and are less than 5 acres in size. The gullies are too deep and too close together for the use of farm machines. Most areas between the gullies are severely eroded, for the original surface layer and, in most places, part of the subsoil have been washed away. The soil material in and between the gullies is generally red cherty clay.

This land type is infertile, acid, and droughty. It cannot be tilled unless the gullies are filled and the surface is smoothed (fig. 16).

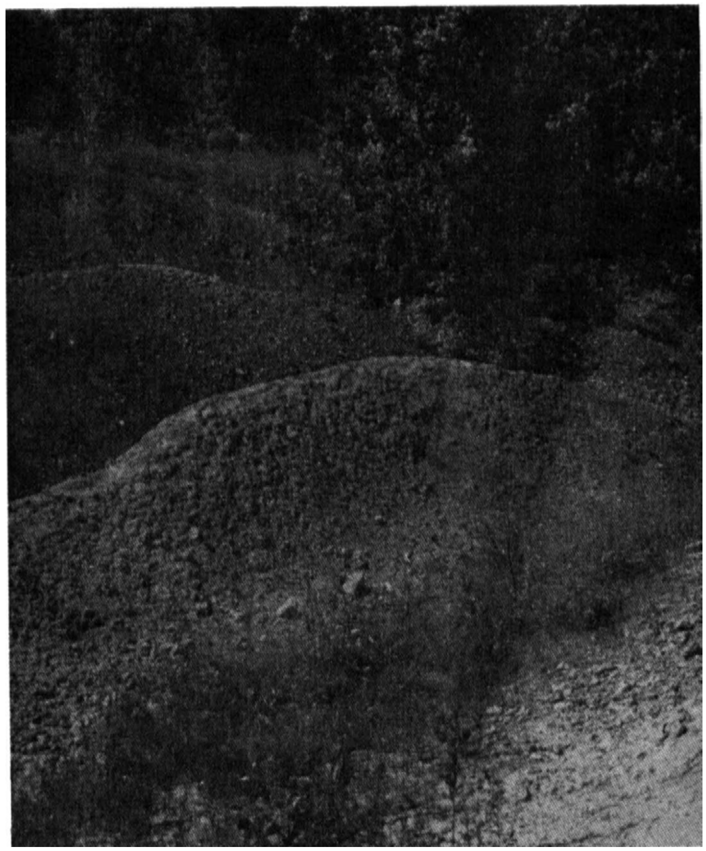

Figure 16.—**An area of Gullied land that supports only sparse vegetation. Reclamation will require the smoothing of the land.**

All areas of this land type have been abandoned. The dominant plants are cedar, locust, sassafras, pine, scrub oak, hickory, and sawbrier. Where gullies are not filled, it is advisable to plant cedar, pine, or kudzu. (Capability unit VIIe-2)

Guthrie Series

The Guthrie series consists of gray, poorly drained soils that have a fragipan. These soils developed in loess on upland flats and in level depressions. The main layers of a typical soil profile are—

0 to 17 inches, light brownish-gray or gray, very friable silt loam.
17 to 25 inches, gray, compact silt loam.
25 to 60 inches, gray silty clay loam that is slightly plastic when wet and hard when dry.

The Guthrie soils are commonly adjacent to the Taft and Sango soils. They are grayer and more poorly drained than either of those soils.

Guthrie soils are very strongly acid and are low in natural fertility. In winter and spring, a few inches of water often stands on the surface.

These soils are mainly in woods. Areas that have been cleared are used mostly for pastures.

Guthrie silt loam (Gu).—This poorly drained soil has a fragipan. It developed in loess on upland flats and in depressions where standing water drains away slowly. This soil is dominantly gray silt loam or silty clay loam to a depth of 3 feet or more. The fragipan begins at about 18 inches and ranges from 1 to 2 feet in thickness. In some areas a layer of nearly black clay is below a depth of 18 inches. The thickness of the loess ranges from about 2 feet at the edge of depressions to as much as 8 feet at the center.

This soil is very strongly acid and low in natural fertility. In winter and spring, a few inches of water often stands on the surface. In summer and fall, this soil is droughty because the water table drops to a depth of several feet. The roots of most plants have not grown fast enough to get the moisture they need from ground water when the water table drops.

Most of this soil is in woods. The only crops that are suited are tall fescue and other crops that tolerate wetness and soybeans and other crops that can be planted late. This soil is difficult to drain because permeability is slow and outlets are lacking. Where outlets are available, open ditches can be used to remove surface water. (Capability unit IVw-1)

Hamblen Series

The Hamblen series consists of brown, moderately well drained soils formed in recent alluvium on first bottoms, along intermittent streams, and in depressions. These soils are in all parts of the county in relatively small, irregularly shaped areas. Most areas are larger than 3 acres but few exceed 20 acres. In this county, more than 10 percent of the acreage of Hamblen soils contain chert fragments. The main layers of a typical soil profile are—

0 to 6 inches, brown or dark-brown, friable silt loam.
6 to 24 inches, brown or dark-brown, friable silt loam; several gray mottles in the lower 8 inches.
24 to 42 inches +, mottled gray and brown, friable silt loam.

Hamblen soils are adjacent to the Staser and Newark soils. Most of the mottling is below a depth of 15 inches in the Hamblen soils, but mottling is below 30 inches or is not present in the Staser soils. The Newark soils have many mottles throughout the profile.

The Hamblen soils are medium acid to slightly acid and are moderate to high in natural fertility. Most areas are easy to work. The gray colors below a depth of 15 inches indicate that these soils are waterlogged below that depth for part of the year.

These soils are well suited to many crops, and most areas are used for crops.

Hamblen silt loam (Hb).—This soil is on first bottoms and in depressions in the uplands. Only a few areas are frequently flooded. The plow layer is brown, friable silt loam. It is underlain by brown or dark-brown, friable silt loam that extends to a depth of about 18 inches. Below this is mottled gray and brown, friable silt loam.

Included with this soil in mapping were a few small areas that have about 18 inches of brown or dark-brown silt loam over a buried yellowish-brown silt loam. Also included were a few areas that have a black clayey layer below a depth of 15 inches.

Hamblen silt loam has high natural fertility and high available water capacity. It is easy to work and to keep in good tilth. The root zone is moderately deep and is favorable for root growth. Depth to the water table ranges from about 15 inches during the wet season to 7 feet or more late in summer.

Nearly all of this soil is used for crops (fig. 17). The only areas that remain in woods are the few that are frequently flooded or are in isolated hollows.

This soil is well suited to intensive use. It is one of the best soils in the county for corn, but most other crops also grow well. Corn is generally grown where areas of this soil are large enough to comprise a separate field. Tobacco and alfalfa are not well adapted, because this soil is only moderately well drained and is occasionally flooded. Mixtures of grasses and legumes are highly productive of hay and pasture. (Capability unit I-1)

Hamblen cherty silt loam (Ha).—This moderately well drained soil is on first bottoms and in depressions. It is in long narrow bands along streams and in small oddly shaped depressions. This soil is brown or dark-brown cherty silty loam to a depth of about 18 inches. It is underlain by mottled brown or dark-brown and gray cherty silt loam that extends to a depth of about 24 inches. Next is light-gray cherty silt loam 18 inches thick or more.

This soil is moderate or high in natural fertility. Available water capacity is medium. Because it is cherty, this soil is fairly hard to cultivate.

Almost all of this soil is used for crops. Remaining in woods are a few narrow bands isolated in deep hollows and a few frequently flooded areas next to streams.

This soil is suited to nearly all crops commonly grown in the county. Among the adapted crops are corn, tall fescue, white clover, and annual lespedeza. Mixtures of grasses and legumes produce high yields. Because this soil is occasionally flooded and is only moderately well drained, it is not well suited to alfalfa or tobacco. (Capability unit IIs-1)

Humphreys Series

The Humphreys series consists of deep, well-drained, loamy soils. These soils are on the low terraces, or second bottoms, of creeks and rivers and are on foot slopes in the uplands. Some areas have a large amount of chert fragments on the surface and in the soil. The main layers of a typical profile of Humphreys silt loam are—

0 to 9 inches, brown or dark-brown, friable silt loam.
9 to 40 inches, yellowish-brown to dark-brown, friable silt loam.
40 to 60 inches, yellowish-red cherty silty clay loam streaked with shades of yellow, brown, and gray.

The third layer ranges from silty clay loam to silt loam or cherty silt loam in texture.

Humphreys soils resemble the Crider soils more than any other soils in the county, but the Crider soils have a dark-red clay layer below a depth of about 40 inches, and the Humphreys do not have a dark-red layer of any kind. Also, some of the Humphreys soils are cherty, but the Crider soils are free of chert.

Humphreys soils are moderate in natural fertility. They are strongly acid in areas not limed. Their root zone is deep and well aerated, and crops respond well to good management. Available water capacity depends on the content of chert and ranges from medium to high.

These soils are well suited to the crops commonly grown in the area. Figure 18 shows an area of Humphreys silt loam that is used for grain or hay crops.

Humphreys silt loam, 2 to 5 percent slopes (HuB).—This deep loamy soil is well drained. It is on second bottoms of creeks and rivers and on foot slopes in the uplands.

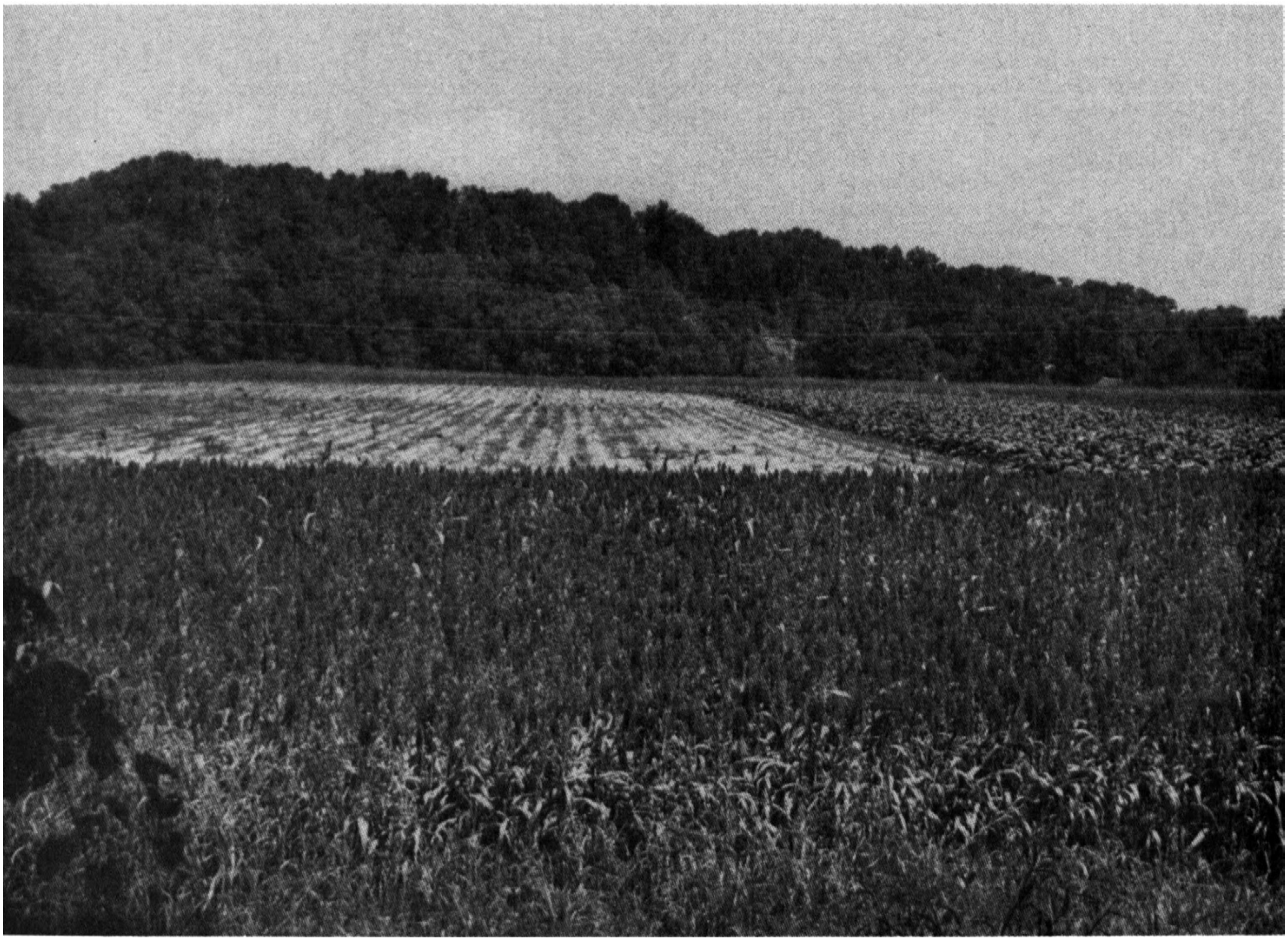

Figure 17.—Grain sorghum on Hamblen silt loam in the foreground. A Humphreys silt loam is in the middle ground, and Bodine soils are in the background.

It has a brown or dark-brown loamy surface layer 7 to 10 inches thick. The subsoil is friable silt loam that, to a depth of 3 or 4 feet, is yellowish brown in most places but is dark brown in some places.

This soil is productive. It has high available water capacity and a deep root zone. Crops respond well to fertilization and other good management. All common crops are well suited. (Capability unit IIe–1)

Humphreys silt loam, 5 to 12 percent slopes (HuC).—This deep, well-drained, loamy soil is mainly in tracts of 2 or 3 acres. Some areas form bands or banks between first bottoms and the tops of benches. Many areas are at the base of steep slopes. The soil generally has a brown or dark-brown silt loam surface layer 6 to 8 inches thick and a yellowish-brown, friable silt loam subsoil. In some places the subsoil is dark brown. Some small spots are eroded.

The root zone of this soil is deep, and available water capacity is high. Crops respond well to fertilization and other practices of good management. Under good management all common crops produce above average yields. This soil is so sloping that it erodes if it is not protected. (Capability unit IIIe–1)

Humphreys cherty silt loam, 2 to 5 percent slopes (HcB).—This deep, well-drained soil has many small chert fragments on the surface and in the soil. It is on second bottoms of creeks and rivers and on foot slopes in the upland. The surface layer is brown to dark-brown cherty silt loam 6 to 10 inches thick. The subsoil is cherty silt loam that is generally dark brown or brown but is yellowish brown in some places.

This soil has a deep, well-aerated root zone, but available water capacity is only medium because 1/4 to 1/5 of the soil volume is chert fragments. The chert fragments are a nuisance, but they do not prevent cultivation. Many crops respond well to good management.

This soil is well suited to small grains and most hay and pasture crops but is only moderately well suited to other crops. Row crops are the least well suited because they make most of their growth during summer when there is not enough moisture. (Capability unit IIs–1)

Humphreys cherty silt loam, 5 to 12 percent slopes (HcC).—Most of this soil is on foot slopes below steep cherty soils. It is a deep, well-drained loamy soil that has a large amount of chert fragments on the surface and in the soil.

Figure 18.—Lespedeza growing on low terraces or second bottoms of Humphreys silt loam. The wooded hills in the background consist of Baxter and Bodine soils.

The surface layer, 5 to 7 inches thick, is brown or dark-brown, friable cherty silt loam. About 15 percent of this layer, by volume, consists of chert fragments. The subsoil is fairly similar to the surface layer, but it is yellowish brown and contains slightly more clay. Cherty clay or cherty silty clay loam begins at a depth of about 3 feet.

This soil has a deep root zone, but its available water capacity is medium because chert fragments take up about one-fifth of the soil volume. Small grains and other crops that make most of their growth in spring respond well to fertilizer because moisture is generally plentiful in that season. Response to fertilizer is only fair from corn and other crops that make most of their growth in summer.

All crops adapted to the area can be grown, but close-growing crops and crops that grow early in the year produce the most favorable yields. If chert-free soils that have high available water capacity are available, it is not advisable to use this soil for tobacco, vegetables, or other crops of high value. (Capability unit IIIe-2)

Made Land

Made land (Ma) consists of areas that have been filled, excavated, or used for refuse dumps. Most areas are in or near Springfield or the smaller towns. Areas along highways and railroads have been graded and used as sites for school buildings, factories, subdivisions, and other construction. Some railroads and highways are on land that has been filled with dirt and graded. The refuse and dumps have been leveled and covered with dirt. (Not placed in a capability unit)

Mountview Series

The Mountview series consists of deep, well-drained soils in undulating to rolling areas that have slopes of 2 to 12 percent. These soils developed in a layer of loess 2 to 3 feet thick that overlies reddish clay or cherty clay (fig. 19). The main layers of a typical soil profile are—

0 to 7 inches, brown, friable silt loam.
7 to 35 inches, yellowish-brown, friable silt loam or silty clay loam.
35 to 60 inches, red or yellowish-red clay streaked with shades of yellow and brown.

The third layer is below the loess. It ranges from clay or cherty clay to cherty silty clay loam in texture and from red or yellowish red to dark red in color.

The Mountview soils are commonly adjacent to Dickson, Pembroke, and Baxter soils. Mountview soils are better drained than the Dickson soils and are lighter colored than the Pembroke soils.

These soils have very low or low natural fertility and, in areas not limed, are very strongly acid or strongly acid. Crops respond well to fertilizer because Mountview soils have a deep, permeable root zone and high available water capacity. Almost all crops grown in the county are well suited.

Mountview silt loam, 2 to 5 percent slopes (MoB).—This deep, well-drained soil developed in a layer of loess 2 to 3 feet thick that overlies clay or cherty clay weathered from limestone. The surface layer is 6 to 8 inches thick and consists of brown, friable silt loam. The subsoil is yellowish-brown silt loam or silty clay loam to an average depth of 36 inches. Below that depth is red cherty clay or clay that formed from weathered limestone. Depth to limestone bedrock ranges from 10 to 40 feet.

In many places there is a mottled brown, red, and gray layer of material 2 to 8 inches thick between the loess and the red clay. Some fields have a few very small eroded

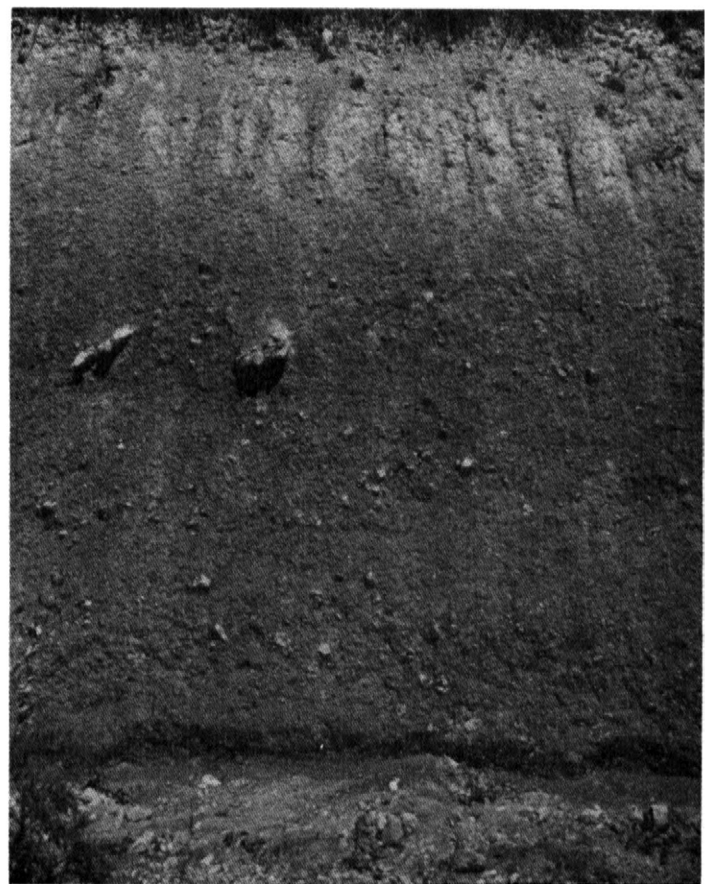

Figure 19.—A profile of a Mountview silt loam. The layer of loess extends downward almost to the two large pieces of chert. Below this the soil is similar to the cherty Baxter soils.

spots where the yellowish-brown subsoil is exposed. The plow layer is commonly darker in the northern half of the county than it is in the southern half.

This soil is low in natural fertility and, in unlimed areas, is strongly acid. Crops respond very well to fertilization because the root zone is deep and permeable and available water capacity is high.

This soil is suited to all crops grown in the county, but it is too sloping for annual cultivation. (Capability unit IIe-2)

Mountview silt loam, 5 to 12 percent slopes, eroded (MoC2).—This deep, well-drained soil is on the slopes of low, rolling hills. The surface layer is generally brown, very friable silt loam 4 to 7 inches thick. The subsoil consists of yellowish-brown, friable silt loam and extends to an average depth of 30 inches. It is underlain by several feet of red clay or cherty clay that formed from weathered limestone. The material above a depth of 30 inches formed in loess. Depth to clay or cherty clay ranges from 24 to 36 inches. Depth to limestone bedrock ranges from 10 to 40 feet. The plow layer of this soil is browner in the northern half of the county than it is in the southern half.

In many places, there is a layer of mottled red, yellow, brown, and gray material between the silt loam and the clay. This layer is 2 to 8 inches thick. Most fields have a few spots where all of the original surface layer has washed off.

This soil is low in natural fertility, but crops respond extremely well to fertilizer and lime. The root zone is deep and permeable, and available water capacity is high.

This sloping soil is not suitable for cultivation unless crops are grown in a long-term system. All crops are adapted. (Capability unit IIIe-2)

Mountview silt loam, 5 to 12 percent slopes, severely eroded (MoC3).—This soil has a yellowish-brown, friable silt loam plow layer that is mostly subsoil material. The subsoil, about 24 inches thick, consists of yellowish-brown, friable silt loam or silty clay loam. It is underlain by several feet of red clay or cherty clay that extends to bedrock. In a few areas shallow gullies have formed.

This soil is strongly acid and is low in natural fertility and content of organic matter. It is fairly easy to work. Crops respond well to management. Available water capacity is medium.

This soil occurs in small areas that seldom make up an entire field. It is suited to small grains and to hay and pasture. Stands are sometimes hard to establish, but once established, plants grow well if fertilizer and lime are added. This soil is only moderately well suited to row crops and should be used for them only after 3 years or more of sod crops. (Capability unit IVe-1)

Newark Series

The Newark series consists of somewhat poorly drained silty soils on bottom lands, along intermittent drainageways, and in broad depressions in the uplands. On bottom lands these soils are in long narrow bands, generally at the outer rims of flood plains. The main layers of a typical soil profile are—

- 0 to 22 inches, mottled light brownish-gray and brown, very friable silt loam.
- 22 to 42 inches +, gray, friable silt loam.

Below the surface layer, the soil ranges from silt loam to silty clay loam.

Newark soils lie next to the Hamblen, Dekoven, and Guthrie soils. They are more poorly drained than the Hamblen soils and are lighter colored than the Dekoven soils. Newark soils are browner than the Guthrie soils and lack a fragipan.

The Newark soils have moderately high natural fertility and are slightly acid to medium acid.

Most of the acreage is wooded, but some areas are used for permanent pasture. A few areas are used for corn.

Newark silt loam (Ne).—This somewhat poorly drained soil is on first bottoms and in broad depressions in the uplands. Along the streams, the areas are long and narrow and are mostly at the outer rims of the flood plains. The areas in depressions are small and nearly circular.

The plow layer is mottled grayish-brown and brown, very friable silt loam. It is underlain by similar but grayer soil that extends to a depth of about 22 inches and, in turn, is underlain by dominantly gray, friable silt loam. In some areas the soil below the plow layer is silty clay loam. In some of the depressions, Dekoven, Taft, or Guthrie soils are buried below a depth of 18 inches.

This soil is moderately high in natural fertility and is medium acid to slightly acid. Excess water in the soil slows the movement of air and the growth of the roots of most crops. During winter and until late in spring, the water table is near the surface. Ponding for a few hours to several days is common. Occasional flooding and slow drainage are the main limitations to use.

This soil is mostly in woods. Most areas of this soil are too small or too oddly shaped to be cleared and farmed. Some areas are in permanent pasture consisting mainly of fescue and white clover. Corn is also grown, but crop failures are common.

This soil is well suited to summer pasture because it holds enough moisture to supply the plants. Fescue, white clover, or alsike clover are well adapted. Soybeans and other crops that can be planted late are also well suited. Corn is moderately well suited to areas that have outlets and are drained. Tobacco and alfalfa are poorly suited. (Capability unit IIw-1)

Nixa Series

The Nixa series consists of moderately well drained cherty soils that have a fragipan. These soils are on benches and foot slopes, below areas of Baxter and Bodine soils. A few areas are on low benches along streams. Slopes range from 2 to about 12 percent. The main layers of a typical soil profile are—

- 0 to 7 inches, brown, friable cherty silt loam.
- 7 to 24 inches, yellowish-brown cherty silt loam or cherty silty clay loam.
- 24 to 48 inches +, yellowish-brown, compact cherty silt loam mottled with shades of yellow, brown, and gray; this layer is the fragipan.

The depth to the fragipan ranges from about 16 to 30 inches.

Nixa soils lie next to the Baxter, Bodine, and Dickson soils. The Nixa soils contain a large amount of chert, but the Dickson soils are free of chert. The fragipan in the Nixa soils is commonly thicker and more compact than that in the Dickson soils.

These soils are strongly acid. They contain chert fragments that make farming difficult and limit the available water capacity.

Nixa soils are only fairly well suited to row crops, but they are well suited to small grains, hay, and pasture.

Nixa cherty silt loam, 2 to 5 percent slopes (NxB).—This moderately well drained soil has a fragipan. It occurs mostly in 2- to 5-acre tracts on benches and foot slopes below Baxter and Bodine soils. The surface layer is brown, friable cherty silt loam 6 to 8 inches thick. It is underlain by a yellowish-brown, friable cherty silt loam or cherty silty clay loam that extends to an average depth of 24 inches. Below that depth is a mottled gray, yellow, and brown fragipan that is compact and slowly permeable. It is about 15 to 25 inches thick and is underlain by yellowish-red cherty clay streaked with shades of yellow and brown. Depth to the fragipan ranges from 20 to 30 inches. In a few places 2 to 4 inches of overwash has been recently deposited on the surface of this soil.

This soil is strongly acid and low in natural fertility. Roots grow to a depth of about 24 inches, or to the fragipan. The soil above the fragipan is friable and easily penetrated by roots, but the fragipan is compact and hard when it is dry. The fragipan does not permit penetration of roots in dry weather. In wet weather, it slows percolation so much that the soil material directly above it is saturated.

Small grains and most hay and pasture plants grow well on this soil. Alfalfa is poorly suited because periodically this soil is wet above the fragipan. Summer annuals are only moderately to fairly well suited because the available water capacity is low. (Capability unit IIe-3)

Nixa cherty silt loam, 5 to 12 percent slopes (NxC).—This moderately well drained soil lies directly below hilly and steep Baxter and Bodine soils. The plow layer is brown, friable cherty silt loam. The subsoil to an average depth of 24 inches is yellowish-brown, friable cherty silt loam or cherty silty clay loam. Next is a fragipan consisting of cherty silt loam, cherty clay loam, or silty clay loam that is more than 12 inches thick. Under the fragipan is an old buried soil that is yellowish red and commonly cherty.

This Nixa soil is strongly acid and low in available water capacity. It is hard to work because of the chert. The root zone, though cherty, is moderately deep. The fragipan limits the growth of roots and the movement of water.

This soil is in areas too small and oddly shaped to make up a single field. It is suited to tall fescue, orchardgrass, white clover, lespedeza, and other hay and pasture plants. Small grains and other crops that mature early grow well. This soil is not well suited to row crops, which grow during summer, or to alfalfa. (Capability unit IIIe-4)

Pembroke Series

The Pembroke series consists of deep, well-drained, productive soils on broad smooth uplands, mainly in the northern half of the county. The areas range mostly from 3 to 100 acres in size. Slopes range from 2 to 12 percent but are mostly between 3 and 7 percent. The upper part of the profile developed in loess, and the lower part developed in old alluvium. The main layers of a typical soil profile are—

0 to 8 inches, dark-brown, friable silt loam.
8 to 30 inches, yellowish-red silty clay loam.
30 to 50 inches, dark-red or dark reddish-brown silty clay loam or clay; the content of clay increases with depth.

The surface layer ranges from dark brown to dark yellowish brown or dark reddish brown.

Pembroke soils lie next to Crider, Baxter, and Mountview soils. The subsoil of Pembroke soils is finer textured and more reddish than that of Crider soils.

Pembroke soils are highly productive. They have moderate natural fertility, have high available water capacity, and are strongly acid. Their root zone is deep.

Almost all of the acreage is used for crops; only a few areas are in woods. All crops common in the area are grown.

Pembroke silt loam, 2 to 5 percent slopes (PeB).—This is a deep, productive soil on gently sloping uplands in the northern part of the county. Areas range from about 2 to 60 acres in size. The plow layer is dark-brown, friable silt loam. It is underlain by a few inches of reddish-brown silty clay loam that grade to yellowish-brown or red silty clay loam. This layer is 2 feet thick or more. It is underlain by dark-red or dark reddish-brown clay or clay loam that, in a few places, contains chert amounting to 15 percent or more of the layer, by volume. Depth to bedrock ranges from 10 to 40 feet or more. In a few spots, this soil has a reddish-brown silt loam plow layer.

This productive soil is easy to work and to keep in good tilth. Natural fertility is moderate, the root zone is deep and well aerated, and available water capacity is high. Crops respond extremely well to management.

Nearly all of this soil is used for crops; only a few areas are idle or are in forest. All crops suited to the area can be grown. Among the well-suited crops are alfalfa (fig. 20), tobacco, corn, small grains, vegetables, grasses, and legumes. (Capability unit IIe-1)

Pembroke silt loam, 5 to 12 percent slopes, eroded (PeC2).—This deep, well-drained soil is on short slopes below gently sloping Pembroke soils. Areas are small and oddly shaped. The surface layer is dark-brown, friable silt loam about 4 to 7 inches thick. It is underlain by yellowish-red, red, or reddish-brown silty clay loam that extends to an average depth of 30 inches and, in turn, is underlain by several feet of dark-red clay. Depth to limestone rock varies from place to place and is commonly more than 20 feet.

The plow layer of this soil is soft and friable and is easy to work into a seedbed. The root zone is deep, available water capacity is high, and natural fertility is moderate. Crops respond well to additions of fertilizer and to other good management.

All crops adapted to the area can be grown. Slope is the chief limitation to use. (Capability unit IIIe-1)

Pickwick Series

The Pickwick series consists of deep, well-drained, reddish-colored soils. These soils are on hillsides where slopes are about 5 to 12 percent. The uppermost 18 to 24 inches of these soils developed largely in loess and is friable silty clay loam. The lower part developed in old alluvium and is red and clayey. The main layers of a typical soil profile are—

0 to 6 inches, brown, friable silty clay loam.
6 to 24 inches, yellowish-red or red, friable silty clay loam.
24 to 60 inches, dark-red, moderately friable clay.

Figure 20.—Alfalfa cut for hay on Pembroke silt loam, 2 to 5 percent slopes.

The surface layer ranges from brown to reddish brown or yellowish red.

The Pickwick soils lie next to Crider, Pembroke, and Mountview soils. Pickwick soils have a lighter colored, finer textured surface layer than Pembroke soils.

Pickwick soils are fairly productive. They have medium available water capacity, have moderate natural fertility, and are strongly acid. They are easy to work. Crops respond well to good management.

The soils are well suited to small grains, red clover, alfalfa, orchardgrass, and other close-growing crops.

Pickwick silty clay loam, 5 to 12 percent slopes, severely eroded (PkC3).—This well-drained soil is mainly on short hillsides, but a few areas surround limestone sinks. Most areas are so small and so oddly shaped that they do not make up a separate field. The plow layer is brown, reddish-brown, dark reddish-brown, or yellowish-red silty clay loam. The subsoil is about the same color as the plow layer but contains more clay. At a depth of about 24 inches, the material grades to dark-red clay.

This soil is strongly acid and moderate in natural fertility. Available water capacity is medium. Although the silty clay loam plow layer makes cultivation slightly difficult, crops, especially cool-season ones, respond well to good management.

This soil is suited to small grains, red clover, alfalfa, orchardgrass, and tall fescue. It is somewhat droughty for row crops. Cultivated crops are suited only if they are grown for a short period in a long-term cropping system. (Capability unit IVe-1)

Rock Land

Rock land (Ro) has more than half of its surface covered by limestone rock. It is on bluffs and around limestone sinks. Most areas are adjacent to streams and are rough and broken. Slopes range from about 15 percent to nearly vertical. In some areas limestone outcrops cover almost all of the surface, and in other areas the average distance between outcrops is about 10 feet.

The soil material between the rocks has weathered mainly from limestone, but in places a small part is loess. In most places the surface layer is brown silt loam, silty clay loam, or silty clay. It is underlain by yellowish-red silty clay or clay that ranges from a few inches to 3 or 4 feet in thickness.

Rock land lies next to Baxter, Cumberland, and Bodine soils.

Nearly all of Rock land is in forest. Dominant trees are oaks, cedars, and locusts. This land can be used for forestry or wildlife habitat. In most places the soil material between the rocks is deep enough for the growth of trees. Cedars are probably the best suited trees, but their growth is slow. (Capability unit VIIs–2)

Sango Series

The Sango series consists of moderately well drained soils that have a fragipan. These soils developed in 3 to 4 feet of loess underlain by silty clay or clay that was derived from limestone. The fragipan is at a depth of 20 to 30 inches. Sango soils are in slight depressions and on broad upland flats. They occur in all parts of the county, but most of the acreage is in the southern half. The main layers in a typical soil profile are—

- 0 to 6 inches, grayish-brown, very friable silt loam.
- 6 to 24 inches, light yellowish-brown, friable silt loam mottled with strong brown, pale brown, and light gray in the lower 3 or 4 inches.
- 24 to 40 inches, light brownish-gray or light yellowish-brown, compact silt loam mottled with gray and brown; this layer is the fragipan.

Sango soils are next to Dickson, Taft, and Guthrie soils. They are lighter colored than the Dickson soils and are less mottled than the Taft. The Sango soils are not so well drained as the Dickson soils, though both kinds of soils are moderately well drained. Sango soils are better drained than Taft and Guthrie soils.

Sango silt loam (Sa).—This soil, which has a fragipan, is on nearly level uplands and in slight depressions, mostly in the southern half of the county. The plow layer is grayish-brown or pale-brown, friable silt loam. The subsoil is light yellowish-brown, friable silt loam about 14 inches thick. The lower few inches of the subsoil are mottled with shades of brown and gray. The subsoil is underlain by a fragipan consisting of light brownish-gray or light yellowish-brown, very compact silt loam mottled with brown and gray. The fragipan averages about 20 inches in thickness. In small areas below sloping soils, sediments recently washed from slopes are in a layer 6 to 8 inches thick.

This soil is low in natural fertility and, unless it is limed, is very strongly acid. Air, roots, and moisture move easily through the surface layer and upper part of the subsoil but move very slowly through the fragipan.

Nearly half of this soil is wooded. Some areas are in pastures of tall fescue and white clover, and some are in corn and small grains.

This soil is well suited to the pasture plants commonly grown in the county. It is poorly suited to alfalfa and tobacco because runoff and internal drainage are slow. If adequate fertilizer and lime are added, this soil is fairly well suited to most cultivated crops. (Capability unit IIw–1)

Staser Series

The Staser series consists of dark-brown, well-drained soils that are cherty in some places. These soils are on first bottoms and in depressions. The main layers of a typical soil profile are—

- 0 to 30 inches, dark-brown, friable silt loam.
- 30 to 45 inches +, dark yellowish-brown or dark-brown, friable silt loam.

In most areas these soils are free of gray mottles to a depth of about 30 inches, but in a few areas mottles occur at a depth of 25 inches.

Staser soils lie next to the Hamblen, Newark, and Humphreys soils. They are better drained than the Hamblen and Newark soils and are younger than the Humphreys. Also, Staser soils lie at an elevation a few feet lower than that of the Humphreys soils.

Staser soils are moderate in natural fertility and are medium acid to slightly acid. Except in cherty areas, these soils are easy to work and to keep in good tilth. The deep, friable root zone favors good growth of roots and good movement of air and moisture.

These productive soils are highly valued for farming. All row crops and hay and pasture crops common in the county are grown.

Staser silt loam (Ss).—This soil is on first bottoms, along intermittent drainageways, and in depressions. It is deep, well drained, and productive. The areas in the depressions are small and oddly shaped; those along streams commonly are long narrow strips 3 to 10 acres in size. Dark-brown, friable silt loam extends from the surface to a depth of 30 inches or more. It is underlain by dark yellowish-brown or dark-brown silt loam that is mottled with gray in some areas.

Included with this soil in mapping were a few areas that have a loam or fine sandy loam surface layer. Also included were a few cherty spots. In a few areas in depressions or on slight benches, color is strong brown or dark yellowish brown below a depth of 16 inches.

This soil is productive and easy to work. Natural fertility is moderate, and the root zone is deep and favorable for extensive growth of roots. The available water capacity is high. The main limitation to use is susceptibility to flooding.

Nearly all of this soil is used for crops. Corn and hay crops are dominant, but crops common in the county grow well if management is good. (Capability unit I–1)

Staser cherty silt loam (Sc).—This deep, well-drained soil is on first bottoms and in depressions in the uplands. The areas are irregular in shape and 2 to 10 acres in size. To a depth of about 30 inches, the soil material is brown or dark-brown cherty silt loam. Below 30 inches, it is commonly dark-brown, or dark yellowish-brown cherty silt loam. The chert is not evenly distributed over the surface or throughout the soil. Some areas contain as much as 50 percent, while others have barely enough to be noticeable.

This soil is friable, but it contains enough chert to make it slightly droughty. The deep root zone favors the growth of roots and the circulation of air and moisture. Some areas are flooded a few times each year, but the water recedes rapidly and is seldom ponded.

If fertilized, this soil is moderately well suited to corn, annual lespedeza, perennial grasses and legumes for hay and pasture (fig. 21), and many other crops. In some areas the choice of crops is limited because of flooding. (Capability unit IIs–1)

Taft Series

The Taft series consists of light-colored, somewhat poorly drained, silty soils that have a fragipan at a depth of about 20 inches. These soils developed on upland flats

Figure 21.—A grass-clover mixture used for hay on Staser cherty silt loam on level bottom lands. Bodine cherty silt loam, 20 to 45 percent slopes, is in the background.

in a layer of loess 2 to 5 feet thick. The main layers of a typical soil profile are—

0 to 10 inches, grayish-brown, very friable silt loam.
10 to 20 inches, mottled yellow and gray, friable silt loam or silty clay loam.
20 to 40 inches, mottled yellow, gray, brownish, and brown, compact, brittle silt loam or silty clay loam; this layer is the fragipan.

In some areas these soils have a layer of silty clay or clay below a depth of 30 inches. These soils are adjacent to Guthrie and Sango soils. They are not so well drained as the Sango soils but are better drained than the Guthrie soils.

The Taft soils are very strongly acid, low in natural fertility, and low in content of organic matter.

Taft silt loam (Ta).—This somewhat poorly drained soil is in low flat areas where water drains slowly. The surface layer is grayish-brown or gray, very friable silt loam about 10 inches thick. It is underlain by about 10 inches of mottled yellow and gray, friable silt loam or silty clay loam. Next is a fragipan consisting of mottled yellow, gray, and brown silt loam or silty clay loam that is compact and brittle. In some areas the surface layer is faintly mottled. Gray clay occurs below the fragipan in some places. In others the material below the fragipan is yellowish-red or red clay mottled with gray and yellow. This material may be cherty. A few areas of this soil have a layer of recently deposited brown or dark-brown silt loam overwash 6 to 8 inches thick. These areas are common where this soil lies below Pembroke and Crider soils.

This soil is low in fertility, is very strongly acid, and has medium available water capacity. The fragipan restricts the downward flow of water; consequently, the soil is waterlogged during winter and until late in spring. In most areas water runs off slowly and is often ponded during the rainy periods.

Most of this soil is in woods, mainly sweetgum, water oak, and hickory. Most cleared areas are used for pastures consisting of tall fescue and white clover. Fescue, Ladino clover, and soybeans are well adapted, but alfalfa and tobacco are not. Small grains can be grown if surface water is removed. (Capability unit IIIw-1)

Use and Management of Soils

The soils of Robertson County are used extensively for cultivated crops and pasture. This section explains how the soils may be managed for these main purposes and also as woodland, for wildlife, and in the building of highways, farm ponds, and other engineering structures. Also given are estimated yields of the principal crops under two levels of management.

The management of crops and pasture and of wildlife are discussed by groups of soils. Also by groups of soils, but in a table, are facts pertinent to the management of woodland. To determine the soils in each of these groups, refer to the "Guide to Mapping Units" at the back of this soil survey.

Crops and Pasture [3]

In this subsection, capability classification is explained and the management of soils by capability units is discussed. A table lists estimated yields of the soils under two levels of management.

Capability groups of soils

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

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

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

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

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

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

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

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

Class VI. Soils that 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 that 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 that have limitations that preclude their use for commercial plant production without major reclamation and restrict their use to recreation, wildlife, or water supply, or to esthetic purposes.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, is used in those areas where climate is the chief limitation to the production of common cultivated crops.

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

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

Management by capability units

This subsection describes the soils in each capability unit, tells of their use and suitability for crops, pasture, and forest, and discusses management practices. To find the names of the soils in any given unit, refer to the "Guide to Mapping Units" at the back of this survey.

Specific amount of fertilizer, varieties of crops, and mixtures for seeding pasture are not suggested, because these vary as new discoveries are made. Up-to-date recommendations are published from time to time by the Tennessee Agricultural Experiment Station and the Agricultural Extension Service. In planning the management of a farm, technical assistance can be obtained from the local Extension Service and the Soil Conservation District.

CAPABILITY UNIT I-1

In this capability unit are some of the most productive soils in the county. These soils are well drained or moderately well drained silt loams on level bottom lands. They

[3] By A. B. HARMON, JR., agronomist, Soil Conservation Service.

are loamy, friable, and permeable to a depth of 3 feet or more. Available water capacity is high. Many areas are likely to be flooded for short periods, probably no longer than 1 day. One of the soils, Hamblen silt loam, has a high water table during rainy periods, but this can be lowered by drainage. These soils have fairly high natural fertility and are medium acid to slightly acid.

The soils of this unit can be used intensively for many of the crops and pasture plants commonly grown in the area. They are well suited to corn, sorghum, and other row crops and are not commonly used for permanent pasture. Because of the occasional floods during the growing season, it is risky to plant tobacco or other crops that cannot withstand these floods.

Crops respond well to applications of lime and fertilizer. Row crops can be grown every year, but green-manure crops or crop residues should be turned under to maintain soil tilth and to return organic matter. Sudangrass, millet, or other summer forage crops provide excellent supplemental pasture. These crops are especially well suited because the soils in this unit hold a large amount of water and much of it is available in summer.

Few management practices are required for maintaining good tilth. Tillage operations can be carried out through a fairly wide range of moisture content. A cover of permanent sod is needed where scouring or deposition of gravelly material is likely. Runoff from adjacent uplands can be controlled by diversion ditches.

CAPABILITY UNIT IIe-1

This capability unit consists of deep, well-drained silt loams. Slopes range from 2 to 5 percent. These soils have a deep root zone and high available water capacity. They are easy to work, and crops respond well to good management.

All crops commonly grown in the county, including alfalfa, tobacco, and vegetables, are well suited (fig. 22). Pastures on these soils are excellent. Large applications of lime and fertilizers are justified by the increase in yields.

Figure 22.—**Dark-fire cured tobacco (left) and burley tobacco (right) growing on Pembroke silt loam, 2 to 5 percent slopes, which is in capability unit IIe-1.**

Under good management, these soils can be protected from erosion in a 2-year cropping system in which grasses and legumes follow a row crop. It is desirable to leave the close-growing crops in the more sloping areas for more than a year because this practice helps to control erosion. Cultivating on the contour and leaving natural waterways in sod also help to control erosion, and to increase the amount of water that enters the soils. Terracing and stripcropping are also effective. Runoff from adjacent slopes can be controlled by well-placed diversion ditches.

CAPABILITY UNIT IIe-2

Only Mountview silt loam, 2 to 5 percent slopes, is in this capability unit. This soil is deep and well drained, but it is low in natural fertility. The root zone is deep, available water capacity is high, and tilth is generally good. Crops respond well to good management.

If this soil receives adequate fertilizer, it can be used fairly intensively for crops. Proper fertilization is essential if alfalfa, red clover, or similar legumes are grown. Good pasture can be maintained if legumes are mixed with grasses.

A suitable cropping system is one that lasts for 2 to 3 or 4 years and includes a grass and a legume. An example is 1 year of a row crop, 1 year of a small grain, and 1 or 2 years of grass mixed with clover, lespedeza, or alfalfa.

Moderate to heavy applications of lime and fertilizer are needed for good growth of alfalfa, red clover, or plants used for pasture.

Management is required that provides contour cultivation and sod waterways. Terracing and stripcropping are effective in controlling runoff on the long slopes. Controlling erosion and conserving moisture are not difficult on this soil if crop residues are properly used and lime and fertilizer are added.

CAPABILITY UNIT IIe-3

This capability unit consists of soils that have a silt loam or cherty silt loam surface layer and a fragipan at a depth of about 2 feet. Above the fragipan, these soils are friable and are easily penetrated by roots, but the fragipan is a barrier. Also, a perched water table forms during rainy periods because permeability is slow in the fragipan. Slopes range from 2 to 5 percent. These soils are very strongly acid and are low in natural fertility.

The soils in this unit are suited to most of the common crops. Sorghums, soybeans, small grains, clover, lespedeza, and fescue are adapted. Corn is suited in years when the supply of moisture is adequate. Alfalfa generally is not well suited, but Dickson silt loam, 2 to 5 percent slopes, has produced favorable yields for 3 or 4 years where the level of management was high. Other hay and pasture plants can be grown successfully if adequate fertilizer is added.

A cropping system that protects these soils from erosion is 1 year of a row crop, 1 year of a small grain, and 1 year of clover. Because these soils are acid and are low in fertility, lime and fertilizer are needed for both crops and pasture plants. Pastures are improved if management favors the legumes in a grass-legume mixture.

To control runoff, all cultivation should be on the contour and the waterways should be kept in sod. If cultivated crops are grown on the long slopes, stripcropping or terracing is a suitable practice to reduce erosion, conserve water, and increase yields.

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CAPABILITY UNIT IIs-1

This unit consists of cherty silt loams on level and gently sloping bottom lands and low terraces. These soils are deep and well drained or moderately well drained. They have a large amount of chert on the surface and throughout the soil. The fragments of chert in these soils reduce the amount of moisture they can hold and make them slightly droughty in summer when rainfall is light. Yields of many crops, however, are fair or above average.

Although most crops common in the area can be grown, occasional flooding during the growing season limits the production of tobacco, small grains, and alfalfa on the bottom lands. Favorable yields of corn, sorghums, and other row crops can be expected in the less cherty areas. Pastures, including those for summer forage, are productive.

Level areas of these soils can be used intensively for adapted crops, but a short rotation is beneficial in the more sloping areas. Turning under crop residues or green-manure crops helps to improve soil tilth. Crops respond well to fertilizer. Chert fragments interfere with tillage and with the harvesting of hay, but these soils can be worked throughout a fairly wide range of moisture content.

Controlling erosion is not difficult, but a cover of a permanent sod crop is needed in areas that are likely to be scoured or to receive new deposits of chert. Diversion ditches may be needed to protect areas receiving runoff from adjacent uplands.

CAPABILITY UNIT IIw-1

This unit consists of nearly level silt loams on bottom lands. In winter and spring, these soils are very wet because of seepage, flooding, and a water table that is often within 1 foot of the surface. In summer and fall, however, the water table drops to a depth of several feet and many crops can be grown. These soils are permeable and are easy to drain by tile or by ditches if outlets are available. Natural fertility is fairly high and lime ordinarily is not needed.

Restricted internal drainage limits the use of these soils, but crops that require much moisture during summer are well suited. Among these crops are corn, soybeans, and sorghums, and lespedeza and other pasture plants that make most of their growth in summer. The use of small grains is limited because flooding is likely and because the plants tend to lodge or to mature late. Tobacco and alfalfa generally are not adapted. Good stands of fescue, white clover, bermudagrass, and other grasses and legumes can be obtained. Response to fertilizer is good.

These soils can be used intensively if tilth and fertility are maintained. Where row crops are grown every year, crop residues should be turned under. Areas subject to scouring by floodwater should be kept in close-growing plants that are used for hay or pasture.

These soils are easily tilled and can be worked throughout a fairly wide range of moisture content, but wetness often delays field operations early in spring and late in fall. In many places the choice of crops, as well as yields, can be increased by drainage. In most places on these nearly level soils, rows alined toward drainageways remove excess surface water. In areas not so nearly level, tile or ditches are effective. In some places, however, the returns from increased yields that result from drainage may not be enough to pay the cost of drainage.

CAPABILITY UNIT IIIe-1

This capability unit consists of well-drained silt loams that have slopes ranging from 5 to 12 percent. These soils have a deep root zone and high available water capacity. They are easy to work and to keep in good tilth.

All crops commonly grown in the county are well adapted to these soils. Yields of corn, tobacco, small grains, grasses, and legumes are favorable if management is good. Alfalfa and almost all hay and pasture plants are well suited. Crops respond well to additions of fertilizer and other good management.

Because of the slopes and the hazard of erosion, a fairly long cropping system that includes close-growing crops is needed. An example is a row crop, a small grain or a winter cover crop, and 2 years or more of a mixture of grass and a legume grown for hay or pasture. It is beneficial to keep alfalfa and other deep-rooted crops in the cropping system for more than 2 years. Where stripcropping is used, a suitable cropping system is one consisting of corn, oats, and alfalfa. The carrying capacity of pasture is high where fertilizer is applied.

Contour cultivation is needed in all areas. Natural waterways should be kept in sod. Stripcropping is a good practice on long slopes not suitable for terracing.

CAPABILITY UNIT IIIe-2

In this unit are deep, well-drained, loamy soils that have a silt loam or a cherty silt loam surface layer. Slopes range from 5 to 12 percent. Roots penetrate the soft, friable subsoil to a depth of at least 30 inches. Natural fertility is low, but available water capacity is medium to high.

If these soils are properly fertilized, they are suited to most crops commonly grown in the county. They are well suited to small grains, hay, and pasture. Crops respond well to fertilization and other management. Alfalfa grows well if these soils are managed well. Pastures are of good quality where legumes are mixed with grasses. In areas of Humphreys cherty silt loam, 5 to 12 percent slopes, the chert may interfere with the harvesting of hay.

These soils can be kept productive if they are managed well and are used in a cropping system that lasts 4 or 5 years. An example of a suitable system is a row crop, a small grain, and 3 years of grass mixed with clover. Alfalfa can be used instead of the grass-clover mixture. A cover crop is needed after the row crop is harvested.

All cultivation should be on the contour. Properly constructed terraces are needed where row crops are grown in a cropping system that lasts less than 4 years. Stripcropping is desirable on long slopes where terraces are not practical.

CAPABILITY UNIT IIIe-3

This unit consists of soils that have a thin silt loam or cherty silt loam surface layer and a thick subsoil that contains much clay. Slopes range from 2 to 12 percent. Available moisture capacity is medium. The Baxter and Cumberland soils in this unit are cherty, but the Dewey soils are practically free of chert.

The soils in this unit are fairly well suited to most crops commonly grown in the county. Because of the content of chert or the clay in the subsoil, these soils are better suited to small grains, hay, or pasture than to row crops. During the droughty periods late in spring and in summer, yields of corn and tobacco are reduced. Sorghums, alfalfa, and annual lespedezas grow well if these soils are well fertilized and limed and are otherwise well managed.

A row crop can be grown if it is preceded by 3 or 4 years of fescue, white clover, or other sod crops. Chert interferes with the cultivation of row crops in some areas. Tilth is difficult to maintain where erosion has exposed the clayey subsoil, but in these places the use of deep-rooted legumes, green-manure crops, or crop residues is beneficial.

Practices that help control erosion are cultivating on the contour and keeping all natural waterways in sod. Stripcropping may be needed on some of the long slopes.

CAPABILITY UNIT IIIe-4

This capability unit consists of sloping soils that have a silt loam or cherty silt loam surface layer and a fragipan at a depth of about 2 feet. Above the fragipan, these soils are soft, friable, and permeable, but the fragipan is dense, slowly permeable, and a barrier to growth of roots. Natural fertility is low, but crops respond well or fairly well to additions of fertilizer and other good management. Slopes range from 5 to 12 percent.

Because of the content of chert and the moderately shallow root zone, these soils are better suited to small grains, hay, and pasture than to row crops. They are not well suited to tobacco, alfalfa, and other crops of high value. Yields of corn and other late-maturing row crops are generally medium, but they are often reduced because moisture is limited in the latter part of the growing season. Grain sorghum and lespedezas grow well. Good yields are obtained from orchardgrass or fescue mixed with white clover or annual lespedeza, or to other mixtures used for hay and pasture.

If these soils are used for tilled crops, the cropping system should provide close-growing crops or sod crops for at least 3 years out of 4. A better cropping system in some areas is one consisting of a small grain and a grass-legume mixture for hay or pasture. Adequate amounts of fertilizer and lime are necessary for moderate yields of all crops. Areas that contain a large amount of chert are more suitable for pasture than for hay or cultivated crops.

All cultivation should be on the contour. On the stronger slopes, stripcropping is effective in reducing erosion and increasing yields. The less sloping areas can be terraced if suitable outlets are built and maintained. A permanent sod is needed in all waterways.

CAPABILITY UNIT IIIw-1

Taft silt loam is the only soil in this capability unit. This somewhat poorly drained soil is in low nearly flat areas and is mottled gray and yellow. It is frequently saturated in winter and in spring, and a few inches of water occasionally stands on the surface for several days. This soil is slowly permeable, and drainage, except by ditches, is difficult. Many areas are in basins or depressions where there are no outlets.

This soil is only fairly well or poorly suited to crops, because it is wet and has a restricted root zone. It is suited to grain sorghum, soybeans, lespedeza, and other summer annuals, but it is poorly suited to alfalfa, tobacco, and other crops that do not tolerate wetness. Wetness often delays planting operations in spring, and it slows the growth of plants early in spring and in winter. Except in depressions that are ponded in winter, small grains used for pasture grow fairly well. This soil is well suited to fescue or bermudagrass mixed with white clover and similar mixtures used for hay and pasture. Adequate amounts of lime and fertilizer are needed for favorable yields of all crops, but yields of row crops vary widely and depend on the content of moisture.

If this soil is drained, it can be used intensively for adapted crops. In many areas, however, drainage is not feasible, because outlets are lacking. Where outlets are available, ditches can be used to remove surface water. Drainage improves crop production and lengthens the grazing season.

CAPABILITY UNIT IVe-1

This unit consists of deep, well-drained, severely eroded soils that have a silt loam or silty clay loam surface layer. Slopes range from 5 to 12 percent. These soils are clayey below a depth of 1 to 2 feet. The plow layer is in the former subsoil, because the original surface layer has washed away. These soils are fairly easy to work because the plow layer does not contain much clay. Available water capacity is medium, and crops respond well to good management.

Severe erosion limits the use of these soils, but small grains, alfalfa, and mixtures for permanent pasture are well suited and help to control erosion. Row crops can be grown in a long cropping system in which cover crops or hay and pasture are grown most of the time. Alfalfa and deep-rooted legumes are also suited, but they should be seeded with grass so as to increase the control of erosion. Pastures are of high quality where they are adequately fertilized.

Cropping systems should last 5 or 6 years if row crops are grown. An example of a suitable cropping system is a row crop, a small grain or a cover crop, and 3 to 4 years of a grass-legume mixture that is used for hay or pasture. Returning crop residues helps to improve tilth and to increase the moisture in the soil. The cropping system can be shorter than 5 years if it consists of a small grain and a grass-legume mixture. If a mixture of orchardgrass or fescue and white clover is used for pasture, and the pasture is well managed, grazing for 120 to 150 days for a mature animal can be expected on each acre annually.

All farming operations should be on the contour. Natural waterways should be kept in sod. Stripcropping is suitable on the long slopes, and terracing is suitable in areas that have slopes of less than about 9 percent.

CAPABILITY UNIT IVe-2

This unit consists of loamy soils, some of which contain a moderate amount of chert fragments. Slopes range from 5 to 20 percent. These soils have a thin surface layer and a subsoil that is several feet thick and contains a large amount of clay. The roots of perennial plants penetrate these soils for several feet, but those of annual plants are mostly confined to the plow layer.

Small grains, hay, and pasture are better suited to these soils than are row crops because the content of moisture is generally low during the growing season. Alfalfa and other deep-rooted legumes are well suited. Also well suited is a pasture mixture consisting of orchardgrass or fescue and white clover. All plants respond well to lime and fertilizers.

To help control erosion and maintain fertility, only one row crop should be grown in a cropping system lasting for 5 or 6 years. A shorter system can be used in the less sloping and less eroded areas, if management is especially good and the soils are protected by close-growing crops. Returning crop residues to the soil improves tilth and increases soil moisture. Well-adapted pasture mixtures of grasses and clover provide annually about 120 days of grazing per acre for a mature animal. Grazing should be managed to insure that the plant cover is good.

To keep soil losses to a minimum, all farming should be on the contour. Waterways should be kept in sod. Stripcropping is effective in reducing erosion and in increasing yields where tilled crops are grown. In the steeper areas, it may be desirable to reseed pasture in alternate strips.

CAPABILITY UNIT IVw-1

Only Guthrie silt loam is in this unit. This gray, poorly drained soil is in low flat areas, many of which are in basins and depressions. It is often ponded during winter and spring, but it ordinarily dries out in summer and fall. Drainage is difficult because permeability is slow. Outlets are lacking in many areas.

Only crops that tolerate wetness are suited to this soil. Yields of soybeans and grain sorghum are favorable, but corn, tobacco, small grains, and alfalfa are not adapted. Fescue, white clover, and similar plants used for hay or pasture are fairly well suited. Plants respond moderately well to fertilizer, and adequate amounts are required for favorable yields.

Important practices in managing this soil are selecting suitable plants, applying adequate fertilizer, and improving drainage where feasible. The soil can be used intensively for adapted crops, since the hazard of erosion is slight. Grazing is generally limited to summer and fall, which are drier than the other seasons. If this soil is grazed during wet periods, the surface layer is packed and the stands of grasses are reduced or destroyed. If management is good, 1 acre of this soil produces annually 100 to 130 days of grazing for a mature animal.

Drainage is not feasible in many areas, because suitable outlets are lacking. Even where outlets are available, the cost of drainage should be weighed against the need for additional cropland and the expected increase in yields. In some areas diversion ditches are needed for reducing ponding by catching runoff from higher lying areas.

CAPABILITY UNIT VIe-1

This unit consists of soils that generally have a moderate amount of chert on the surface and in the soil. Slopes range from 12 to 30 percent. These soils have a thin loamy surface layer and a thick, reddish subsoil that contains much clay. Most of these soils are severely eroded.

Because these soils are generally strongly sloping, severely eroded, and cherty, they are poorly suited to tilled crops. Most cleared areas should be used for permanent pasture. The less sloping areas produce fair yields of hay if management is good. A mixture suitable for hay consists of deep-rooted legumes and grass, such as alfalfa and orchardgrass or sericea lespedeza and fescue. Good pastures consisting of fescue mixed with white clover or lespedeza can be established, but additions of lime and fertilizer are essential.

These soils should be worked only when they are renovated by seeding a forage mixture. All operations should be on the contour. To control erosion on the long, steep slopes seeding in contour strips is desirable. After a seeding, grazing should be carefully controlled until the stand is well established. By rotating pastures, a good plant cover can be maintained. Pastures that are well managed and fertilized provide a mature animal with from 75 to 100 days of grazing per acre annually.

Severely eroded areas that cannot be used for pasture should be planted to desirable trees that are protected from fire and grazing.

CAPABILITY UNIT VIs-3

This unit consists of soils that are very cherty and very rocky and have a cherty silt loam surface layer. Slopes range from 12 to 20 percent. The root zone of these soils is shallow, and available water capacity is low. These soils are strongly acid and have low natural fertility.

The soils in this unit are suited to pasture or timber, but not to tilled crops. Hay crops can be grown in some areas where the chert or rock outcrops do not seriously interfere with harvesting. Well-suited plants are bermudagrass, sericea lespedeza, fescue, and white clover. Moderate applications of fertilizer and lime are essential in establishing and maintaining stands. If management is good and moisture is favorable, a mature animal is provided annually with 75 to 90 days of grazing per acre. Areas now in trees should be managed for woodland products.

These soils should be worked or disked only when a seedbed is prepared or a stand is renovated. Seeding in alternate strips is desirable on long slopes. Cleared areas not needed for pasture should be planted to trees.

CAPABILITY UNIT VIIe-2

Only Gullied land is in this capability unit. This land is a network of shallow and deep gullies. Some of the deep gullies have cut down to the limestone bedrock. The soil material is generally clayey and cherty and is similar to that in the subsoil of Baxter soils.

To prevent further erosion, permanent vegetation should be established on this land. Most areas that are not wooded should be planted to trees. Loblolly and shortleaf pines are generally suitable for most sites.

In some of the less sloping areas pastures can be established where the soil material is deep enough, but grazing in these areas is limited. Suitable plants are sericea lespedeza, fescue, bermudagrass, and common lespedeza. Heavy applications of fertilizer are needed, and controlled grazing is essential. While the plants are getting started, runoff should be diverted from critical areas by diversion ditches. By planting bicolor or other lespedezas where the soil material is deepest, the soil material is improved and food and cover are furnished for wildlife.

CAPABILITY UNIT VIIs-1

This unit consists of very cherty soils and very rocky soils. Slopes range from 12 to 50 percent. These soils are strongly acid and low or very low in natural fertility. Available water capacity is low.

These soils are too steep, cherty, or rocky for crops or pasture in most places. Also, they are droughty, and response to management is poor. Forage yields are very low, and trees are better suited than pasture. It is advisable to leave uncleared areas in trees and to plant trees in idle areas. Protection against fire and grazing is needed. The present stands can be improved by selective cutting, thinning, and weeding. Good management of the woodland improves it as a habitat for many kinds of wildlife.

CAPABILITY UNIT VIIs-2

Only Rock land is in this capability unit. It consists of limestone outcrops and soil material between them. The soil material ranges from a few inches to 3 or 4 feet in depth. It is clayey and, in some places, cherty. Slopes range from about 15 to 40 percent. Rock escarpments, or cliffs, are prominent in a few places.

Use of this land is limited mainly to trees. In most places the trees reproduce naturally if they are protected from fire and grazing. Adapted pines and cedars grow fairly well on the better sites.

Good management of woodland provides selective harvesting of mature trees and protection from fire and grazing. Removing culls or weeds helps to conserve moisture for the more desirable species. In areas where the soil material is deepest, bicolor lespedeza and similar plants can be grown to provide food and cover for wildlife.

Estimated yields

Table 3 lists estimated yields of principal crops grown on the soils of this county under two levels of management. The yields in columns A are expected under prevailing, or common management; those in columns B are expected under the improved management defined later in this subsection. Under prevailing management, yields generally are 20 to 35 percent lower than those obtained under improved management. Estimates are not listed if the soil ordinarily is not planted to the crop or is not suited to it. Gullied land, Made land, and Rock land are not listed in table 3.

The estimates in columns B are based on (1) yields obtained in experiments conducted at the Highland Rim Experiment Station, (2) on yield tests made on farms in a cooperative study of soil productivity and management, and (3) on the knowledge of agronomists and soil scientists who have had experience with the crops and soils in Robertson County.

The yields from the experiments and tests were adjusted to reflect the combined effects of slope, weather, and level of management. For soils on which yields from experiments and tests were not available, estimates were made from experiments and tests on similar soils. Estimates are an average of long-term annual yields where irrigation was not used. The hazard of overflow for soils on bottom lands was disregarded in making yield estimates, because the effects of flooding must be considered locally by those familiar with the characteristics of the various streams.

A farmer in Robertson County generally will obtain yields similar to those listed in columns B if he follows the practices that were assumed when the yields were estimated. These practices are (1) fertilizing and liming each crop according to needs indicated by soil tests and by past cropping and fertilization; (2) selecting adapted, high-yielding varieties of crops; (3) preparing seedbeds adequately; (4) planting or seeding by suitable methods, at appropriate rates, and at the right time; (5) inoculating legumes; (6) using shallow cultivation if row crops are grown; (7) controlling weeds, insects, and diseases; (8) using the cropping systems suggested in the subsection "Management by Capability Units" or similar systems; (9) conserving soil and water where needed by establishing waterways, cultivating on the contour, terracing, or contour stripcropping; and (10) protecting pasture from overgrazing.

The following paragraphs give the rates of seeding and fertilizing that are required if yields in table 3 are to be obtained.

Corn.—Soils that produce 85 bushels or more of corn per acre, as indicated in column B of table 3, require 100 to 125 pounds of nitrogen (N) per acre. Plant to insure a stand of 12,000 to 16,000 plants per acre. Soils that show yields of 60 to 85 bushels ordinarily require 75 to 100 pounds of nitrogen and 8,000 to 12,000 plants per acre. Soils that yield 40 to 60 bushels ordinarily require 50 to 70 pounds of nitrogen. Enough seed should be planted to insure about 8,000 plants per acre. For all yields apply

TABLE 3.—*Estimated average yield per acre of principal crops under two levels of management*

[Estimated yields are based on average rainfall over a long period of time, without irrigation. Absence of figure indicates crop is not suited to the specified soil or is not commonly grown on it]

Soil	Corn		Dark-fire cured tobacco		Alfalfa		Wheat		Lespedeza seeded alone		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Baxter cherty silt loam, 2 to 5 percent slopes	45	60	1, 600	1, 850	2. 2	2. 9	30	35	0. 9	1. 3	110	155
Baxter cherty silt loam, 5 to 12 percent slopes, eroded	35	52	1, 450	1, 700	1. 9	2. 5	27	32	. 8	1. 2	100	145
Baxter cherty silt loam, 12 to 20 percent slopes, eroded	32	45	1, 350	1, 550	1. 8	2. 4	23	28	. 7	. 9	95	135
Baxter cherty silt loam, 20 to 30 percent slopes											80	110
Baxter cherty silt loam, 30 to 50 percent slopes											60	85
Baxter cherty silty clay loam, 5 to 12 percent slopes, severely eroded	27	38	1, 200	1, 400	1. 5	2. 0	21	25	. 6	. 8	70	95
Baxter cherty silty clay loam, 12 to 20 percent slopes, severely eroded	23	34			1. 2	1. 6	18	22	. 5	. 6	60	85
Baxter cherty silty clay loam, 20 to 30 percent slopes, severely eroded											55	75
Baxter very rocky soils, 12 to 20 percent slopes											55	75
Baxter very rocky soils, 20 to 30 percent slopes											55	75
Bodine cherty silt loam, 12 to 20 percent slopes											55	80
Bodine cherty silt loam, 12 to 35 percent slopes, severely eroded											50	70
Bodine cherty silt loam, 20 to 45 percent slopes											40	60
Crider silt loam, 2 to 5 percent slopes	67	95	2, 000	2, 350	3. 0	4. 0	35	42	1. 4	2. 0	150	200
Crider silt loam, 5 to 12 percent slopes, eroded	55	85	1, 875	2, 200	3. 0	4. 0	34	40	1. 2	1. 7	140	185
Cumberland cherty silt loam, 5 to 12 percent slopes, eroded	38	55	1, 500	1, 750	2. 2	3. 0	30	36	1. 0	1. 4	120	155
Cumberland cherty silt loam, 12 to 20 percent slopes, eroded	33	48	1, 400	1, 600	1. 9	2. 6	27	32	. 8	1. 1	105	140
Cumberland cherty silty clay loam, 5 to 12 percent slopes, severely eroded	28	40	1, 250	1, 450	1. 7	2. 3	23	27	. 6	. 9	80	110
Cumberland cherty silty clay loam, 12 to 20 percent slopes, severely eroded					1. 5	2. 0	20	24	. 5	. 7	70	90
Cumberland silty clay loam, 5 to 12 percent slopes, severely eroded	30	48	1, 400	1, 600	2. 1	2. 8	27	32	. 7	1. 0	85	120
Dekoven silt loam	56	[2] 80							1. 1	1. 5	150	200
Dewey silt loam, 5 to 12 percent slopes, eroded	40	58	1, 550	1, 750	2. 9	3. 9	34	40	1. 1	1. 5	125	165
Dewey silt loam, 12 to 20 percent slopes, eroded	34	50	1, 450	1, 650	2. 5	3. 4	29	34	. 9	1. 3	115	150
Dewey silty clay loam, 5 to 12 percent slopes, severely eroded	26	40	1, 300	1, 550	2. 0	2. 7	25	30	. 6	. 9	90	130

See footnotes at end of table.

TABLE 3.—*Estimated average yield per acre of principal crops under two levels of management*—Continued

Soil	Corn		Dark-fire cured tobacco		Alfalfa		Wheat		Lespedeza seeded alone		Pasture	
	A	B	A	B	A	B	A	B	A	B	A	B
	Bu.	*Bu.*	*Lbs.*	*Lbs.*	*Tons*	*Tons*	*Bu.*	*Bu.*	*Tons*	*Tons*	*Cow-acre-days* [1]	*Cow-acre-days* [1]
Dewey silty clay loam, 12 to 20 percent slopes, severely eroded	------	------	--------	--------	1. 7	2. 3	22	26	. 4	. 6	75	105
Dickson silt loam, 2 to 5 percent slopes	48	70	1, 650	1, 900	1. 4	2. 0	30	36	1. 1	1. 6	125	175
Dickson silt loam, 5 to 12 percent slopes, eroded	42	63	1, 550	1, 800	1. 5	2. 2	29	34	1. 0	1. 4	115	160
Guthrie silt loam	------	[2] 45	--------	--------	------	------	------	------	. 8	1. 1	100	140
Hamblen cherty silt loam	50	75	1, 350	1, 550	1. 1	1. 6	28	33	1. 1	1. 6	125	180
Hamblen silt loam	65	95	1, 450	1, 700	1. 2	1. 8	30	35	1. 4	2. 0	150	210
Humphreys cherty silt loam, 2 to 5 percent slopes	48	68	1, 700	2, 000	2. 1	2. 8	31	37	1. 1	1. 5	120	165
Humphreys cherty silt loam, 5 to 12 percent slopes	42	60	1, 550	1, 800	2. 0	2. 6	29	35	. 9	1. 3	110	150
Humphreys silt loam, 2 to 5 percent slopes	60	90	1, 900	2, 250	2. 6	3. 5	35	42	1. 2	1. 8	145	200
Humphreys silt loam, 5 to 12 percent slopes	55	82	1, 800	2, 100	2. 5	3. 3	34	40	1. 1	1. 6	130	180
Mountview silt loam, 2 to 5 percent slopes	50	78	1, 900	2, 200	2. 1	3. 0	35	42	1. 2	1. 6	130	185
Mountview silt loam, 5 to 12 percent slopes, eroded	45	68	1, 700	2, 000	2. 1	3. 0	32	38	1. 0	1. 4	115	165
Mountview silt loam, 5 to 12 percent slopes, severely eroded	28	48	1, 300	1, 500	1. 9	2. 7	25	30	. 6	. 9	85	115
Newark silt loam	------	[2] 60	--------	--------	------	------	------	------	. 9	1. 2	140	190
Nixa cherty silt loam, 2 to 5 percent slopes	35	52	1, 500	1, 750	1. 3	1. 9	29	34	. 9	1. 3	110	160
Nixa cherty silt loam, 5 to 12 percent slopes	28	43	1, 400	1, 600	1. 3	1. 9	27	32	. 8	1. 1	100	145
Pembroke silt loam, 2 to 5 percent slopes	65	92	1, 950	2, 250	3. 2	4. 0	36	45	1. 4	1. 9	150	200
Pembroke silt loam, 5 to 12 percent slopes, eroded	55	82	1, 800	2, 100	3. 0	3. 8	35	42	1. 3	1. 7	135	180
Pickwick silty clay loam, 5 to 12 percent slopes, severely eroded	42	60	1, 375	1, 600	2. 4	3. 0	29	35	. 8	1. 1	90	130
Sango silt loam	42	60	1, 275	1, 500	1. 1	1. 5	22	28	1. 0	1. 4	120	175
Staser cherty silt loam	50	80	1, 550	1, 800	1. 8	2. 4	30	37	1. 0	1. 4	130	170
Staser silt loam	70	105	1, 900	2, 200	2. 1	3. 0	33	42	1. 5	2. 0	165	220
Taft silt loam	35	50	--------	--------	------	------	20	25	. 9	1. 3	110	155

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture is grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for two cows has a carrying capacity of 60 cow-acre-days. To determine the tonnage of air-dry forage per acre divide the cow-acre-days by 53.

[2] Yields are for areas from which excess surface water has been removed by ditches or other drains.

phosphate (P_2O_5) and potash (K_2O) in amounts indicated by soil tests. The nitrogen can be supplied in commercial fertilizer, in barnyard manure, in the residue of legumes, or in any combination of these. If the estimated yield is less than 40 bushels per acre, the soil is poorly suited to corn and may be better suited to some other crop.

The rates of fertilization and planting of corn grown for silage are the same as those of corn grown for grain. To determine the approximate yield of corn silage, in tons, divide the number of bushels of grain by 5.

Dark-fire cured tobacco.—To obtain the yields of tobacco listed in column B of table 3, apply 100 to 130 pounds of nitrogen at or shortly before planting time and use 8,500 to 10,000 plants per acre. Nitrogen may be supplied in commercial fertilizer or in a combination of commercial fertilizer and barnyard manure. Apply phosphate (P_2O_5) and potash (K_2O) in amounts indicated by soil tests.

Alfalfa.—When alfalfa is seeded, apply 20 pounds of borax per acre, and apply 20 pounds annually, after the first year of production. After the first year, apply annually the amounts of phosphate and potash indicated by soil tests, or apply 30 pounds of phosphate and at least 120 pounds of potash per acre. Control grazing, and do not cut hay between September 10 and the first killing frost. The estimated yields in table 3 do not apply to soils that are ponded or flooded.

Wheat.—To obtain the yields of wheat listed in column B of table 3, apply 30 pounds of nitrogen per acre in fall at seeding time. Apply phosphate and potash in amounts indicated by soil tests.

Lespedeza.—To obtain the yields of lespedeza listed in column B of table 3, seed Kobe lespedeza alone in spring on a prepared seedbed or allow it to volunteer. Add fertilizer as indicated by soil tests. Annual yields of lespedeza overseeded on small grain harvested for the grain are about 50 to 60 percent less than yields of lespedeza seeded alone. Overseeding generally results in nearly a complete failure of the lespedeza once every 2 years. If the small grain is harvested for hay, the yields of the lespedeza are generally about 20 percent less than those of lespedeza seeded alone.

Pasture.—To obtain the yields of pasture listed in column B of table 3, apply phosphate and potash at seeding time according to the results of soil tests, and if the clover in the mixture is sparse, topdress with 30 pounds of nitrogen per acre each year late in February.

Pasture plants suited to the soils of this county are too numerous to list. The yields estimated for the poorly drained soils, such as Guthrie, are those of a mixture of tall fescue and white clover. The yields estimated for the rest of the soils are those of orchardgrass mixed with white clover and of tall fescue mixed with white clover. For information about suitability of specified soils for specified pasture plants, see the section "Descriptions of the Soils" and the subsection "Management by Capability Units."

Management of Soils Used as Woodland [4]

The area that is now Robertson County was covered with forests of hardwoods when the first settlers arrived in about 1781. The main trees were black oak, red oak, white oak, yellow-poplar, ash, blackgum, black walnut, hickory, beech, and sweetgum. These species still grow in the county, but much of the woodland has been cleared for cultivation, and much timber has been used to make furniture, barrel staves, and other products. Most of the steeper slopes are still wooded. By 1961, the woodland had been reduced to about 73,200 acres, or 24 percent of the county. All of this woodland was privately owned (*9*). It is generally in small tracts, and most farms have some woodland (fig. 23). All the sawtimber is hardwood. The timber in an average stand amounts to 2,500 board feet per acre. The quality of timber is high. Trees that have a diameter of more than 15 inches make up 66 percent of the sawtimber.

[4] By C. E. BURGER and C. M. HENNINGER, woodland conservationists, Soil Conservation Service.

***Figure 23.*—Woodland on steep Bodine soils in background. Staser cherty silt loam is on the bottom land in the foreground. (Photo courtesy of Paul Sutton, University of Tenn.)**

Woodland suitability groups

To assist managers of woodland, the soils in Robertson County have been placed in nine woodland suitability groups. Each group consists of similar soils that are briefly described in table 4. The soils in each group are suited to about the same kinds of trees, have about the same productivity, and are limited to about the same degree by hazards that affect management. To determine the soils in each group refer to the "Guide to Mapping Units" at the back of this survey.

Shown in table 4 for the woodland suitability groups are ratings of limitations and hazards to management, suitable species of trees, and productivity of selected trees. The suitable species are not listed according to their priority. Some of the terms in table 4 require explanation.

Plant competition.—This term refers to the rate unwanted trees, shrubs, and vines invade if openings are made in the canopy or if open land is planted. Competition is *slight* if invading plants do not prevent adequate natural regeneration and early growth or do not interfere with the normal development of planted seedlings. Competition is *moderate* if invading plants delay the establishment and slow the growth of naturally occurring or planted seedlings but do not prevent the development of a fully stocked, normal stand. Competition is *severe* if invading plants prevent adequate natural or artificial restocking unless the site is intensively prepared or special practices, including weeding, are used.

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

Seedling mortality.—This term refers to the expected loss of seedlings that is a result of unfavorable soil characteristics or topography, not as a result of plant competition. Ratings are based on the number of seedlings normally planted for adequate stocking. Mortality is *slight* if less than 25 percent of the seedlings die. It is *moderate* if between 25 and 50 percent die. If more than 50 percent of the seedlings die, mortality is *severe.*

Erosion hazard.—This hazard is rated according to expected erosion that is a result of the cutting and removal of trees. The rating is *slight* if problems of erosion are not important. A rating of *moderate* indicates that some measures must be taken to control soil erosion. A rating of *severe* indicates that intensive practices and specialized equipment are needed for keeping loss of soil to a minimum.

Productivity.—In table 4, productivity is expressed as site index, or height of trees at a given age, and by the International rule, which gives average annual growth in board feet. The site index is the average height, in feet,

TABLE 4.—*Woodland suitability groups, ratings of*

Woodland suitability group	Plant competition	Equipment limitation [1]	Seedling mortality	Erosion hazard
Group 1. Well drained and moderately well drained soils that are on nearly level bottom lands and have a very deep, permeable root zone and high available water capacity.	Severe	Slight	Slight	Slight
Group 2. Well-drained soils that are largely on low terraces and foot slopes and have a medium-textured subsoil, a very deep, permeable root zone, and high available water capacity.	Moderate to severe.	Slight	Slight	Slight to moderate.
Group 3. Well-drained soils that are on uplands and terraces and have a medium-textured surface layer, a clayey subsoil, a very deep moderately permeable root zone, and medium available water capacity.	Moderate	Slight to moderate.	Slight to moderate.	Slight to severe.
Group 4. Well-drained soils that are on uplands and have a medium-textured surface layer and subsoil, a deep, permeable root zone, and high available water capacity.	Moderate	Slight	Slight	Slight
Group 5. Well-drained to excessively drained cherty soils that are on hilly and steep uplands and have a moderately shallow to deep, permeable root zone.	Moderate	Moderate to severe.	Slight	Moderate to severe.
Group 6. Moderately well drained soils that have a fragipan or compact layer at a depth of 20 to 30 inches and medium available water capacity.	Moderate	Moderate	Slight	Slight
Group 7. Poorly drained, nearly black or grayish-brown soils that are on bottom lands, are fine textured and slowly permeable, and are very wet in winter and spring.	Severe	Moderate	Moderate	Slight
Group 8. Poorly drained and somewhat poorly drained, silty soils that are on uplands, are slowly permeable, and are often ponded in winter and spring.	Moderate	Severe	Moderate	Slight
Group 9. Soils and land types that vary in depth, texture, slope, and degree of erosion.	Slight to moderate.	Severe	Slight to severe.	Slight to severe.

[1] Estimate of rating was generally based on the operation of a 2- or 3-ton, single-axle truck.
[2] Generally, species of high value in natural stands.
[3] Plus and minus values (±) are standard deviations that were calculated if four or more site measurements were available. The numbers in parentheses indicate the number of measured plots on which the average site index is based. The site indexes are averages for groups and were determined at 50 years of age, except cottonwoods for which the site index was determined at 30 years.

that the dominant and codominant trees on a specified soil will reach in 50 years, except cottonwood which is 30 years. The values for site index and International rule listed for each woodland suitability group are averages for the soils in the group.

Managing Soils for Wildlife [5]

This subsection describes the food and cover needed by wildlife in the county, and it discusses groups of soils that have about the same suitability for food plants used by wildlife. A table rates specified plants according to their suitability to the soils in the wildlife groups and also according to their suitability as food for some species of wildlife.

Food and cover needed by wildlife

The kind of habitat needed by wildlife and fish varies according to the species. Deer and squirrels live in woodland, quail prefer almost open farmland, and ducks need a water habitat. Some kinds of wildlife eat only insects and small animals, others eat only vegetative foods, and some eat a combination of the two. Largemouth bass and bluegill prefer warm water, but trout require cold water.

Following is a summary of the food and habitat needs of the kinds of wildlife and fish most important in Robertson County.

Bobwhite quail.—Choice foods are acorns, seeds, and fruits, but quail also eat many insects. The food must be close to vegetation that provides shade and also protection from predators and adverse weather.

Deer.—Deer live chiefly in wooded areas of 500 acres or more. They feed on the tender parts of grasses, herbs, shrubs, vines, and trees. Acorns, corn, soybeans, and similar foods are also choice. Because deer drink water frequently, sources of water should not be more than 1 mile apart.

Doves (mourning).—These birds eat only the seeds of plants. The seeds must be on open ground because doves do not scratch for food as do other birds. Doves drink water daily.

[5] By FLOYD R. FESSLER, biologist, Soil Conservation Service.

hazards to their management, suitable species, and productivity

Suitable species		Productivity		
To favor in existing stands [2]	For planting	Species	Site index [3]	Average yearly growth (International rule [4])
				Bd. ft. per acre
Yellow-poplar, upland oaks, black walnut, white ash.	Yellow-poplar, black walnut, loblolly pine.	Yellow-poplar Upland oaks	97±10 (13) 84±11 (6)	510 330
Yellow-poplar, upland oaks, black walnut, white ash.	Yellow-poplar, black walnut, loblolly pine.	Yellow-poplar Upland oaks	92±10 (14) 75 (3)	460 240
Yellow-poplar, upland oaks, black walnut, redcedar.	Loblolly pine, black walnut	Yellow-poplar Upland oaks Redcedar	98±10 (4) 80 48	530 290 210
Yellow-poplar, upland oaks, black walnut.	Loblolly pine, shortleaf pine	Yellow-poplar Upland oaks	90±11 (25) 69±12 (27)	440 190
Yellow-poplar, upland oaks, black walnut.	Loblolly pine, shortleaf pine	Yellow-poplar Upland oaks	91±10 (26) 69±10 (19)	450 190
Yellow-poplar, upland oaks	Loblolly pine	Yellow-poplar Upland oaks	94±11 (6) 78±11 (15)	485 270
Lowland oaks, white oak, sweetgum, cottonwood.	Loblolly pine	Sweetgum Cottonwood Lowland oaks	90 100 90	440 645 440
Lowland oaks, white oak, yellow-poplar, sweetgum, red maple.	Loblolly pine	Yellow-poplar Upland oaks Lowland oaks	98±9 (4) 72±10 (21) 87±11 (4)	530 210 410
Redcedar or any well-formed tree that has commercial use.	Redcedar, loblolly pine, shortleaf pine.	([5])	([5])	([5])

[4] International rule for well-stocked, well-managed stands to 30 years for cottonwoods and to 60 years for all other species.
[5] Reliable data not available.

Ducks.—Choice foods for ducks are browntop and Japanese millets, barnyard grass, chufa, corn, smartweed, grain sorghum, and soybeans. Ducks prefer their food covered with water, though they occasionally feed on dry land when flooded food is not available. The water should not be deeper than 15 inches for mallards, pintails, and other ducks that do not dive for their food.

Geese.—Wild geese feed on corn and other grains, and they graze clover, rye, ryegrass, wheat, and other green winter crops. These migratory birds use ponds, lakes, and other water for resting and drinking.

Rabbits, cottontail.—Rabbits need brushy areas interspersed with grass. A brierlike cover protects them from predators. Clovers, winter grains, or grasses near this cover provide attractive foods.

Squirrels.—These animals generally prefer areas wooded with a stand of mixed trees that bear acorns, nuts, fruits, and seeds. Squirrels also like corn. Squirrels nest in trees but prefer den holes in the trees for shelter and for raising their young.

Turkey.—Wild turkeys thrive only in wooded areas of 1,000 acres or larger. They eat insects, acorns, grapes, seeds of grasses and pines, and, in winter and spring, green forage. These birds require water daily, and sources of water should not be more than one-half mile apart.

Nongame birds.—The foods of the nongame birds in the county vary. Several species eat only insects, a few eat insects and fruits, and others eat insects, acorns, nutmeats, and fruits.

Fish.—Warm-water ponds are suitable for largemouth bass, bluegills, redear sunfish, and channel catfish. For bluegills, and redear sunfish the choice foods are mostly aquatic worms, insects, and insect nymphs and larvae. Small fish are essential food for bass and channel catfish.

The supply of food for fish depends on the fertility of the water. This fertility is affected by the soils of the watershed and somewhat by the soils at the bottom of the pond. Fertilizer is needed in most warm-water ponds, for it helps to eliminate troublesome water weeds and to increase the production of fish. Fertilizer containing nitrogen, phosphate, and potash is best. Lime is also needed in the warm-water ponds in this county. The basin of the pond should be limed before it is filled with water. Supplementary feeding also increases the production of fish.

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Rainbow trout require cold water. They cannot stand a temperature of more than 70 degrees F. The ponds should not be fertilized, but supplementary feeding is needed. The many large springs in this county could supply the kind of water needed for rainbow trout.

Wildlife suitability groups

The soils of Robertson County have been placed in eight wildlife suitability groups according to their suitability for producing food and cover for specified kinds of wildlife. Gullied land was not placed in a wildlife group, because it is suitable for only a few kinds of plants, and to determine these plants, each site must be examined.

Table 5 rates the suitability of specified plants for the soils of each wildlife group. It also rates the suitability of these plants as food for birds and animals that live in the county or stop there while migrating. From the plants listed in table 5, the farmer can select one that is suitable for an available area of soil and that is also choice food for the kind of wildlife that he wishes to attract.

TABLE 5.—*Suitability of plants to soils in wildlife groups*

[In the numerical ratings, 1 stands for suited, 2 stands

Plants	Suitability of plants to wildlife groups—								Suitability of plants as food for [1]—		
	1	2	3	4	5	6	7	8	Bobwhite	Deer	Dove
Alfalfa	2	1	1	3	2	2	3	3		Choice	
Amaranth (pigweed)	1	1	2	3	2	2	3	3	Fair		Choice
Ash, green and white	2	2	3	2	2	2	2	2	Fair	Fair	
Barley [5]	1	1	1	3	2	1	3	3	Fair	Fair	Fair
Barnyard grass	1	2	3	3	3	3	1	1			Choice
Beautyberry	1	2	3	3	3	2	2	2	Fair	Fair	
Beech	1	1	1	3	2	1	1	2	Choice		
Blackberry	1	1	2	3	3	1	3	3	Choice	Fair	
Blackgum	2	2	2	3	2	2	2	2	Fair	Fair	
Black locust	3	2	2	3	2	2	3	3	Fair		
Bristlegrass	1	1	2	3	3	1	3	3	Choice	Fair	Choice
Browntop millet [5]	1	1	1	3	2	2	3	3	Choice	Fair	Choice
Buckwheat [5]	1	1	2	3	2	1	3	3	Fair	Choice	Fair
Button clover and burclover (forage)	1	1	2	3	2	1	3	3		Choice	
Cherry, black	1	1	2	3	3	3	1	2	Choice	Fair	
Chufa	1	3	3	3	3	3	1	1		Choice	
Clover, crimson and white (forage)	1	1	1	2	2	1	2	2	Choice	Choice	
Corn [5]	1	1	1	3	2	1	2	3	Choice	Choice	Choice
Cowpeas [5]	1	1	2	3	3	1	2	2	Choice	Choice	Fair
Crabapple	2	1	1	2	2	1	3	3		Choice	
Crabgrass	1	1	1	3	2	1	1	3			Fair
Dewberry	2	1	2	2	2	1	3	3	Choice	Fair	
Dogwood	3	1	1	1	2	1	3	3	Choice	Choice	
Elder	1	1	2	3	3	2	1	1		Choice	
Elm	1	1	1	3	2	2	2	2		Fair	
Farkleberry (winter huckleberry)	3	3	3	3	3	1	3	3	Fair	Fair	
Fescue (forage)	1	1	1	2	1	1	1	1		Fair	
Grapes (wild)	1	1	1	2	2	1	3	3		Choice	
Greenbrier	1	1	2	2	2	1	3	3		Choice	
Hackberry	1	2	2	1	1	1	3	2	Fair	Choice	
Hawthorn	2	2	3	3	2	2	3	3		Fair	
Hazelnut	1	2	3	2	3	2	3	2			
Hickory	1	1	1	2	1	1	3	3		Fair	
Holly	2	2	2	2	3	2	3	3		Fair	
Honeysuckle	1	1	1	3	2	1	3	3		Choice	
Huckleberry and blueberry	3	3	3	3	1	1	3	3	Fair	Fair	
Japanese millet [5]	1	2	2	3	2	2	1	1	Choice		Choice
Johnsongrass	1	1	2	3	3	2	2	2	Fair	Fair	Fair
Lespedeza, bicolor	1	1	1	2	1	2	3	3	Choice	Choice	
Lespedeza, annual	1	1	1	2	1	1	1	2	Choice	Choice	Fair
Lespedeza, sericea	1	1	1	2	1	1	3	3			
Lespedeza, wild	1	1	1	2	1	1	1	2		Fair	
Maple	1	1	1	3	2	1	2	2		Choice	
Milkpea	3	3	2	2	2	1	3	3	Choice	Fair	
Mulberry	1	1	2	3	3	2	3	3	Choice	Fair	
Oak	1	1	1	3	1	1	1	1	Choice	Choice	
Oats [5]	1	1	1	3	2	1	3	3	Choice	Choice	Fair
Panicgrass	1	1	3	2	3	2	1	1	Choice	Fair	Choice

See footnotes at end of table.

The wildlife suitability groups are described in the following pages. The soils in each group are identified in the "Guide to Mapping Units" at the back of this survey.

WILDLIFE SUITABILITY GROUP 1

Deep, well drained or moderately well drained soils on bottom lands make up this group. Nearly all areas are next to or near streams. These soils are silty or loamy. They are friable to a depth of 30 inches or more. Dominant slopes are less than 3 percent.

The soils in this group have high available water capacity and are easy to work. They are well suited to many kinds of crops, especially summer annuals. Row crops can be planted every year.

WILDLIFE SUITABILITY GROUP 2

In this group are well-drained soils that have a deep root zone, a medium-textured surface layer and subsoil, and high available water capacity. Dominant slopes range from 2 to 10 percent.

and preferences of wildlife species using the food

for marginally suited, and 3 stands for not suited]

Suitability of plants as food for [1]—Continued							
Duck	Goose	Rabbit	Squirrel	Turkey	Nongame birds		
					Fruit eaters [2]	Grain and seed eaters [3]	Nut and acorn eaters [4]
	Choice	Choice					
						Fair	
Fair			Fair	Fair		Fair	Fair.
Choice	Choice	Fair	Choice	Choice		Fair	
Choice	Choice					Fair	
					Fair	Fair	
			Choice	Choice			Choice.
			Choice	Choice	Choice		Choice.
			Fair	Choice	Choice		
				Fair			Fair.
Fair	Fair			Fair		Choice	
Choice	Fair	Choice		Choice		Choice	
Fair		Fair		Choice		Fair	
		Choice		Choice			
			Choice	Fair	Choice		
Choice	Choice		Choice	Choice			
	Choice	Choice		Choice			
Choice	Choice	Choice	Choice	Choice		Choice	Choice.
		Choice		Choice			
					Fair		
		Fair		Fair		Choice	
		Fair	Fair	Choice	Choice		Choice.
			Fair	Choice	Choice		Fair.
				Fair	Choice		
			Choice	Fair		Fair	
			Fair	Fair	Fair		
	Fair	Fair		Fair			
			Fair	Choice	Choice		
		Choice		Fair	Fair		
			Fair	Choice	Choice		
			Fair	Fair	Fair		
			Choice				Choice.
			Choice	Fair			Choice.
					Fair		
					Choice		
			Fair	Fair	Choice		
Choice		Choice				Choice	
						Choice	
		Fair	Fair				
		Fair		Fair		Fair	
		Fair					
		Fair					
			Fair	Fair			
		Choice					
			Choice	Choice	Choice		
Choice			Choice	Choice			Choice.
Fair	Choice	Choice	Choice	Choice		Choice	
Choice	Fair	Fair		Choice		Choice	

TABLE 5.—*Suitability of plants to soils in wildlife groups*

Plants	Suitability of plants to wildlife groups—								Suitability of plants as food for [1]—		
	1	2	3	4	5	6	7	8	Bobwhite	Deer	Dove
Partridgepea	1	1	2	2	1	1	----	----	Choice		
Paspalum	1	2	3	2	3	2	1	1	Choice	Fair	Choice
Peavine (winter peas)	1	1	2	3	2	1	3	3		Fair	
Pecan	1	1	1	3	3	2	2	3	Choice	Fair	
Persimmon	2	2	2	3	2	2	2	3		Fair	
Pine	----	1	1	1	1	1	3	3	Choice		Choice
Plums	1	1	2	3	2	1	3	2	Choice	Fair	
Pokeberry	1	1	2	2	1	1	3	2	Fair	Choice	Choice
Privet, common	1	1	1	2	1	1	3	2	Fair	Fair	
Pyracantha	2	1	1	2	1	1	3	3	Fair		
Ragweed, common	1	1	1	3	2	1	3	3	Choice	Fair	Choice
Ragweed, giant	1	1	2	3	3	2	3	3			
Redcedar	3	1	1	1	1	2	3	3		Fair	
Rescuegrass	1	1	1	2	2	2	3	2		Choice	
Rice cutgrass	1	1	3	3	3	3	1	3			
Rose, multiflora	2	1	1	1	1	1	3	3			
Rye [5]	1	1	1	2	2	1	2	3	Choice	Choice	Fair
Ryegrass	1	1	1	1	1	1	1	2		Choice	
Sassafras	3	1	1	3	3	2	3	3	Fair	Choice	
Serviceberry	2	1	1	2	1	1	3	3		Fair	
Smartweed	1	2	2	3	3	3	1	1			
Sorghum, grain [5 6]	1	1	2	3	3	1	1	1	Choice	Choice	Choice
Soybeans [5]	1	1	2	3	3	1	1	1	Fair	Choice	Fair
Sudangrass	1	1	2	3	3	1	1	2	Choice		Choice
Sumac	1	1	1	1	1	1	3	2	Fair	Choice	
Sunflower	1	1	1	2	1	1	3	3	Choice	Choice	Choice
Sweetgum	1	1	3	3	3	2	1	1	Choice	Fair	Choice
Sycamore	1	2	3	3	3	2	1	2		Fair	
Tickclover (beggarweed)	1	1	1	2	1	1	3	3	Choice	Choice	
Vetch, hairy	1	1	1	3	2	2	2	2	Choice	Choice	Fair
Virginia creeper	1	1	2	3	3	2	2	1		Fair	
Walnut	2	1	1	1	1	3	3	3			
Wheat [5]	1	1	1	3	2	1	3	3	Choice	Choice	Choice
Yellow-poplar	1	1	1	3	1	1	3	3			

[1] Absence of rating indicates the plant is eaten in a very small amount or its use is unknown.

[2] Fruit eaters common in the county are bluebird, catbird, and mockingbird.

[3] Grain and seed eaters common in the county are blackbird, cardinal, meadowlark, sparrow, and towhee.

[4] Nut and acorn eaters common in the county are bluejay, chickadee, grackle, and woodpecker.

Slopes are the main concern in managing these soils, but crops respond well to good management. These soils are well suited to all common crops, but the slopes prevent annual cultivation in most areas.

WILDLIFE SUITABILITY GROUP 3

This group consists of deep, well-drained soils that occur in uplands and have a dark-red, clayey subsoil. Slopes range from 5 to 20 percent.

The soils in this group produce high yields of grasses and clovers but only fair yields of row crops. Because of the slopes, erosion is likely if these soils are cultivated.

WILDLIFE SUITABILITY GROUP 4

In this group are clayey soils that contain many outcrops of limestone. Dominant slopes range from 10 to 30 percent.

These soils are so rocky that they can be cultivated only with hand tools. Most areas are in trees or bushes, but some areas are in pasture.

WILDLIFE SUITABILITY GROUP 5

This group consists of cherty soils on hills and ridges. The least sloping areas are generally small and on ridgetops. Dominant slopes range from 10 to 25 percent, but a few areas are steeper.

The soils in this group, especially those on slopes facing south and west, are droughty. Natural fertility is low, and acidity is strong. Response to management is moderate.

These soils are well suited to plants, especially perennials, that grow mostly in spring when moisture is plentiful. Yields of summer annuals are ordinarily average or below. Only the small, more nearly level patches on hilltops are suitable for frequent cultivation. A large acreage of these soils is in forest.

WILDLIFE SUITABILITY GROUP 6

This group consists of silty soils that have a fragipan at a depth of about 2 feet. Above the dense, slowly permeable pan, these soils are friable and easy to keep in good tilth, but the lower part of the subsoil is waterlogged during *and preferences of wildlife species using the food*—Continued

Suitability of plants as food for [1]—Continued							
					Nongame birds		
Duck	Goose	Rabbit	Squirrel	Turkey	Fruit eaters [2]	Grain and seed eaters [3]	Nut and acorn eaters [4]
Fair	Fair			Choice		Choice	
			Choice	Choice			Choice.
			Fair	Fair	Fair		
			Choice	Choice			Choice.
			Choice		Fair		
				Fair	Choice		
					Choice		
				Choice	Choice		
						Choice	
						Choice	
					Choice		
	Choice	Choice		Choice			
Choice	Fair					Choice	
				Fair	Choice		
Fair	Fair	Fair	Choice	Choice		Fair	
Choice	Choice	Choice		Choice			
			Fair	Fair	Choice		
			Fair		Choice		
Choice	Fair					Fair	
Choice	Choice	Choice	Choice	Choice		Choice	
Choice	Fair	Fair		Choice			
Choice			Fair			Choice	
		Fair		Fair	Choice		
			Choice	Fair		Choice	Choice.
			Fair	Choice			Choice.
						Fair	
				Fair			
		Fair		Fair			
				Fair	Choice		
			Choice				Choice.
Choice	Choice	Choice	Choice	Choice		Choice	
			Choice			Fair	

[5] If planted as a cultivated crop, the ratings apply only to those soils in capability classes I through IV.

[6] Grain sorghum is a choice food of most grain feeders, but it also attracts blackbirds, cowbirds, sparrows, and other unwanted birds. Also, grain sorghum rots quickly in humid areas.

rainy seasons. Dominant slopes range from 2 to 5 percent, but a few areas have slopes of as much as 12 percent, and a few small areas are nearly level.

These soils are suited to nearly all crops grown in the county, and they can be cultivated frequently. Available water capacity is medium, and response to management is good.

WILDLIFE SUITABILITY GROUP 7

In this group are somewhat poorly drained soils on level bottom lands that are likely to be flooded for short periods in winter and spring. Although the water table is close to the surface during much of winter and spring, it may drop to 5 or 6 feet below the surface in summer and fall. These soils are medium textured to a depth of 30 inches or more. Their subsoil is moderately permeable.

The excess water in these soils limits the kinds of crops that can be grown. Summer annuals that do not require a long growing season produce favorable yields. Tall fescue and white clover also grow well. Areas of 3 acres or more are suitable for growing plants that provide food for wild ducks, for the areas can be flooded so that the ducks can eat the food.

WILDLIFE SUITABILITY GROUP 8

This group consists of poorly drained, gray soils in nearly level areas or in depressions. These soils have a silty, friable surface layer and a silty, slowly permeable subsoil. They are commonly very wet in winter and spring, and water stands on the surface for short periods. In summer they dry out and are fairly droughty.

These soils are low in natural fertility and strongly acid, but they respond fairly well to management. They can be cultivated every year, but only water-tolerant plants can be grown unless drainage is improved. Areas of 3 acres or more are suitable for growing plants that provide food for wild ducks, for these areas can be flooded so that the ducks can eat the food.

Use of Soils for Engineering [6]

This subsection contains test data and other information that can be used for engineering purposes. Engineers can use the information to—

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

With the use of the soil map for identification, the engineering interpretations in this subsection can be useful for many purposes. It should be emphasized that they may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and where the excavations are deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

To make the best use of the soil survey the engineer should know the physical properties of the soil material and the condition of the soil in place. After testing the soil material and observing the behavior of each soil when used in engineering structures and foundations, the engineer can develop design recommendations for each soil delineated on the map.

Much of the information in this subsection is given in tables 6, 7, and 8. Table 6 contains test data for soils of three series in the county. In table 7 properties of the soils that are important to engineering are estimated. In table 8 are interpretations of engineering properties of soils.

In addition to the subsection, other sections of the survey, including "Descriptions of the Soils" and "Formation and Classification of Soils," are useful to engineers. Some of the terms used by the soil scientist may not be familiar to the engineer, and some terms have a special meaning in soil science. These terms, as well as other special terms used in the soil survey, are defined in the Glossary.

Engineering classification systems

Two systems of classifying soils are in general use among engineers. One is the system approved by the American Association of State Highway Officials (AASHO) (*1*), and the other is the Unified system adopted by the Corps of Engineers, U.S. Army (*10*). Both systems are used in this survey and are explained in the following paragraphs. The explanations are taken largely from the PCA Soil Primer (*3*).

AASHO classification system.—Most highway engineers classify soils according to the AASHO system. In this system soil material is classified on the basis of gradation, liquid limit, and plasticity index into seven principal groups. The groups range from A–1, consisting of gravelly soils that have high bearing strength and are the best soils for subgrades, to A–7, consisting of clayey soils that have low strength when wet and are the poorest soils for subgrades. Within each of the principal groups, the relative engineering value of the soil material is indicated by the group index. Group indexes range from 0 for the best material to 20 for the poorest material. For the soils tested, the group indexes are shown in table 6 following the soil group symbol. The estimated AASHO classification of the soils in the county, without group indexes, is given in table 7.

Unified classification system.—The Unified system identifies the soils according to their texture, plasticity, and performance as construction material. Soil materials are identified as coarse grained (8 classes), fine grained (6 classes), and highly organic. The tested soils are classified according to the Unified system in table 6. The classification for the soils that were not tested is estimated in table 7.

Soil test data

Samples from the principal soil types in three extensive soil series were tested according to standard procedures so that the soils could be evaluated for engineering purposes. The results of these tests are given in table 6. The samples were tested for moisture-density, liquid limit, and plasticity index. Also, they were analyzed mechanically for grain-size distribution.

In the moisture-density, or compaction, test, soil material is compacted in a mold several times. A constant compactive effort is used, each time at a successively higher content of moisture. The density, or unit weight of the soil material increases as the content of moisture increases until the optimum moisture content is reached. After that, the density decreases as the content of moisture increases. The highest density obtained in the compaction test is called maximum dry density. Data on moisture density are important in earthwork because the soil is generally most stable if it is compacted to the maximum density when it is at the optimum moisture content.

The results of the mechanical analyses show the relative proportions of the different size particles. These data, however, should not be used in naming soil textural classes, because the content of clay was obtained by the hydrometer method.

The test for liquid limit and plastic limit measures the effect of water on the consistence of the soil material. As

[6] DAVID ROYSTER, soils engineer, Materials and Testing Division, Tennessee State Highway Department, assisted in the preparation of this subsection.

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

Engineering properties of soils

In table 7 are properties that affect use of soils in engineering. Made land and Rock land are not included in table 7, because they are so variable that estimating their properties is not practical.

In table 7 the column that shows permeability gives the estimated rate, in inches per hour, at which water moves through an uncompacted soil. The estimates are based on the structure and porosity of the soil, on field observations, and on measurement. Not much laboratory data was available.

Available water capacity, expressed in inches per inch of soil depth, is the approximate amount of capillary water in the soil when it is wet to field capacity, or the amount of water held in the soil between 1/3 and 15 atmospheres of tension. If the soil is at the permanent wilting point of common plants, this amount of water will wet the soil to a depth of 1 inch without deeper penetration. Laboratory data on available water capacity were obtained for several of the soils in this county. For the other soils, the estimates in table 7 are based on data for similar soils.

In the column headed "Reaction," the degree of acidity or alkalinity is expressed in pH values. The pH of a neutral soil is 7.0, that of an acid soil is less than 7.0, and that of an alkaline soil is more than 7.0. Reaction is estimated on the basis of field observations and laboratory tests. The pH ratings given in table 7 are for the soils that have not been limed.

The rating for shrink-swell potential indicates how much the volume of a soil changes as its content of moisture changes. The estimates in table 7 are based mainly on the amount and type of clay in the soil. In general, soils classified as CH and A–7 have a moderate or high shrink-swell potential. Clean sands and gravel and those soils containing a small amount of nonplastic and slightly plastic fines have a low shrink-swell potential.

Interpretations of engineering properties of soils

In table 8 the soils of the county are rated according to their suitability as a source of topsoil and road fill. Also, table 8 lists soil features that affect highway construction and other engineering uses. Made land and Rock land are not listed in table 8.

The rating for suitability as a source of topsoil refers to the upper 3 feet of soil that has been mixed because the original surface layer of many soils in the county is thin or absent. Below a depth of 3 feet, only Staser soils are a good source of topsoil.

Very coarse grained, easily drained soil materials are best for road fill, but in Robertson County soils that have this kind of material are few. Material from Bodine and Baxter soils is the most suitable.

Suitability as a source of sand and gravel are not rated in table 8. Natural deposits of sand do not occur in the county. The only known source of gravel in the county is the chert gravel in the Bodine soils. These soils are fair as a source of gravel because expensive cleaning is necessary before the gravel can be used. Chert gravel is economical for secondary and county roads, but normally it is not strong enough for use in concrete structures or as base material for primary roads. Crushed limestone is much more satisfactory. To reduce the amount of limestone required, a layer of chert gravel can be used over a poor soil. Limestone is quarried at several places in Robertson County.

The selection of locations for highways is affected by a high water table, flooding, unstable slopes, and the depth of soil material over bedrock. The Guthrie, Taft, Hamblen, Staser, and other soils in the county are flooded occasionally or have a seasonal high water table. Roads on these soils should be raised by an embankment above the highest level of flooding. Ditches or underdrains may be needed to intercept water that seeps to the surface, as is common at the base of slopes in deposits of local alluvium. Also, seepage in the back slopes of cuts may cause the material in the slopes to slump or slide.

In some places where the soils are sloping or steep, the location of secondary roads is influenced by the depth to bedrock and the kind of bedrock. It is essential to determine the kind of bedrock and how difficult it is to excavate. In some areas of Bodine and Baxter soils, cherty limestone is within 3 or 4 feet of the soil surface. For all highways, an investigation is needed to determine the likelihood of slides, or other soil movements, and of water seepage along or through the bedrock. Also considered is the suitability of the material within or slightly below the subgrade. A layer of highly plastic clay such as in the Dewey soils impedes internal drainage and provides a poor foundation for roads. In some places this layer of clay should be cut out before the pavement is constructed. In low flat areas or in poorly drained areas where it is not feasible to cut out the layer of clay, the roadway should be built on an embankment well above the clay. Cobbles and stones are likely to make grading difficult.

In this county the construction of small lakes or ponds is adversely affected by permeable substrata, by caverns in the limestone bedrock, and by the kind of material available for embankment. Most of the soils in the county have moderate or moderately rapid permeability and a high risk of seepage unless the reservoir area is compacted or chemically treated. The Dewey, Cumberland, and other soils that contain a large amount of clay are difficult to compact and generally require treatment with a sodium compound. The Bodine, Baxter, and other of the coarser textured soils ordinarily can be sealed by compaction and do not require special treatment.

The limitations of soils for sewage disposal fields are rated slight, moderate, and severe in table 8. A rating of *slight* means that the soil has few or no limitations, or that the limitations can be easily overcome. If properly constructed, sewage disposal fields should function well in soils having a rating of slight. A rating of *moderate* means that the soil can be used for sewage disposal if the field is carefully designed and is well managed. A soil having a borderline percolation rate has a moderate limitation. A

TABLE 6.—*Engineering*

[Test performed by Tennessee Department of Highways in accordance with standard

Soil name and location	Parent material	Tennessee report No.	Depth	Horizon	Moisture-density [1]		Estimated amount larger than 3 inches discarded in field sampling
					Maximum dry density	Optimum moisture	
			Inches		*Lb. per cu. ft.*	*Percent*	*Percent*
Baxter cherty silt loam:							
5 miles west of White House (modal).	Cherty limestone.	[5] 19	0–6	Ap	101	15	
		20	17–40	B22	96	23	5
		21	40–55	B3	95	23	10
		22	55–72	C1	96	22	15
15 miles northeast of Springfield and 0.25 of a mile of Red River (thinner than modal).	Cherty limestone.	8	0–5	Ap	98	14	
		9	15–17	B22	100	19	
		10	35–59	C	90	28	10
3.5 miles west of White House and 0.56 of a mile south of Baggettsville (more clayey than modal).	Cherty limestone.	23	0–6	Ap	100	15	
		24	24–48	B22	90	27	10
		[5] 25	48–66	B3	92	22	12
Cridar silt loam:							
8 miles northeast of Springfield and 1.25 miles east of Hubertville on State Route 25 (modal).	Loess over limestone residuum.	15	0–6	Ap	103	14	
		16	15–25	B22	107	14	
		17	30–44	IIB2b	106	15	
		18	52–72	IIC	101	18	
12 miles northeast of Springfield and 1.7 miles north of Lamont (intergrades toward Mountview).	Loess over limestone residuum.	26	0–8	Ap	102	15	
		27	11–22	B2	104	16	
		28	54–72	IIB22b	100	22	
4 miles northwest of Springfield and 2.4 miles east of Cedar Hill on U.S. Highway No. 41 (shallower than modal).	Loess over limestone residuum.	29	0–5	Ap	105	13	
		30	7–15	B2	106	14	
		31	19–36	IIC1	106	14	
		32	36–72	IIC2	95	22	
Guthrie silt loam:							
2.5 miles west of White House (modal).	Old alluvium.	4	3–17	A22g	104	14	
		5	17–25	Bxg	106	14	
		6	29–63	IIB2bg	99	18	
		7	63–76	IIIC	109	14	
10.5 miles northeast of Springfield and 1.5 miles northeast of Milldale and 100 feet east of road (Bir horizon).	Old alluvium.	11	2–6	A2	98	14	
		12	6–21	Bx1	106	12	
		13	21–45	Bx2	109	12	
		[5] 14	45–72	Bir	110	14	
5 miles northeast of Springfield and 500 feet northeast of Dozier Church and 20 feet south of Wagon Road (no fragipan).	Old alluvium.	1	3–12	A22g	104	13	
		2	14–26	IIA12bg	102	19	
		3	30–78	IIClg	110	12	

[1] Based on the Moisture-Density Relations of Soils Using a 5.5-lb. Rammer and 12-in. Drop, AASHO Designation: T 99–57, Method A(*1*).

[2] Mechanical analyses according to the AASHO Designation: T 88–57(*1*). Results by this procedure frequently may differ somewhat from results that would have been obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analyses used in this table are not suitable for use in naming textural classes for soil.

test data

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

Mechanical analysis [2]											Liquid limit	Plasticity index	Classification	
Percentage passing sieve [3]—							Percentage smaller than [3]—						AASHO	Unified [4]
2-in.	¾ in.	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 80 (0.25 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
98	89	77	68	61	59	57	52	40	17	11	30	6	A-4(4)	ML-CL.
100	86	67	64	61	60	59	58	55	42	37	55	18	A-7-5(9)	MH.
100	83	70	68	65	64	63	62	59	46	40	54	22	A-7-5(12)	MH.
100	92	90	84	79	79	76	76	71	52	41	60	29	A-7-5(20)	MH-CH.
100	71	49	46	44	43	42	40	28	10	35	31	5	A-4(1)	SM.
------	100	99	98	97	97	95	92	81	54	44	44	19	A-7-6(12)	ML-CL.
100	91	86	85	83	83	82	81	75	62	52	57	23	A-7-5(17)	MH.
100	83	68	61	56	54	53	51	35	16	10	32	5	A-4(4)	ML.
100	90	83	82	80	80	79	78	76	67	60	71	39	A-7-5(20)	MH-CH.
96	80	68	65	63	62	62	61	60	54	44	72	39	A-7-5(16)	MH-CH.
------	------	--------	100	98	97	95	92	67	28	19	31	8	A-4(8)	ML-CL.
------	------	--------	100	98	98	96	92	79	36	30	36	14	A-6(10)	CL.
------	------	100	99	98	97	95	92	76	40	31	38	11	A-6(8)	ML.
100	99	98	97	93	91	88	85	74	42	35	42	10	A-5(8)	ML.
------	------	--------	100	97	96	93	87	67	20	13	26	2	A-4(8)	ML.
------	------	--------	100	98	97	95	91	79	38	29	36	10	A-4(8)	ML-CL.
------	------	--------	100	99	98	96	94	83	54	49	45	15	A-7-5(11)	ML.
------	------	--------	100	98	97	95	91	70	28	19	29	6	A-4(8)	ML-CL.
100	99	96	95	93	92	91	89	72	34	27	39	17	A-6(10)	CL.
100	90	81	80	75	74	72	70	55	24	19	34	12	A-6(9)	ML-CL.
100	91	86	85	82	80	78	77	69	48	43	48	43	A-7-6(13)	CL.
------	------	--------	100	99	98	96	94	72	26	16	26	3	A-4(8)	ML.
------	------	99	99	98	98	96	92	76	29	19	27	6	A-4(8)	ML-CL.
------	------	--------	100	99	99	98	95	80	46	37	38	14	A-6(10)	ML-CL.
------	------	99	99	96	94	92	89	70	40	30	32	13	A-6(9)	CL.
------	------	98	95	93	91	89	82	58	18	12	27	NP	A-4(8)	ML.
------	------	83	77	74	73	71	67	50	20	15	30	8	A-4(7)	ML-CL.
------	150	90	85	82	80	77	73	55	20	14	25	5	A-4(8)	ML-CL.
82	50	24	20	17	16	14	13	10	6	5	37	14	A-2-6(0)	SM-SC.
------	------	--------	--------	100	99	98	92	74	21	13	24	3	A-4(8)	ML.
------	------	--------	--------	--------	100	99	98	82	44	35	43	11	A-7-5(9)	ML-CL.
------	------	--------	100	99	99	98	95	80	28	19	27	8	A-4(8)	CL.

[3] Based on material passing a 3-inch sieve. The test data has not been corrected for amounts discarded greater than 3 inches.

[4] The Soil Conservation Service and Bureau of Public Roads have agreed that all soils having plasticity indexes within 2 points from A-line are to be given a borderline classification. Examples of borderline classification thus obtained are ML-CL, MH-CH, and SM-SC.

[5] All of the material in sample Nos. 19, 25, and 14 passed a 3-inch sieve.

[6] NP=nonplastic.

TABLE 7.—*Estimated engineering*

Soil name	Depth to and kind of bedrock	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		Inches			
Baxter:					
Cherty silt loam (BaB, BaC2, BaD2, BaE, BaF).	4 to 35 feet to limestone bedrock.	0–8	Cherty silt loam	ML, CL, or SM	A–4
		8–18	Cherty silty clay loam	MH or CH, or ML–CL.	A–7
		18–72	Cherty clay	CH or MH	A–7
Cherty silty clay loam (BcC3, BcD3, BcE3).	4 to 35 feet to limestone bedrock.	0–12	Cherty silty clay loam	MH or CH, or ML–CL.	A–7
		12–72	Cherty clay	CH or MH	A–7
Very rocky soils (BkD, BkE).	Many outcrops of limestone.	0–15	Cherty silt loam	ML or CL	A–4
		15–72	Cherty clay	CH or MH	A–7
Bodine (BoD, BoE3, BoF)	4 to 10 feet to limestone bedrock or to loose beds of chert.	0–8	Cherty silt loam	GM or ML	A–4
		8–36	Cherty silt loam	GM or GC	A–4 or A–2
Crider (CrB, CrC2)	10 to 40 feet to limestone bedrock.	0–30	Silt loam	ML or CL	A–4
		30–72	Clay	ML or CL	A–6 or A–7
Cumberland:					
Cherty silt loam (CsC2, CsD2).	10 to 35 feet to limestone bedrock.	0–8	Cherty silt loam	CL	A–4
		8–72	Cherty clay	CH or MH	A–7
Cherty silty clay loam (CtC3, CtD3).	10 to 35 feet to limestone bedrock.	0–6	Cherty silty clay loam	CH or MH	A–7
		6–72	Cherty clay	CH or MH	A–7
Silty clay loam (CuC3)	10 to 30 feet to limestone bedrock.	0–6	Silty clay loam	CH or MH	A–7
		6–72	Clay	CH or MH	A–7
Dekoven (De)	8 to 35 feet to limestone bedrock.	0–40	Silt loam	CL or ML	A–6
Dewey:					
Silt loam (DlC2, DlD2)	5 to 35 feet to limestone bedrock.	0–6	Silt loam	ML or CL	A–4
		6–12	Silty clay loam	MH or CH	A–7
		12–72	Clay	MH or CH	A–7
Silty clay loam (DmC3, DmD3).	5 to 35 feet to limestone bedrock.	0–72	Clay	MH or CH	A–7
Dickson (DsB, DsC2)	10 to 40 feet to limestone bedrock.	0–7	Silt loam	ML	A–4
		7–24	Silt loam	ML or CL	A–4
		24–38	Silt loam	ML or CL	A–6 or A–4
		38–72	Clay or cherty clay	MH or CH	A–7
Gullied land (Gd)	4 to 35 feet to limestone bedrock.	--------	Clay or cherty clay	CH	A–7
Guthrie (Gu)	10 to 35 feet to limestone bedrock.	0–20	Silt loam	ML or CL	A–4
		20–35	Silty clay loam	ML or CL	A–6, A–7, A–4
		35–72	Clay or cherty clay	CL, SM, or SC	A–2, A–4, A–6
Hamblen:					
Silt loam (Hb)	8 to 25 feet to limestone bedrock.	0–36	Silt loam	ML or CL	A–4
Cherty silt loam (Ha)	8 to 25 feet to limestone bedrock.	0–36	Cherty silt loam	ML	A–4
Humphreys:					
Silt loam (HuB, HuC)	8 to 25 feet to limestone bedrock.	0–10	Silt loam	ML	A–4
		10–40	Silt loam	CL	A–6
Cherty silt loam (HcB, HcC).	8 to 25 feet to limestone bedrock.	0–12	Cherty silt loam	ML	A–4
		12–48	Cherty silt loam	CL	A–4 or A–6
Mountview (MoB, MoC2, MoC3).	10 to 40 feet to limestone bedrock.	0–10	Silt loam	ML	A–4
		10–34	Silt loam	CL	A–6
		34–72	Clay or cherty clay	MH or CH	A–7

See footnote at end of table.

properties of soils

Percentage passing sieve— No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)	Permeability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
			Inches per hour	*Inches per inch of soil*	*pH value*		
45–85	60–80	40–80	2. 0–6. 3	0. 15	4. 5–5. 5	Granular	Low.
65–95	65–95	55–95	0. 63–2. 0	. 12	4. 5–5. 5	Blocky	Moderate.
65–95	65–95	60–95	0. 63–2. 0	. 10	4. 5–5. 5	Blocky	Moderate.
65–90	65–85	60–80	0. 63–2. 0	. 12	4. 5–5. 5	Blocky	Moderate.
65–95	65–95	55–95	0. 63–2. 0	. 10	4. 5–5. 5	Blocky	Moderate.
65–85	60–80	55–75	2. 0–6. 3	. 15	4. 5–5. 5	Granular	Low.
65–90	65–90	55–85	0. 63–2. 0	. 10	4. 5–5. 5	Blocky	Moderate.
55–75	50–65	40–55	2. 0–6. 3	. 10	4. 5–5. 0	Granular	Low.
30–50	25–45	20–45	2. 0–6. 3	. 08	4. 5–5. 0	Granular	Low.
80–100	80–100	70–100	0. 63–2. 0	. 20	5. 1–5. 5	Granular	Low.
85–100	80–100	70–100	0. 63–2. 0	. 13	5. 1–5. 5	Blocky	Moderate.
75–85	70–85	60–75	0. 63–2. 0	. 15	5. 1–5. 5	Granular	Low.
70–90	65–85	60–85	0. 63–2. 0	. 11	5. 1–5. 5	Blocky	Moderate.
75–85	70–85	60–75	0. 63–2. 0	. 13	5. 1–5. 5	Blocky	Moderate.
70–90	65–85	60–80	0. 63–2. 0	. 11	5. 1–5. 5	Blocky	Moderate.
95–100	90–95	70–90	0. 63–2. 0	. 17	5. 1–5. 5	Blocky	Moderate.
95–100	90–100	75–95	0. 63–2. 0	. 13	5. 1–5. 5	Blocky	Moderate.
95–100	95–100	85–100	0. 63–2. 0	. 19	5. 6–7. 3	Granular	Moderate.
95–100	90–100	75–95	0. 63–2. 0	. 18	5. 1–5. 5	Granular	Low.
90–100	90–100	85–95	0. 63–2. 0	. 15	5. 1–5. 5	Blocky	Moderate.
90–100	90–100	85–95	0. 63–2. 0	. 13	5. 1–5. 5	Blocky	Moderate.
90–100	90–100	85–95	0. 63–2. 0	. 14	5. 1–5. 5	Blocky	Moderate.
95–100	90–100	75–90	0. 63–2. 0	. 20	4. 5–5. 5	Granular	Low.
95–100	90–100	80–90	0. 63–2. 0	. 19	4. 5–5. 0	Blocky	Low.
95–100	90–100	80–90	0. 20–0. 63	. 14	4. 5–5. 0	Massive	Low.
80–100	75–95	75–90	0. 20–0. 63	. 12	4. 5–5. 0	Blocky	Moderate.
75–100	70–95	60–90	0. 20–0. 63	0. 05–0. 10	4. 5–5. 5		Moderate.
80–100	75–100	70–95	0. 20–0. 63	. 20	4. 5–5. 0	Granular	Low.
80–100	75–100	75–95	0. 20–0. 63	. 14	4. 5–5. 0	Massive	Low.
20–100	20–95	10–90	0. 20–0. 63	. 11	4. 5–5. 0	Massive	Moderate.
95–100	90–100	75–95	0. 63–2. 0	. 20	5. 6–6. 5	Granular	Low.
75–90	70–85	60–80	0. 63–2. 0	. 16	5. 6–6. 5	Granular	Low.
90–100	85–95	75–90	0. 63–2. 0	. 21	5. 1–5. 5	Granular	Low.
85–100	80–95	75–90	0. 63–2. 0	. 18	5. 1–5. 5	Blocky	Low.
75–90	70–85	60–75	2. 0–6. 3	. 16	5. 1–5. 5	Granular	Low.
70–90	65–85	55–75	0. 63–2. 0	. 14	5. 1–5. 5	Blocky	Low.
95–100	95–100	80–95	0. 63–2. 0	. 20	4. 5–5. 5	Granular	Low.
95–100	95–100	80–95	0. 63–2. 0	. 19	4. 5–5. 0	Blocky	Low.
75–90	70–80	60–80	0. 63–2. 0	. 11	4. 5–5. 0	Blocky	Moderate.

TABLE 7.—*Estimated engineering*

Soil name	Depth to and kind of bedrock	Depth from surface	Classification		
			USDA texture	Unified	AASHO
		Inches			
Newark (Ne)	8 to 25 feet to limestone bedrock.	0–36	Silt loam	ML or CL	A–4 or A–6
Nixa (NxB, NxC)	10 to 40 feet to limestone bedrock.	0–10	Cherty silt loam	ML	A–4
		10–24	Cherty silt loam	ML or CL	A–4 or A–6
		24–38	Cherty silt loam	ML or CL	A–4
		38–72	Cherty clay or clay	MH, CH, or CL	A–6 or A–7
Pembroke (PeB, PeC2)	10 to 40 feet to limestone bedrock.	0–8	Silt loam	ML or CL	A–4
		8–36	Silty clay loam	CL	A–6
		36–72	Clay	MH or CH	A–7
Pickwick (PkC3)	10 to 40 feet to limestone bedrock.	0–24	Silty clay loam	CL	A–6
		24–72	Clay	MH or CH	A–7
Sango (Sa)	10 to 40 feet to limestone bedrock.	0–8	Silt loam	ML	A–4
		8–22	Silt loam	ML or CL	A–4 or A–6
		22–42	Silt loam	ML or CL	A–4 or A–6
		42–72	Clay or cherty clay	MH or CH	A–7
Staser:					
Silt loam (Ss)	8 to 25 feet to limestone bedrock.	0–36	Silt loam	ML or CL	A–4
Cherty silt loam (Sc)	8 to 25 feet to limestone bedrock.	0–36	Cherty silt loam	ML or CL	A–4
Taft (Ta)	10 to 40 feet to limestone bedrock.	0–10	Silt loam	ML or CL	A–4
		10–20	Silt loam	CL	A–4 or A–6
		20–36	Silt loam	CL	A–6
		36–72	Silty clay	MH or CL	A–6 or A–7

[1] These ratings are for the soils before liming.

rating of *severe* means that use of the soil for a sewage disposal field is generally not practical, and that the limitation is difficult and costly to overcome. For those soils rated severe in table 8, the nature of the soil limitation is given after the rating.

Formation and Classification of Soils

This section tells how the factors of soil formation have affected the development of soils in Robertson County. It also explains the current system of soil classification and names the classes of that system in which the soil series in the county have been placed. Finally, it describes the soil series and gives a profile that is representative for each series.

Formation of Soils

The characteristics of a soil at any given point are determined by the combined effects of the five soil-forming factors—parent material, climate, plant and animal life, relief, and time. All of these factors affect the formation of every soil, but the importance of each differs from place to place. In one place parent material is more important, and in another, climate. In still other places, the influence of each of these two factors is about equal.

Parent material, relief, and time are the most important soil-forming factors that cause differences in the soils of Robertson County. Although climate has strongly affected most of the soils, it is nearly uniform throughout the county and does not cause major differences among the soils. Plants and animals, mainly trees, have also influenced formation of the soils in kind and in distribution, but they too were nearly uniform throughout the county and have not caused significant differences. The following paragraphs discuss each factor and its effect on the formation of soils in this county.

Parent material

Many of the soils of this county have formed in material derived from limestone. Most of the others formed in loess. Alluvium was the parent material of only a few soils. The alluvium probably originated from limestone or loess, or both. It was transported by water from its original location and was redeposited.

All of this county is underlain by limestone bedrock that contains a moderate amount of chert. A thick layer of cherty clay has weathered from the limestone. This layer ranges from about 2 feet in thickness in the shallowest places to 30 or 40 feet in the deepest places. Almost all of the soils on hillsides, mainly the Baxter and Bodine, have formed in this cherty clay. The parent material of the Bodine soils was more cherty than that of the Baxter. As a result, Bodine soils have a paler color and are more cherty than the Baxter.

properties of soils—Continued

Percentage passing sieve—			Permeability	Available water capacity	Reaction [1]	Structure	Shrink-swell potential
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 200 (0.074 mm.)					
			Inches per hour	*Inches per inch of soil*	*pH value*		
95-100	95-100	85-95	0. 63-2. 0	. 19	5. 6-6. 5	Granular	Low.
70-90	65-85	55-75	2. 0-6. 3	. 15	4. 5-5. 5	Granular	Low.
70-90	65-85	60-75	0. 63-2. 0	. 14	4. 5-5. 5	Blocky	Low.
70-90	65-85	60-75	0. 20-0. 63	. 12	4. 5-5. 5	Massive	Low.
80-95	75-95	65-85	0. 63-2. 0	. 11	4. 5-5. 5	Blocky	Moderate
95-100	90-100	85-95	0. 63-2. 0	. 20	5. 1-5. 5	Granular	Low.
95-100	90-100	80-95	0. 63-2. 0	. 17	5. 1-5. 5	Blocky	Low.
95-100	90-100	75-90	0. 63-2. 0	. 13	5. 1-5. 5	Blocky	Moderate.
95-100	90-100	80-95	0. 63-2. 0	. 17	5. 1-5. 5	Blocky	Low.
95-100	90-100	75-90	0. 63-2. 0	. 13	5. 1-5. 5	Blocky	Moderate.
95-100	90-100	80-90	0. 63-2. 0	. 20	4. 5-5. 0	Granular	Low.
95-100	90-100	80-90	0. 63-2. 0	. 18	4. 5-5. 0	Blocky	Low.
95-100	90-100	75-90	$<$0. 20	. 14	4. 5-5. 0	Massive	Low.
80-100	75-95	65-90	0. 63-2. 0	. 12	4. 5-5. 0	Blocky	Moderate.
95-100	90-100	80-90	0. 63-2. 0	. 20	5. 6-6. 5	Granular	Low.
70-90	65-85	55-75	0. 63-2. 0	. 16	5. 6-6. 5	Granular	Low.
95-100	90-100	80-95	0. 63-2. 0	. 20	4. 5-5. 0	Granular	Low.
95-100	90-100	75-95	0. 20-0. 63	. 18	4. 5-5. 0	Blocky	Low.
95-100	85-100	75-95	$<$0. 20	. 14	4. 5-5. 0	Massive	Low.
80-100	75-95	65-90	0. 20-0. 63	. 13	4. 5-5. 0	Blocky	Moderate.

A layer of loess was deposited over these cherty soils long after their profiles had developed from the cherty clay weathered from limestone. The loess probably covered all of Robertson County and ranged from only a thin smear to 2 or 3 feet in thickness. Later, geologic and accelerated erosion removed the loess from the hillsides, and now, only the gently rolling and nearly level areas are covered. The layer of loess that can be recognized generally ranges from 1½ to about 3 feet in thickness, except in basins, where it is 4 to 6 feet thick. Loess is the parent material of the Mountview, Crider, Dickson, Sango, Taft, and Guthrie soils. The differences among these soils were caused largely by differences in topography and by the effects of those differences on drainage.

A few soils in the county formed in clayey alluvium that is several feet thick. This alluvium probably resulted from the weathering away of small mountains that formerly were sparsely scattered throughout the county, especially in the northern half. The Cumberland and Dewey soils formed in this old alluvium, and the Pembroke soils formed where loess covered the alluvium.

The formation of soils from two kinds of parent material—loess over cherty clay derived from limestone, and loess over old alluvium—has influenced the development of a fragipan in some soils. In most soils the fragipan has formed at the point of contact of the loess and the buried soil below the loess, mainly in what was formerly the surface layer of the buried soil. A fragipan is common in soils formed in such materials where the slope is less than about 5 percent (*11*).

Normally, the boundary between the loess and the older soil below it is not abrupt. Much of the two materials has been mixed by the uprooting of trees, by the activities of animals, and by loess falling into cracks in the limestone residuum or in the old alluvium to a depth of several feet. Therefore, the layer of loess contains some material brought up from a depth of several feet, and the upper few feet of the buried soil contains some loess.

Climate

Robertson County has a warm, moist climate. Winters are relatively mild and summers are warm. The average annual temperature is about 58° F.; the average temperature in January is 40.5°; and the average temperature in July is 80.3°. The average annual rainfall is about 47 inches, and nearly 25 inches of that amount falls during December through April.

This climate favors the rapid development of a profile in the soils. The warm temperature produces rapid chemical reaction. The soil seldom freezes to a depth of more than 3 inches and then only for short periods. The large amount of water moving through the soil removes dissolved or suspended material. Plant remains decompose rapidly and thus hasten the effects of organic acids on the development of clay minerals, and the removal of the carbonates. The climate is nearly uniform throughout the

TABLE 8.—*Interpretation of*

Soil series and map symbol	Suitability as source of—		Soil features affecting—	
	Topsoil	Road fill	Highway location	Ponds: Reservoir area
Baxter (BaB, BaC2, BaD2, BaE, BaF, BcC3, BcD3, BcE3, BkD, BkE).	Poor	Fair to good	Strong slopes; limestone within 3 feet of surface in places.	Moderate permeability; underlain by cavernous limestone.
Bodine (BoD, BoE3, BoF)	Poor	Good	Bedrock; steep slopes	Rapid permeability; underlain by cavernous limestone.
Crider (CrB, CrC2)	Good	Poor to fair	No limiting soil properties.	Moderate permeability
Cumberland (CsC2, CsD2, CtC3, CtD3, CuC3.	Poor	Fair	No limiting soil properties.	Moderate permeability; underlain by cavernous limestone.
Dekoven (De)	Fair	Poor	High water table; flooding.	No limiting features
Dewey (DlC2, DlD2, DmC3, DmD3)	Poor	Fair to poor	Bedrock within 4 feet of surface in places.	Moderate permeability; underlain by cavernous limestone.
Dickson (DsB, DsC2)	Fair	Poor	Seasonal perched water table.	No limiting features
Gullied land (Gd)	Poor	Poor to fair	Limestone bedrock; subject to sliding.	Excessive siltation; poor site.
Guthrie (Gu)	Poor	Poor	High water table; ponded surface water.	No limiting features
Hamblen (Ha, Hb)	Good	Poor	High water table; flooding.	Moderate permeability
Humphreys (HcB, HcC. HuB, HuC)	Good	Poor to fair	No limiting soil properties.	Moderate permeability
Mountview (MoB, MoC2, MoC3)	Fair	Fair below a depth of 3 feet.	No limiting soil properties.	No limiting features
Newark (Ne)	Poor	Poor	Soil subject to flooding	Moderate permeability
Nixa (NxB, NxC)	Poor	Fair	Seasonal perched water table.	Permeable cherty layer below pan in some places.
Pembroke (PeB, PeC2)	Good	Poor	No limiting soil properties.	Moderate permeability
Pickwick (PkC3)	Fair	Poor	No limiting soil properties.	Moderate permeability
Sango (Sa)	Poor	Poor	Seasonal perched water table.	No limiting features
Staser (Sc, Ss)	Good	Poor to fair	Flooding	Moderate permeability
Taft (Ta)	Poor	Poor	Seasonal high water table; ponded surface water.	No limiting features

county and does not account for differences among the soils. Most of the soils are strongly acid. They generally have a pale color typical of soils formed in a climate where leaching goes on almost without interruption.

Plant and animal life

Plants, animals, insects, bacteria, and fungi are important in the formation of soils. Among the changes caused by plants and animals are gains in organic matter and nitrogen, gains or losses in plant nutrients, and changes in structure and porosity of the soils.

In this county the native vegetation was dominantly hardwood trees. The trees on the well-drained sites were chiefly red and white oaks, hickory, poplar, and walnut. On the poorly drained flats, they were mainly sweetgum, black willow, water oak, maple, and sycamore. Soils formed under hardwoods are generally low in content of organic matter. Most of the soils in the county, however, were darkened by organic matter to a depth of 1 or 2 inches before they were cleared.

Relief

Relief, or shape of the landscape, influences the formation of soils through its effect on drainage, erosion, plant cover, and temperature. In this county relief ranges from nearly level to very steep. In the extreme southern part of the county are deep hollows, steep hillsides, and narrow winding hilltops. The rest of the county is gently rolling and hilly. It contains a few nearly level fields and several rather large, shallow basins. In a few other places, the surface is rough and is broken by many sinkholes and depressions.

The gently rolling and nearly level uplands are covered by 2 to 3 feet of loess. Fragipans are common in those *engineering properties of soils*

Soil features affecting—Continued				Limitations for sewage disposal fields
Ponds—Continued: Embankment	Agricultural drainage	Irrigation	Terraces and diversions	
No limiting features	Good drainage	Cherty soil; moderate to low water-holding capacity.	Slopes too steep in most places.	Slight.
Rapid permeability; very cherty.	Good drainage	Low productivity; low water-holding capacity.	Slopes too steep in most places; shallow over beds of chert.	Moderate to severe; shallow to beds of chert.
Low strength and stability; severe hazard of erosion.	Good drainage	No limiting features	No limiting features	Slight.
No limiting features	Good drainage	Cherty soil; moderate water-holding capacity.	No limiting features	Slight.
Low strength and stability; intermittent wetness.	No limiting features	No limiting features	Level relief	Severe; flooding.
No limiting features	Good drainage	No limiting features	No limiting features	Slight.
High erodibility; low strength and stability.	Good drainage	No limiting features	No limiting features	Severe; slow percolation.
Soil features variable	Good drainage	Gullies; limited use for cultivation.	Gullies; limited use for cultivation.	Variable; filling required.
High erodibility; low strength and stability.	Slow permeability; needs surface drainage; subsurface drainage difficult.	Poor drainage; slow permeability in subsoil.	Level relief	Severe; slow percolation and ponded surface water.
No limiting features	No limiting features	No limiting features	Level relief	Severe; flooding.
No limiting features	Good drainage	No limiting features	No limiting features	Slight.
High erodibility; low strength and stability.	Good drainage	No limiting features	Level relief	Slight.
Soil intermittently wet	No limiting features	No limiting features	Level relief	Severe; flooding.
No limiting features	Good drainage	Low water-holding capacity.	No limiting features	Severe; slow percolation.
No limiting features	Good drainage	No limiting features	No limiting features	Slight.
No limiting features	Good drainage	No limiting features	No limiting features	Slight.
High erodibility; low strength and stability.	Ponded surface water	No limiting features	Level relief	Severe; slow percolation.
No limiting features	Good drainage	No limiting features	Level relief	Severe; flooding.
Soil intermittently wet	Slow permeability	Somewhat poor drainage	Level relief	Severe; slow percolation.

areas, partly because water drains off slowly. Examples of soils that contain a fragipan are the Dickson, Sango, and Nixa. On the flats and in depressions where water often stands are the gray, wet, and poorly aerated Guthrie soils. On the stronger slopes, geologic and accelerated erosion have removed most of the layer of loess. The Baxter, Bodine, and Dewey soils have formed in those areas. They have a reddish color, are well drained, and contain a large amount of clay and chert.

Time

Time, generally a long period of time, is required for the formation of soils. Differences in the length of time the parent material has been in place are commonly reflected in the degree of horizon development in the soil profile.

Most of the soils of this county are very old. They have well-defined horizons and a strongly developed profile. A few, however, are young; the horizons in their profiles either have not developed or are only faint. Among the youngest soils of the county are the Hamblen, on first bottoms next to streams. Except for a plow layer, horizons cannot be detected in the profile of those soils. Such soils as the Humphreys, on low terraces, are intermediate in age. Their profiles contain weakly expressed horizons.

Classification of Soils

Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationships to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First, through classification and then through use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

Thus, in classification, soils are placed in narrow categories that are used in detailed soil surveys so that knowledge about the soils can be organized and applied in managing farms, fields, and woodlands; in developing rural areas; in performing engineering work; and in many other ways. They are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

Two systems of classifying soils have been used in the United States in recent years. The older system was adopted in 1938 (*2*) and later revised (*6*). The system currently used was adopted for general use by the National Cooperative Soil Survey in 1965. The current system is under continual study. Therefore, readers interested in developments of this system should search for the latest literature available (*4*, *8*). The soil series of Robertson County are placed in the current system in table 9. The classes in the current system are briefly defined in the following paragraphs.

ORDER: Ten soil orders are recognized in the current system. They are Entisols, Vertisols, Inceptisols, Aridisols, Mollisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates.

Table 9 shows the four soil orders represented in Robertson County. These are the Alfisols, Inceptisols, Mollisols, and Ultisols. Alfisols have a clay-enriched B horizon that has more than 35 percent base saturation in some part. Inceptisols are soils that occur most commonly on young but not recent land surfaces. Their name is derived from the Latin *inceptum*, for beginning. Mollisols are soils that have a dark-colored, thick surface layer and that have high base saturation throughout the soil profile. Ultisols have a clay-enriched B horizon in which base saturation is less than 35 percent. The base saturation decreases with increasing depth.

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

GREAT GROUP: Soil suborders are separated into great groups on basis of uniformity in the kinds and sequence of major soil horizons and features. The horizons used to make separations are those in which clay, iron, or humus have accumulated or those that have pans interferring with growth of roots or movement of water. The features used are the self-mulching properties of clays, soil temperature, major differences in chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group is not shown separately in table 9, because the great group is the last word in the name of the subgroup.

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

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

TABLE 9.—*Soil series classified according to the current system* [1]

Series	Family	Subgroup	Order
Baxter	Clayey, kaolinitic, mesic	Typic Paleudults	Ultisols.
Bodine	Loamy skeletal, siliceous, thermic	Typic Paleudults	Ultisols.
Crider	Fine silty, mixed, mesic	Typic Paleudalfs	Alfisols.
Cumberland	Fine, mixed, mesic	Rhodudultic Paleudalfs	Alfisols.
Dekoven	Fine silty, mixed, noncalcareous, thermic	Fluventic Haplaquolls	Mollisols.
Dewey	Clayey, kaolinitic, thermic	Humic Paleudults	Ultisols.
Dickson	Fine silty, mixed, thermic	Ochreptic Fragiudults	Ultisols.
Guthrie	Fine silty, siliceous, thermic	Typic Fragiaquults	Ultisols.
Hamblen	Fine loamy, mixed, thermic	Aquic Fluventic Dystrochrepts	Inceptisols.
Humphreys	Fine loamy, siliceous, thermic	Humic Hapludults	Ultisols.
Mountview	Fine silty, siliceous, thermic	Typic Paleudults	Ultisols.
Newark	Fine silty, mixed, nonacid, thermic	Aeric Fluventic Haplaquepts	Inceptisols.
Nixa	Loamy skeletal, siliceous, mesic	Ochreptic Fragiudults	Ultisols.
Pembroke	Fine silty, mixed, mesic	Mollic Paleudalfs	Alfisols.
Pickwick	Fine silty, mixed, thermic	Typic Paleudults	Ultisols.
Sango	Coarse silty, siliceous, thermic	Ochreptic Fragiudults	Ultisols.
Staser	Fine loamy, mixed, thermic	Fluventic Hapludolls	Mollisols.
Taft	Fine silty, siliceous, thermic	Aqueptic Fragiudults	Ultisols.

[1] Placement of some soil series in the current system of classification, especially in families, may change as more precise information becomes available.

Descriptions of the Soil Series

In this subsection the soil series represented in Robertson County are discussed in alphabetic order and a profile typical for each series is described. For a discussion of each mapping unit in the county, as well as for additional information about the series, refer to the section "Descriptions of the Soils," near the beginning of this soil survey.

Baxter Series

The Baxter series consists of deep, well-drained, cherty soils. These soils formed in material weathered from cherty limestone. They are sloping to steep and are on uplands.

Representative profile of Baxter cherty silt loam, 2 to 5 percent slopes, 1 mile west of Baggettsville—

Ap—0 to 6 inches, brown (10YR 5/3) cherty silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

A3—6 to 8 inches, brown (10YR 4/3) cherty silt loam; weak, fine, granular and weak, medium, subangular blocky structure; friable; medium acid; clear, smooth boundary.

B1t—8 to 12 inches, yellowish-red (5YR 5/6) or strong-brown (7.5YR 5/6) cherty silty clay loam; moderate, medium, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21t—12 to 17 inches, red (2.5YR 4/6) or yellowish-red (5YR 4/6) cherty silty clay loam; moderate, medium, subangular blocky structure; clay films on the surfaces of peds; firm; strongly acid; clear, smooth boundary.

B22t—17 to 40 inches, red (2.5YR 4/6) or yellowish-red (5YR 4/6) cherty clay; few, fine, yellowish-brown (10YR 5/6) variegations; common clay films; firm; strongly acid; gradual, smooth boundary.

B31t—40 to 55 inches, variegated dark-red (2.5YR 3/6), yellowish-red (5YR 4/6), yellowish-brown (10YR 5/6), and olive-yellow (2.5Y 6/6) cherty clay; moderate and coarse, angular blocky structure; clay films on the surfaces of some peds; firm; strongly acid; diffuse, wavy boundary.

B32t—55 to 72 inches, variegated dark-red (2.5YR 3/6), red (2.5YR 4/6), yellowish-brown (10YR 5/6), olive-yellow (2.5Y 6/6), and pale-brown (10YR 6/3) cherty clay; thick clay films; very firm; layer of chert in the lower part of the horizon; very strongly acid; diffuse, wavy boundary.

B3—72 to 90 inches +, variegated dark-red (2.5YR 3/6), red (2.5YR 4/6), yellowish-brown (10YR 5/6), and olive-yellow (2.5Y 6/6) cherty clay; coarse, strong, angular blocky structure; firm; very strongly acid.

In many places the B21t horizon is variegated with shades of yellow. The B22t horizon ranges from cherty clay to cherty silty clay loam or cherty silty clay in texture.

Bodine Series

The Bodine series consists of brown, cherty soils that formed in material weathered from very cherty limestone. These soils are steep and are on hills and ridges.

Representative profile of Bodine cherty silt loam, 12 to 20 percent slopes, 1 mile south of Greenbrier and one-fourth mile west of Carr Creek—

Ap—0 to 7 inches, brown (10YR 5/3) cherty silt loam; weak, medium, granular structure; very friable; strongly acid; clear, smooth boundary.

B1—7 to 12 inches, light yellowish-brown (10YR 6/4) cherty silt loam; weak, medium, subangular blocky structure; friable; many roots; very strongly acid; clear, smooth boundary; fragments of chert as much as 8 inches across.

B21—12 to 28 inches, light yellowish-brown (10YR 6/4) very cherty silt loam; peds and fragments of chert have brownish-yellow (10YR 6/6) clay coatings; friable; very strongly acid; gradual, wavy boundary; about 50 percent, by volume, of this horizon is chert fragments.

B22t—28 to 62 inches; strong-brown (7.5YR 5/6) very cherty silty clay loam; moderate, medium, subangular blocky structure; clay films coat many of the chert fragments; are patchy and thin on peds, and common in pores; about 60 percent, by volume, chert fragments; very strongly acid.

The thickness of the Ap horizon ranges from 5 to about 10 inches. The B1 and B21 horizons are yellowish brown (10YR 5/4 or 5/8) in some places and strong brown (7.5YR 5/6 or 5/8) in a few others. In a few places, this soil contains a layer of silty clay or clay. This layer is mainly yellowish red (5YR 4/6 or 4/8) but contains yellowish-brown (10YR 5/6 or 5/8) variegations at a depth of about 24 inches.

Crider Series

The Crider series consists of deep, well-drained, brownish, silty soils. These soils have formed on smooth uplands from loess and alluvium. Their profile developed mainly in loess to a depth of 24 to 40 inches; below that depth these soils formed in alluvium. The slopes range from 2 to 12 percent.

Representative profile of Crider silt loam, 2 to 5 percent slopes, 1¼ miles east of Hubertville—

Ap—0 to 7 inches, dark-brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; medium acid; abrupt, smooth boundary.

B1—7 to 9 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, granular and weak, fine, subangular blocky structure; friable; medium acid; abrupt, smooth boundary.

B21t—9 to 15 inches, dark-brown (7.5YR 4/4) silt loam; weak, medium, subangular blocky structure; friable; few clay films; few black stains; strongly acid; clear, smooth boundary.

B22t—15 to 26 inches, dark-brown (7.5YR 4/4) silt loam; a few small spots of yellowish red and pale brown; moderate, medium, subangular blocky structure; friable; common clay films; strongly acid; clear, smooth boundary.

B23t—26 to 30 inches, reddish-brown (5YR 4/4) silty clay loam; variegations of red (2.5YR 4/8) and light gray (10YR 7/2); moderate, medium, subangular blocky structure; friable; few black concretions and black stains; strongly acid; clear, smooth boundary.

IIB24t—30 to 40 inches, red (2.5YR 4/6) silty clay loam; common variegations of pale brown (10YR 6/3), yellowish red (5YR 5/8), and red (10R 4/6); moderate or strong, angular blocky structure; few patchy clay films; firm; few black concretions and stains; strongly acid; gradual, smooth boundary.

IIB25t—40 to 60 inches, dark-red (2.5YR 3/6) clay variegated with shades of yellow, red, and brown; moderate, medium and fine, angular blocky structure; few patchy clay films; firm; few black stains; common fragments of chert or gravel, less than 20 millimeters in diameter; strongly acid; gradual, smooth boundary.

IIB26t—60 to 75 inches, dark-red (10R 3/6) clay variegated with shades of yellow, red, and brown; strong, medium and fine, angular blocky structure; thick discontinuous clay films; firm; contains pieces of chert that increase in size and number with increasing depth; strongly acid.

The Ap horizon ranges from dark brown (10YR 4/3) to brown (10YR 5/3) in color and from 6 to 10 inches in thickness. In some places the B21t and B22t horizons are reddish brown (5YR 4/4) instead of dark brown, and they range from silt loam to silty clay loam in texture. Depth to the dark-red IIB25t horizon ranges from 24 to 40 inches. The content of gravel in the IIB26t horizon ranges from practically none to about 30 percent, by volume.

Cumberland Series

The Cumberland series consists of deep, well-drained soils that are rolling to hilly. Some areas are on short side slopes, and others are in areas pitted with sinks. Most areas are cherty. These soils have formed in very old alluvium.

Representative profile of Cumberland cherty silt loam, 5 to 12 percent slopes, eroded, 2 miles southwest of Ashburn—

Ap—0 to 6 inches, dark reddish-brown (5YR 3/4) cherty silt loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

B21t—6 to 9 inches, dark-red (2.5YR 3/6) cherty silty clay loam; moderate, medium, subangular blocky structure; firm; medium acid; gradual, smooth boundary.

B22t—9 to 44 inches, dark-red (10R 3/6) cherty clay; strong, medium, subangular blocky structure; very firm; thick clay films on the surfaces of peds; strongly acid; diffuse, smooth boundary.

B23t—44 to 52 inches, dark-red (10R 3/6) cherty clay; common, medium, brownish-yellow (10YR 6/6) variegations caused by weathered chert fragments; strong, medium, subangular blocky structure; very firm; thick clay films on the surfaces of peds; strongly acid; diffuse, smooth boundary.

B24t—52 to 60 inches +, dark-red (10R 3/6) cherty clay variegated with brownish yellow (10YR 6/6); strong, coarse, subangular blocky structure; very firm; common, very fine, white fragments of chert; clay films on the surfaces of peds; strongly acid.

The plow layer is dark brown (10YR 3/3 or 7.5YR 3/2), reddish brown (5YR 4/4 or 2.5YR 4/4), dark reddish brown (5YR 3/4 or 2.25YR 3/4), or dark red (2.5YR 3/6). The B21t horizon is dark reddish brown (5YR 3/4) in some places.

Dekoven Series

The Dekoven series consists of nearly black, somewhat poorly drained, silty soils on bottom lands. These soils have formed in sediments washed from areas of loess and from material weathered from limestone. Their reaction is medium acid to neutral.

Representative profile of Dekoven silt loam, three-quarters of a mile north of North Robertson School—

A11—0 to 2 inches, very dark-gray (10YR 3/1) to black (10YR 2/1) silt loam; moderate, medium and coarse, granular structure; friable; slightly acid.

A12—2 to 14 inches, black (10YR 2/1) silt loam; moderate, fine or medium, granular structure; friable; slightly acid; clear, smooth boundary.

A13—14 to 18 inches, very dark-gray (10YR 3/1) to black (10YR 2/1) silt loam; moderate and weak, fine, granular structure; friable when moist, very firm when dry; a few concretions 10 millimeters or less in diameter; slightly acid; abrupt, smooth boundary.

C1g—18 to 24 inches, dark-gray (10YR 4/1) silt loam; weak, fine, granular structure; friable when moist, very hard when dry; a few concretions 10 millimeters or less in diameter; slightly acid; gradual, smooth boundary.

C2g—24 to 30 inches, dark-gray or gray (10YR 4/1 or 5/1) silt loam; weak, fine, granular structure; friable when moist, hard when dry; common, fine, strong-brown (7.5YR 5/8) concretions 5 millimeters or less in diameter; slightly acid; gradual, smooth boundary.

C3g—30 to 48 inches, gray (10YR 5/1) silt loam; common, medium, yellowish-brown mottles; massive; friable when moist, hard when dry; common, fine, yellowish-red (5YR 5/8) concretions; slightly acid.

In some places the Ap horizon has a texture of silt loam and the texture below that horizon is silty clay loam. In most places, however, the texture of the profile is silt loam throughout. The A horizon ranges from 10 to 24 inches in thickness.

Dewey Series

The Dewey series consists of deep, well-drained soils on short hillsides and in karst areas of the uplands. These soils have formed in material weathered from limestone and in fine-textured, very old alluvium. The slopes range from about 3 to 20 percent.

Representative profile of Dewey silt loam, 5 to 12 percent slopes, eroded, 2 miles west of Cross Plains—

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; strongly acid; abrupt, smooth boundary.

B1t—6 to 9 inches, yellowish-red (5YR 4/8) silty clay loam; many, medium, distinct, brown (10YR 4/3) variegations; moderate, fine, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B21t—9 to 12 inches, yellowish-red (5YR 4/8) silty clay loam; moderate, medium, subangular blocky structure; clay films on the surfaces of peds; firm; strongly acid; clear, wavy boundary.

B22t—12 to 23 inches, red (2.5YR 4/6) clay; strong, medium, subangular blocky structure; clay films on the surfaces of peds; very firm; strongly acid; clear, wavy boundary.

B23t—23 to 36 inches, dark-red (2.5YR 3/6) clay; many, medium, distinct, strong-brown (7.5YR 5/6) variegations; strong, medium, subangular blocky structure; thick, continuous clay films; very firm; strongly acid; gradual, wavy boundary.

B24t—36 to 50 inches +, dark-red (2.5YR 3/6) clay; common, distinct, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/6) variegations; strong, medium and coarse, angular blocky structure; thick, continuous clay films; very firm; very strongly acid.

In severely eroded spots, the Ap horizon is dark brown (7.5YR 4/4), yellowish red (5YR 4/6 or 4/8), dark red (2.5YR 3/6), or red (2.5YR 4/6). The texture of the Ap horizon in severely eroded areas ranges from silt loam to clay, depending on the amount of soil removed by erosion. Some areas contain a thin A3 or B1 horizon. The color of the B22t horizon ranges from red (2.5YR 4/6) to dark red (2.5YR 3/6). In a few areas, the entire B horizon is red (2.5YR 4/6 or 4/8).

Dickson Series

The Dickson series consists of moderately well drained soils that contain a fragipan. These soils have formed in a layer of loess, 2 to 3 feet thick, that is underlain by red clay or cherty clay. This clay was derived from material weathered from limestone and from old alluvium. The slopes range from about 2 to 12 percent, but they are dominantly between 1 and 4 percent.

Representative profile of Dickson silt loam, 2 to 5 percent slopes, 2 miles west of Turnersville—

Ap—0 to 6 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; strongly acid; abrupt, smooth boundary.

B1—6 to 9 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine and medium, granular and weak, thin, platy structure; very friable; strongly acid; abrupt, smooth boundary.

B2—9 to 22 inches, yellowish-brown (10YR 5/6) silt loam; faint variegations of strong brown; weak, fine, angular and weak, medium, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

B3—22 to 25 inches, yellowish-brown (10YR 5/6) silt loam; few, distinct, strong-brown mottles and common, fine, very pale brown mottles; weak, medium, angular and subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

A'2 and B'x—25 to 36 inches, mottled yellowish-brown (10YR 5/6), strong-brown (7.5YR 5/8), and light-gray (10YR 7/1) silt loam; weak, medium, angular blocky structure (almost platy in places); hard when dry, brittle when moist; very strongly acid; gradual, irregular boundary.

B'x—36 to 42 inches +, variegated yellowish-red (5YR 4/6), red (2.5YR 4/8), light brownish-gray (10YR 6/2), and strong-brown (7.5YR 5/8) silty clay loam; moderate or strong, angular blocky structure; very firm and brittle; common clay films; common black and brown concretionary stains; very strongly acid.

The color of the Ap horizon ranges from brown (10YR 5/3) to dark brown (10YR 4/2), and the color of the B1 horizon, from yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6). Depth to the fragipan ranges from 20 to 36 inches. In most places the fragipan is about 10 to 12 inches thick, but the thickness ranges from about 4 inches, where the fragipan is weakly developed, to about 18 inches, where the fragipan is strongly developed.

Guthrie Series

The Guthrie series consists of gray, poorly drained, silty soils on nearly level flats and in basins. These soils have formed in loess. They have a fragipan beginning at a depth of about 17 inches.

Representative profile of Guthrie silt loam, 3 miles west of White House and three-quarters of a mile north of State Route 76—

A1—0 to 1½ inches, very dark gray (10YR 3/1) silt loam; many, medium, faint mottles of dark gray (10YR 4/1) and many, medium, distinct mottles of gray (10YR 6/1); weak, fine, crumb structure; friable; medium acid; abrupt, smooth boundary.

A21g—1½ to 3 inches, light brownish-gray (10YR 6/2) silt loam; weak, fine, crumb structure; friable; strongly acid; smooth, abrupt boundary.

A22g—3 to 17 inches, gray (10YR 6/1) to light brownish-gray (10YR 6/2) silt loam; weak, fine, crumb structure (nearly structureless); friable; few highly weathered fragments of chert up to 10 millimeters in diameter; strongly acid; abrupt, smooth boundary.

Bx1g—17 to 25 inches, gray (10YR 6/1 and 5/1) silt loam; many coarse and fine mottles of strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6); compact in place, friable when crushed; few roots; very strongly acid or strongly acid; clear, wavy boundary.

Bx2g—25 to 29 inches, gray (10YR 5/1) to dark-gray (10YR 4/1) silty clay loam; many, coarse, faint and distinct mottles of yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8); common channels, one-half inch in diameter, filled with gray (10YR 6/1) to light brownish-gray (10YR 6/2) silt loam; moderate, coarse, subangular and angular blocky structure; firm; common roots less than 5 millimeters in diameter; few fragments of highly weathered chert less than 5 millimeters in diameter; strongly acid; abrupt, wavy boundary.

IIB21tg—29 to 63 inches, gray (N 5/0) silty clay; many coarse mottles of strong brown (7.5YR 5/8), yellowish brown (10YR 5/6), and yellowish red (5YR 4/8); strong, coarse, angular blocky structure; very firm; few roots; few fragments of highly weathered chert less than 15 millimeters in diameter; very strongly acid; diffuse, irregular boundary.

IIB22t—63 to 76 inches +, variegated yellowish-red (5YR 5/6), dark-red (2.5YR 3/6), strong-brown (7.5YR 5/8), and light brownish-gray (10YR 6/2) silty clay; the grayish material has a texture of clay and makes up about one-third of the soil mass; the yellowish-red and red material appears to be decayed chert; firm to very firm; strongly acid.

Depth to the fragipan ranges from 15 to about 24 inches. In most places the soil material is strongly acid or very strongly acid throughout the profile. In a few places, it is slightly alkaline below a depth of about 3 feet. The content of chert below the Ap horizon ranges from almost none to about 10 percent, by volume.

Hamblen Series

The Hamblen series consists of soils that are moderately well drained. These soils have formed in recent alluvium washed both from soils formed in loess and from soils formed in material weathered from limestone. Most of the sediments came from Baxter, Bodine, Mountview, and Dickson soils. The Hamblen soils are on first bottoms, along intermittent drainageways, and in upland depressions.

Representative profile of Hamblen silt loam, 4 miles north of Cedar Hill, along Buzzard Creek—

Ap—0 to 6 inches, brown (10YR 4/3) silt loam; weak, fine, crumb structure; friable; medium acid.

A12—6 to 15 inches, brown (10YR 4/3) silt loam; weak, fine, granular structure; friable; few, very fine, black concretions; medium acid.

B—15 to 24 inches, brown (10YR 4/3) silt loam; common, medium, light brownish-gray (10YR 6/2), pale-brown (10YR 6/3), and light yellowish-brown (10YR 6/4) mottles and a few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; friable; common black stains; slightly acid.

C1g—24 to 36 inches, mottled light-gray (10YR 7/2), light brownish-gray (10YR 6/2), and pale-brown (10YR 6/3) silt loam; few, fine, distinct, strong-brown (7.5YR 5/6) mottles (light-gray and brownish-gray colors dominant in lower 6 inches of horizon); structureless; friable; common, fine, black stains; slightly acid.

C2g—36 to 48 inches +, light-gray (10YR 6/1) silt loam; few, fine, distinct, yellowish-red (5YR 4/8) mottles, and dark-brown (7.5YR 4/4) spots; friable; slightly acid.

In places the A horizon is brown (10YR 5/3) or dark brown (10YR 4/3) instead of having the modal color of brown (10YR 4/3) shown for the Ap horizon of the representative profile. The reaction ranges from medium acid to slightly acid.

Humphreys Series

The Humphreys series consists of deep, well-drained soils that are loamy. These soils have formed on low terraces and upland benches in sediments washed from loess and from material weathered from limestone. They are strongly acid. The slopes range from 2 to 12 percent.

Representative profile of Humphreys silt loam, 2 to 5 percent slopes, 2 miles north of Coopertown—

Ap—0 to 9 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable; strongly acid; abrupt, clear boundary.

B1t—9 to 18 inches, brown (7.5YR 4/4) silt loam or silty clay loam; weak, fine or medium, subangular blocky structure; friable; strongly acid; clear, smooth boundary.

B2t—18 to 34 inches, brown (7.5YR 4/4) to strong-brown (7.5YR 5/6) silty clay loam; weak, fine or medium, subangular blocky structure; friable; common clay films; strongly acid; clear, smooth boundary.

B3—34 to 48 inches +, yellowish-brown (10YR 5/6) to strong-brown (7.5YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; friable; few clay films; many small fragments of chert; strongly acid.

The Ap horizon ranges from dark brown (10YR 3/3) to brown (10YR 4/3) in color and from 6 to 12 inches in thickness. The B horizon is dark brown in some places. The content of chert throughout the profile ranges from almost none to about 30 percent, by volume.

Mountview Series

The Mountview series consists of deep, well-drained, pale-colored soils that are silty. These soils have formed on upland slopes in a mantle of loess 2 to 3 feet thick.

Representative profile of Mountview silt loam, 2 to 5 percent slopes, 1 mile southeast of Coopertown—

Ap—0 to 8 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; strongly acid; clear, wavy boundary.

B1—8 to 12 inches, yellowish-brown (10YR 5/4 or 5/6) silt loam; weak, fine, subangular blocky structure; friable; strongly acid; clear, wavy boundary.

B21t—12 to 20 inches, yellowish-brown (10YR 5/6) to strong-brown (7.5YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; few fine pieces of chert; very strongly acid; diffuse, smooth boundary.

B22t—20 to 28 inches, yellowish-brown (10YR 5/6) silt loam; moderate, medium, subangular blocky structure; friable; thin, discontinuous clay films; few fine and medium fragments of chert; very strongly acid; gradual, smooth boundary.

B23t—28 to 34 inches, yellowish-brown (10YR 5/6) silty clay loam; variegated red (2.5YR 4/8), light olive brown (2.5Y 5/4), light gray (10YR 7/2), and strong brown (7.5YR 5/6); moderate, medium, subangular blocky structure; firm; common, thick, continuous clay films; few fine and medium fragments of chert; very strongly acid; gradual, wavy boundary.

IIB24t—34 to 44 inches, variegated red (2.5YR 4/6), dark-red (10R 3/6) to red (10R 4/8), strong-brown (7.5YR 5/6), and light olive-brown (2.5Y 5/6) clay; strong, medium and fine, subangular and angular blocky structure; firm; few medium and fine fragments of chert; common, thick, continuous clay films; very strongly acid; gradual, smooth boundary.

IIB25t—44 to 60 inches +, variegated red (2.5YR 4/6), strong-brown (7.5YR 5/6), and light brownish-gray (10YR 6/2) silty clay; moderate, medium and fine, angular blocky structure; firm; very strongly acid.

The color of the Ap horizon ranges from brown (10YR 5/3) to brown (10YR 4/3). The color of the B21t, B22t, and B23t horizons ranges from yellowish brown to strong brown. The IIB24t and IIB25t horizons are yellowish red (5YR 4/6 or 4/8) in some places. The content of chert in these horizons ranges from almost none to as much as 40 percent, by volume.

Newark Series

The Newark series consists of somewhat poorly drained, medium acid to slightly acid soils. These soils are on first bottoms, along intermittent drainageways, and in depressions. They formed in mixed sediments washed from soils derived from loess and material weathered from limestone.

Representative profile of Newark silt loam, one-half mile south of Springfield—

Ap—0 to 7 inches, mottled brown (10YR 5/3), very pale brown (10YR 7/3), light-gray (10YR 7/2), and yellowish-brown (10YR 5/6) silt loam; weak, fine, crumb structure; very friable; slightly acid; gradual, smooth boundary.

C1—7 to 18 inches, mottled light-gray (10YR 7/1), pale-brown (10YR 6/3), and yellowish-brown (10YR 5/6) silt loam; weak, fine, granular structure; friable; medium acid; gradual, smooth boundary.

C2—18 to 23 inches, mottled light-gray (10YR 7/1) to gray (10YR 6/1), pale-brown (10YR 6/3), and strong-brown (7.5YR 5/6) silt loam; weak, fine, granular structure; friable; medium acid; gradual, smooth boundary.

C3g—23 to 37 inches, gray (N 6/0) silt loam; common, fine and medium, distinct, strong-brown (7.5YR 5/8) and yellowish-brown (10YR 5/6) mottles; weak, fine, granular structure; friable; medium acid; gradual, smooth boundary.

C4g—37 to 41 inches +, light-gray (10YR 7/1 or 7/2) silt loam; friable; many, medium and coarse concretions and fragments of chert; medium acid.

Many black concretions occur in some areas below a depth of about 15 inches. The texture of all horizons is commonly silt loam, but it ranges to silty clay loam below the A horizon.

Nixa Series

The Nixa series consists of pale-colored, cherty soils that contain a fragipan. These soils have formed in loess and in sediments weathered from limestone. They are mainly at the base of areas occupied by hilly and steep Baxter and Bodine soils. A few areas are on low benches and flood plains.

Representative profile of Nixa cherty silt loam, 2 to 5 percent slopes, 3 miles south of Coopertown—

Ap—0 to 7 inches, brown (10YR 5/3) cherty silt loam; weak, fine, granular structure; friable; strongly acid; gradual, smooth boundary.

B1—7 to 11 inches, yellowish-brown (10YR 5/4) cherty silt loam; moderate, fine and medium, subangular blocky structure; few peds and fragments of chert coated with light-gray silt; friable; very strongly acid; gradual, smooth boundary.

B2—11 to 20 inches, yellowish-brown (10YR 5/6) cherty silt loam; moderate, medium, subangular blocky structure; light-gray coatings of silt on the surfaces of peds and on the fragments of chert; friable; very strongly acid; gradual, wavy boundary.

A'2 & B'x—20 to 27 inches, yellowish-brown (10YR 5/4) to dark yellowish-brown (10YR 4/4) cherty silt loam; many, medium, distinct mottles of light brownish gray (10YR 6/2) and very pale brown (10YR 7/3); moderate, medium, angular blocky structure; some peds and fragments of chert are coated with light-gray silt; brittle, compact; the quantity of chert increases with increasing depth; very strongly acid; gradual, wavy boundary.

B'x—27 to 50 inches +, yellowish-brown (10YR 5/4) cherty silty clay loam, variegated with yellowish red and light gray; weak, medium, angular blocky structure; massive; firm, compact; common clay films; some fragments of chert are coated with light-gray silt; very strongly acid.

The amount of chert ranges from about 15 to 40 percent, by volume. The thickness of the alluvial deposit ranges from about 3 to 6 feet. Depth to the A'2 & B'x horizon is commonly about 20 inches, but it ranges from 16 to 25 inches.

Pembroke Series

The Pembroke series consists of soils that are deep and well drained. These soils have formed on broad, smooth uplands in loess and in old alluvium. The upper part of the profile has formed mainly in loess, and the lower part, in alluvium.

Representative profile of Pembroke silt loam, 2 to 5 percent slopes, 3 miles northeast of Cross Plains—

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; very friable; medium acid; clear, smooth boundary.

B1t—8 to 12 inches, reddish-brown (5YR 4/4) silty clay loam or silt loam; weak, medium and fine, subangular blocky structure; friable; thin clay films; strongly acid; clear, smooth boundary.

B21t—12 to 20 inches, yellowish-red (5YR 4/6) silty clay loam; weak, medium, subangular blocky structure; friable; thin clay films; strongly acid; gradual, smooth boundary.

B22t—20 to 34 inches, yellowish-red (5YR 4/6) or red (2.5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; friable; common, fine, black concretions; thin clay films; strongly acid; gradual, smooth boundary.

B23t—34 to 60 inches, dark-red (2.5YR 3/6) or dark reddish-brown (2.5YR 3/4) silty clay loam or clay; moderate and strong, angular blocky structure; firm; common clay films; few coatings of silt and many, fine, black concretions in upper part; some peds coated with black concretionary material in lower part; strongly acid.

The color of the B1t horizon ranges from reddish brown (5YR 4/4) to yellowish red (5YR 4/6) or dark brown (7.5YR 4/4). The color of the B22t horizon ranges from yellowish red (5YR 4/6) or red (2.5YR 4/6) to dark reddish brown (5YR 3/3). In some places the B23t horizon is dark red (10R 3/6).

Pickwick Series

The Pickwick series consists of deep, well-drained, sloping soils on uplands. The uppermost 1 to 2 feet of the profile formed in loess, but the profile below that depth formed in old alluvium.

Representative profile of Pickwick silty clay loam, 5 to 12 percent slopes, severely eroded, about 3 miles north of Cross Plains—

Ap—0 to 7 inches, brown (7.5YR 4/4) silty clay loam; moderate, medium, granular structure; friable; medium acid; clear, smooth boundary.

B1t—7 to 10 inches, reddish-brown (5YR 4/4) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; few clay films; strongly acid; clear, smooth boundary.

B21t—10 to 22 inches, yellowish-red (5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm; common clay films; strongly acid; gradual, smooth boundary.

B22t—22 to 35 inches, red (2.5YR 4/6) silty clay loam; moderate, medium, subangular blocky structure; firm; few yellowish-brown, pale-brown, and strong-brown mottles in lower part; common clay films; strongly acid; gradual, smooth boundary.

B23t—35 to 55 inches, dark-red (2.5YR 3/6) clay; moderate, medium, angular blocky structure; firm; few clay films; strongly acid; few small concretions.

The color of the Ap horizon ranges from brown (7.5YR 4/4) to brown (10YR 4/3), strong brown (7.5YR 5/6), or yellowish red (5YR 4/6). The color of the B1t horizon ranges from reddish brown (5YR 4/4) to strong brown (7.5YR 5/6), or yellowish red (5YR 5/6), and the color of the B22t, from red (2.5YR 4/6) to dark red (10R 3/6).

Sango Series

The Sango series consists of moderately well drained soils that are very strongly acid. These soils have formed in a mantle of loess 3 to 4 feet thick on broad upland flats and in slight depressions. They have a fragipan beginning at a depth of 20 to 30 inches.

Representative profile of Sango silt loam, 1¾ miles northeast of Coopertown—

A1—0 to ½ inch, very dark gray (10YR 3/1) silt loam; moderate, fine, crumb structure; very friable; strongly acid; abrupt, smooth boundary.

A2—½ inch to 6 inches, brown (10YR 5/3) silt loam; weak, fine, granular structure; very friable; very strongly acid; clear, smooth boundary.

B1—6 to 9 inches, light yellowish-brown (10YR 6/4 or 2.5Y 6/4) silt loam; weak, medium, subangular blocky structure; friable; very strongly acid; gradual, smooth boundary.

B2—9 to 16 inches, light yellowish-brown (2.5Y 6/4) silt loam; weak, medium, subangular blocky structure; friable; few black concretions and fragments of chert about 5 to 10 millimeters in diameter; very strongly acid; gradual, smooth boundary.

B3—16 to 22 inches, light yellowish-brown (2.5Y 6/4) silt loam; common, fine, distinct, light-gray (10YR 7/1 or 7/2) mottles; weak, medium, subangular and angular blocky structure; friable; few, fine, black concretions; few, fine, strong-brown spots that appear to be concretionary material; very strongly acid; gradual, smooth boundary.

A′2—22 to 28 inches, mottled light-gray (10YR 7/1) and light yellowish-brown (10YR 6/4 or 2.5Y 6/4) silt loam; weak, medium, angular blocky structure; slightly brittle, few medium and coarse fragments of chert; very strongly acid; gradual, wavy boundary.

B′x1—28 to 48 inches, mottled gray (10YR 6/1), light yellowish-brown (10YR 6/4 or 2.5Y 6/4), and strong-brown (7.5YR 5/6) compact silt loam; weak, coarse, angular blocky structure; brittle; many seams and films of gray clay; very friable after crushing; a few roots as much as about 5 millimeters in diameter, mainly in the gray streaks; few, fine, black, soft concretions; very strongly acid; gradual, wavy boundary.

B′x2—48 to 52 inches +, mottled light-gray (10YR 7/1) and gray (10YR 6/1), strong-brown (7.5YR 5/6), and light yellowish-brown (2.5Y 6/4) silt loam; slightly brittle; few, fine, black concretionary streaks; thick clay films; common medium and coarse fragments of chert in many stages of decomposition caused by weathering; very strongly acid.

Staser Series

The Staser series consists of deep, well-drained soils that are brown, or dark brown. These soils have formed in sediments washed from soil derived from loess and material watered from limestone. They are on first bottoms, along intermittent drainageways, and in depressions.

Representative profile of Staser silt loam, about one-quarter of a mile north of junction of Sulphur Fork Creek and the Red River—

Ap—0 to 10 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; medium acid.

A12—10 to 13 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable; medium acid.

A13—13 to 20 inches, dark-brown (10YR 3/3) silt loam; weak, fine and medium, granular structure; friable; medium acid.

A14—20 to 31 inches, dark-brown (10YR 3/3) silt loam; granular structure; friable; medium acid.

C1—31 to 33 inches, dark yellowish-brown (10YR 3/4) or dark-brown (10YR 3/3) silt loam; weak, fine and medium, granular structure; friable; medium acid.

C2—33 to 45 inches +, dark yellowish-brown (10YR 3/4) or dark-brown (10YR 3/3) silt loam; common, medium, faint, very pale brown (10YR 7/3, dry), mottles or coatings of silt; friable; medium acid.

The alluvial material ranges from 3 to 8 feet in thickness, and the A horizon, from 20 to 40 inches. The texture of the A horizon is commonly silt loam, but it is loam in some areas. In places the C horizons are brown (10YR 5/3 or 4/3) or yellowish brown (10YR 5/4 or 5/6). The reaction ranges from medium acid to slightly acid. Most areas of Staser soils are noncherty, but some areas are cherty.

Taft Series

The Taft series consists of light-colored, somewhat poorly drained soils that have a fragipan at a depth of about 15 to 22 inches. These soils have formed in a mantle of loess 2 to 4 feet thick on nearly level uplands.

Representative profile of Taft silt loam, about 1 mile north of Baggettsville—

Ap—0 to 10 inches, light yellowish-brown (10YR 6/4) to light brownish-gray (10YR 6/2) silt loam; few, fine, faint, light-gray (10YR 7/2) and very pale brown (10YR 7/3) mottles; weak, fine, granular structure; very friable; medium acid.

B1—10 to 15 inches, light yellowish-brown (2.5Y 6/4) to pale-yellow (2.5Y 7/4) silt loam; common, fine, faint, light brownish-gray (2.5Y 6/2) and yellowish-brown (10YR 5/6) mottles; weak, fine, subangular blocky structure; friable; strongly acid.

B2—15 to 20 inches, mottled pale-yellow (2.5Y 7/4) and light-gray (2.5Y 7/2 and N 7/0) silt loam or silty clay loam; weak, medium, subangular blocky structure; firm; few discontinuous clay films; few coatings of silt; very strongly acid.

A'2 & B'x—20 to 32 inches, mottled pale-yellow (2.5Y 7/4), light-gray (N 7/0), strong-brown (7.5YR 5/6), and light yellowish-brown (2.5Y 6/4) silty clay loam; weak, coarse, angular blocky structure; firm and very firm, compact, brittle; very strongly acid.

B'x—32 to 40 inches +, mottled light-gray (N 7/0), light brownish-gray (2.5Y 6/2), pale-olive (5Y 6/3), and strong-brown (7.5YR 5/6) silty clay loam; massive; firm and very firm, compact; very strongly acid.

The A horizon is commonly 8 to 10 inches thick. In places, however, it is about 16 inches thick and consists of brown or dark-brown (10YR 4/3) silt loam. In the uppermost 6 inches in those areas, there are few or no mottles. Depth to the fragipan ranges from about 15 to 22 inches. The thickness of the fragipan ranges from 10 to 24 inches.

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Glossary

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

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

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Chert. A structureless form of silica, closely related to flint, that breaks into angular fragments. Soils that developed from impure limestone containing fragments of chert and that have abundant quantities of these fragments in the soil mass are called cherty soils.

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

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; soil does not hold together in a mass.

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

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

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

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

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

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

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

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

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

Fragipan. A 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, a depth of 15 to 40 inches.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile.

Loess. A fine-grained eolian deposit consisting dominantly of silt-sized particles.

Mottled, soil. Irregular markings or 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.

Permeability. The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

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

Reaction. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. The corresponding words used for range in pH are—

	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

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

Sand. Individual rock or mineral fragments that are a part of soils and have diameters ranging from 0.05 to 2.0 millimeters. Most sand grains consists of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay. See Texture, soil.

Second bottom. The first terrace above the normal flood plain of a stream.

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

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 characteristics of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are (1) *single grain* (each grain by itself, as in dune sand) or (2) *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

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

Substratum. Any layer lying beneath the solum, or true soil; the C or R horizon.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow.

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

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

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