Issued April 5, 1913.

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE STATE OF ALABAMA, EMMETT O'NEAL, GOVERNOR;
REUBEN F. KOLB, COMMISSIONER AGRICULTURE AND INDUSTRIES;
EUGENE A. SMITH, STATE GEOLOGIST.

SOIL SURVEY OF MADISON COUNTY, ALABAMA.

BY

R. T. AVON BURKE, OF THE U. S. DEPARTMENT OF AGRICULTURE,
AND A. M. O'NEAL, JR., OF THE ALABAMA DEPARTMENT
OF AGRICULTURE AND INDUSTRIES.

HUGH H. BENNETT, INSPECTOR IN CHARGE SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1911.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1913.

BUREAU OF SOILS.

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SOIL SURVEY.

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J. W. MCKERICHER, Secretary.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., October 3, 1912.

SIR: In the extension of the soil survey work in the State of Alabama work was undertaken in Madison County during the field season of 1911. This work was done in cooperation with the Alabama department of agriculture and industries, R. F. Kolb, commissioner, and the selection of this area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this work, and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1911, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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MAP.

SOIL SURVEY OF MADISON COUNTY, ALABAMA.

By R. T. AVON BURKE, of the United States Department of Agriculture, and A. M. O'NEAL, Jr., of the Alabama Department of Agriculture and Industries.

DESCRIPTION OF THE AREA.

Madison County is situated in the north-central part of Alabama. It is bounded on the east by Jackson County, on the south by Marshall and Morgan Counties, on the west by Limestone County, and on the north by Giles and Lincoln Counties, Tenn. The county has an area of 800 square miles, or 512,000 acres.

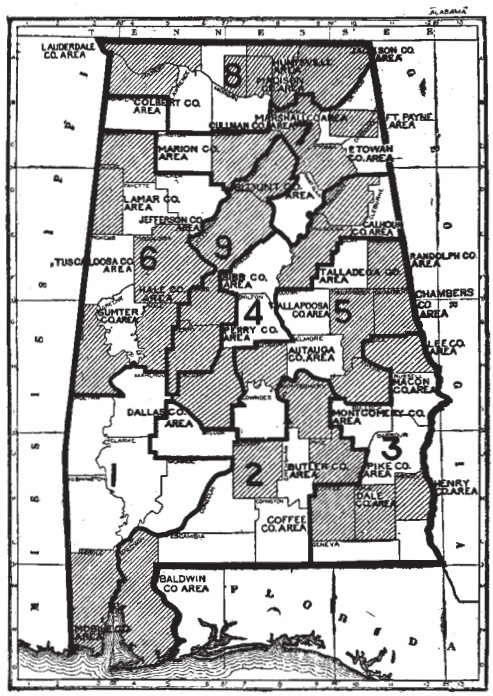

FIG. 1.—Sketch map showing location of the areas surveyed in Alabama.

The general flow of the drainage waters of the area is southward into the Tennessee River through Limestone Creek, Indian Creek, Aldridges Creek, and Flint and Paint Rock Rivers. The Flint River and its tributaries form the most important drainage system in the county, receiving the waters of the north-central, northeastern, and eastern sections. The principal tributary streams are Hurricane Fork, Brier Fork, and Mountain Fork. Paint Rock River receives the drainage waters of the southeastern corner of the county and is fed by numerous streams and branches. Limestone Creek, which crosses the northwestern section of the county, flows into the Tennessee River in Limestone County, receiving the drainage of the western and northwestern sections of the county. Blackwell Branch traverses the southwestern corner of the county and is fed

by subterranean streams which disappear in the sinks of the uplands. Indian Creek, in the same section, receives the waters of Barren Fork and Huntsville Spring Creek.

The topographic features of the county are quite varied and fall naturally into three divisions: The river and stream bottoms, the general uplands, and the mountain spurs and knobs of the Cumberland Plateau.

The bottoms along the Tennessee River are quite narrow as compared with the flats bordering its tributary streams. They range from one-quarter to one-half mile in width, although there are three places along its course where bottoms are entirely lacking and the river washes the limestone or sandstone bluffs. The largest bottoms occur along the Flint and Paint Rock Rivers, while all the major streams are bordered by wide areas.

The general uplands are approached gradually from the flood plains of Paint Rock River, except near McKinney Mountain, and more abruptly from the Tennessee River, and the terraces of Flint River. The general uplands are divided into two divisions; the "Barrens" and the limestone valleys, the two covering the greater part of the county, with elevations ranging from 550 to 850 feet above sea level. The highest elevations are attained in the area known as the Barrens, which is continuous with the Highland Rim of Tennessee. There are two general extensions in this county, the largest occupying the northwestern portion. The other is more narrow and extends to Brownsboro and beyond. It is probable that the area in the vicinity of Monrovia was once continuous with these two extensions, but has since been separated by erosion. The Barrens have an altitude of 700 to 850 feet and occupy what might be described as a structural plain developed by the resistance offered to erosion by the hard layers of siliceous limestone at the base and middle of the Keokuk or Lauderdale chert formation.

The limestone valley region is made up of a network of valleys with low divides, which gives the county a low rolling topography, relieved here and there by knolls and hills or an isolated mountain rising from 200 to 1,000 feet above the surrounding country. Just east of Huntsville, Monte Sano, the highest point in the area, reaches an elevation of 1,601 feet above sea level. It extends southward toward the Tennessee River, forming a lofty and conspicuous divide. Eastward to the county line and beyond, the general features are more rugged, consisting of high mountain spurs and knobs of the Cumberland Plateau, separated by the low, rolling country of the river and stream valleys or sharply indented by deep, narrow coves. On Monte Sano two plateaulike flats of considerable size occur, with others on the tops of the ridges bordering the county line to the east.

The one south of Gurley is the largest in the area and extends into Jackson County, while small flats occur on the tops of Mayo and McKinney Mountains.

The population of Madison County is largely native born, although a great many northern people have located here in the last 30 years. The population, according to the census of 1910, is 47,041. Huntsville, Gurley, New Hope, New Market, and Madison are the principal towns. Churches and schoolhouses are conveniently located throughout the county, while the farmers enjoy the benefits of rural free delivery of mail and local and long-distance telephone service.

One of the trunk lines of the Southern Railway, which utilizes the right of way of the old Memphis & Charleston road, traverses the county from east to west, passing through Madison, Huntsville, Ryland, Brownsboro, and Gurley. The Gadsden and Decherd Branch of the Nashville, Chattanooga & St. Louis Railway crosses the county from north to south. The Fayetteville and Harvest branch of the same system cuts across the northwest corner of the county, passing through the towns of Elkwood, Toney, and Harvest.

A tollgate system, under which the public roads were built and maintained, has been abolished, except on the pike leading to the top of Monte Sano, east of Huntsville. These old roads have been extended, while many of the secondary roads have been repaired and macadamized, forming a network of good highways reaching all parts of the county.

The local markets are the towns already mentioned. Chattanooga, Memphis, and Nashville, 97, 216, and 135 miles, respectively, from Huntsville, are the leading outside markets.

CLIMATE.

Madison County lies within the limits of the warm temperate zone and is characterized by short winters and long summers. As may be noted from the accompanying table, the monthly mean temperature for the months of December, January, and February is 43° F. at Decatur, Ala., the Weather Bureau station nearest the county. For these months there is a range in temperature from —12° to 77° F., the lowest and highest temperature being recorded during the month of February. Cold snaps are usually of brief duration, rarely lasting over three days, when the weather generally moderates considerably, the change often being accompanied by cloudy weather and much rain. The snowfall is usually very light, the records at Decatur showing an average depth of 1.7 inches. The snow soon melts in the valleys, although it remains longer on the mountain tops or ridges. The most disagreeable feature of the winter season is the prolonged

misty rains, which are usually accompanied by east, southeast, and south winds.

The weather in the summer is generally pleasant, the monthly mean temperature for June, July, and August at Decatur being 80° F. The absolute minimum, occuring during June, was 47° F., and the absolute maximum so far recorded at Decatur, 107° F., in July. There is probably a variation of several degrees in the temperature of the valleys and on the mountain crests, as might be expected where there is a difference of 800 to 1,000 feet in elevation, but there are no records from which to determine how great this variation is.

The precipitation is ample for the growth of crops and is well distributed throughout the year. The annual mean at Decatur is 49.5 inches, while 40.1 inches is given for the driest year and 62 inches for the wettest year.

Madison County has exceptionally good water. Springs are found in all parts of the area, seeping from the bluffs or bubbling up through fissures in the lime rock, while water can be secured in wells at depths ranging from 12 to 100 feet.

Normal monthly, seasonal, and annual temperature and precipitation at Decatur.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*	*Inches.*
December	42	72	0	3.8	2.0	5.5	T.
January	42	77	− 3	5.9	6.5	5.6	0.2
February	44	77	−12	5.4	1.1	5.3	1.5
Winter	43			15.1	9.6	16.4	1.7
March	53	84	4	6.4	3.9	4.2	0.5
April	62	92	26	4.6	3.6	11.1	0.0
May	69	98	37	3.5	1.3	2.7	0.0
Spring	61			14.5	8.8	18.0	0.5
June	78	106	47	3.4	1.6	2.8	0.0
July	81	107	56	4.5	5.2	7.5	0.0
August	80	104	53	3.4	3.2	6.4	0.0
Summer	80			11.3	10.0	16.7	0.0
September	72	99	37	2.8	3.6	5.0	0.0
October	61	93	33	2.1	4.7	0.3	0.0
November	50	80	15	3.7	3.4	5.6	T.
Fall	61			8.6	11.7	10.9	T.
Year	61	107	−12	49.5	40.1	62.0	2.2

AGRICULTURE.

The first settlement in the area was made at what is now Whitesburg in 1802, and two years later two families located near the present town of New Market. In 1805 John Hunt settled at Hunt Springs, the site of the present town of Huntsville. Large numbers of settlers from Tennessee, Georgia, and Virginia came later, being attracted by the rich lands to be had at such small cost.

Large tracts were bought up in 1809 by wealthy slave owners from Virginia and planted to cotton. By 1820 the population was 19,565. Large crops of cotton were grown, most of which was hauled to the river and then floated by means of flatboats to New Orleans. Some of these lands produced 1,000 pounds of cotton per acre, worth at that time 20 to 25 cents a pound.

The decade from 1820 to 1830 was one of great prosperity, and a number of industries were organized and developed, which stimulated the agricultural growth of the county. A canal was built from Huntsville to Triana on the Tennessee River by way of Huntsville Spring Creek to facilitate the shipment of cotton and incoming commodities. This is now abandoned. Mail and stage routes were established. Mills and gins sprang up along the water courses, utilizing their great water power, and pikes were built all over the county to be operated under the tollgate system. In 1832 Bell Factory was erected on Flint River, operating 100 looms and 3,000 spindles. Up to this time the nearest railroad was at Decatur, but in 1834 the old Memphis & Charleston Co. was organized and the line extended from Huntsville to Memphis, Tenn. The financial crisis, due to the low price of cotton, which occurred just after 1835, bankrupted many large planters, but by 1840 the county was again in a flourishing condition. From that time to the Civil War the entire section continued to improve. At this time corn had become one of the staple crops, and the bottoms which had been formerly uncultivated were planted to it, excellent yields resulting.

After the war the sudden change in the industrial system left agriculture in a very demoralized state, causing a large part of the land to be thrown out of cultivation. About this time a number of northern and German settlers located in the county, introducing, among other things, the cultivation of nursery stock, which has since become one of the principal industries of the area. Most of the Germans settled in the Barrens and have demonstrated that these lands, which were considered worthless, are very valuable.

Some idea of the present state of the agricultural development of the county may be gained from the land classification published in the census of 1900. At this time about one-fourth of the area was in timber or brush, although a considerable proportion of this land was made up of steep, rocky mountain and hill slopes, which, if cleared,

would not be suited to agricultural purposes. The remainder of the lands, or about three-fourths of the total area, was classified as farm lands, and only 225,384 acres, or 43.7 per cent of the area, was classified as improved land. Of this fully 15 per cent was used as pasturage. The same authority gives the average size of farms as 75.8 acres,[1] although individual farms will range from 30 or 40 to 500 acres or more. Only 27.7 per cent of these farms are operated by the owners, the remaining 72.3 per cent being operated by tenants. This development of the tenant system is largely responsible for the unproductiveness of the soil in many parts of the county. The basis of renting varies considerably in different parts of the county, although the most common plan is a share of the crops grown. The payment of cash rent is uncommon, but where exacted ranges from $2 to $5 an acre. Where the landlord supplies work stock, tools, and seed he usually receives one-half of all crops produced. Where the tenant supplies work stock, etc., he pays the landlord one-third of the corn and one-fourth of the cotton. If commercial fertilizers are used, the landlord contributes in proportion to the share of the crops which comes to him as rent, except where the landlord owns stable manure. In this case the tenant contributes only his labor in putting it on the fields. The tenants are largely dependent upon the landlord or local merchants for necessary supplies, the latter protecting themselves by taking a mortgage on the crops, stock, etc. Only a small proportion of the owners of farm property live on their lands, and when they do they usually farm a small tract and rent the rest.

In some parts of the county the labor supply is adequate. In other sections great difficulty is experienced in securing efficient help. Most of the labor is employed by the month at wages ranging from $15 to $17 where they are housed and boarded on the place, or $20 to $25 where they board themselves, while the day laborer receives from $1 to $1.25 a day.

Corn and cotton constitute the most important crops of the county at present, supplemented by wheat, hay, millet, oats, vegetables, sorghum, sweet potatoes, Irish potatoes, fruit, nursery stock, red clover, peanuts, rye, and alfalfa, named in the order of their importance. Corn is the most important crop in the area, occupying about 46.1 per cent of the cultivated lands. According to the census of 1910 there were 75,192 acres in this crop, yielding 1,016,051 bushels, an average yield of 13.5 bushels per acre, although individual yields will range from 10 to 100 bushels to the acre. Most of the corn in Madison County is grown on the river and stream bottoms, and the proportion of upland acreage in corn is small as compared with that in cotton.

[1] The census enumerated each tenancy as a "farm."

Most of the land devoted to corn is plowed in the spring. In the wetter bottom areas the fields are subsequently ridged and the seed planted on the ridges. In growing the crop in the uplands flat culture and check-row planting are followed where drainage is good and the danger of erosion not great. Much of the corn is grown on the alluvial soils lying along the river and stream bottoms and is subject to overflows during the winter and early spring. Considerable damage would result to the fields if they were in a plowed condition. Even where the soil is compact, and protected more or less by the corn and cotton stubble, it is washed badly in places. Under favorable conditions there is a considerable production of corn in this county, and much of it is shipped to other parts of the State. The Tennessee Red Cob seems to be the favorite variety.

The acreage in cotton has changed very little since 1880, when the census report gave the acreage as 72,838, the report of 1910 showing 75,627 acres in this crop, or 31.6 per cent of the area in farms. The greater proportion of this crop is grown on the uplands, and in places it is produced to the exclusion of all other crops. The methods used in its production vary somewhat in different parts of the area, but the common practice is to plant the crop year after year on the same land. In some seasons cotton is damaged by early fall frosts. The use of earlier maturing varieties, among which the King seems to be the favorite, is lessening the danger of loss from this source. The other varieties grown are the Russell Big Boll, Simpkins Prolific, Shields Dixie Cluster, Hastings Prolific, and what is called " common " or " mixed " cotton.

The next crop of importance in the county is wheat. According to the census of 1910 it occupied 2,422 acres. The acreage of this crop has declined steadily since 1879, when the acreage was 12,578. Nearly all the wheat grown is harvested with binders, shocked, and thrashed, although a small proportion is used as forage or cut and cured for hay. The yields vary from 6 to 30 bushels per acre. The low yields in part can be attributed to the poor physical condition of the soil, due to lack of organic matter. Where the soils have been improved by deep plowing, the incorporation of organic matter, and liberal applications of lime, good stands and yields have been obtained. The varieties grown in this county are Harpers Beardless and Forecaster, Pools Smoothead, and Rice. The grain produced in the more rolling country is said to be of fine quality, and it would seem that wheat production could be profitably extended. Most of the product is sold to local flouring mills.

The hay crop of the area comprises crabgrass, Johnson grass, redtop, and some timothy. Cowpeas are also used for this purpose. The grasses mentioned are supplemented by the small grains, oats, and wheat, which are sometimes fed in the green state. Millet

771 acres were devoted to barley. Potatoes are reported on 2,509 acres, and 1,136 acres were devoted to other vegetables.

The first methods of farming were very crude and wasteful. No attention was given to the proper cultivation of crops, seed selection, crop rotation, or fertilization. Crop yields decreased from year to year, and the productive capacity of the soil was greatly reduced. As the cause of the reduced yields became apparent the farming system was gradually improved, until at present the farmers give more attention to crop rotation, exercise considerable care in the selection of seed, and improve the soil by growing alfalfa and other legumes.

As in other sections of eastern Nebraska, grain production is the chief type of farming in Douglas County, though dairying and the raising of hogs and other live stock are important industries. Corn, oats, wild grasses, wheat, alfalfa, barley, and clover are the chief general farm crops grown, ranking in acreage in the order named. The tendency today is to grow less corn and more wheat, oats, and leguminous crops.

Corn is by far the most important crop, and on farms where it is not fed to live stock it is the chief cash crop. A little over two-fifths of the total area of the improved farm land in Douglas County is devoted to the production of corn. It is grown on all the soil types of the county. It does best on the heavier soils, although fair returns are obtained from the sandy soils. The average yield for the county in 1910 was about 34 bushels per acre. Both the yellow and white dent varieties are grown. Pride of the North, Reids Yellow Dent, and Improved Leaming of the former, and Iowa Silver Mine of the latter are the leading varieties. In planting, most of the corn is listed, some is check rowed, and in a few cases it is double listed. At present most of the corn is sold, though a large percentage is fed to hogs and beef cattle. On farms with silos a large part of the corn is cut for silage; in other cases only the grain and the finer part of the stalk are utilized. It is a general practice to pasture the corn lands after the ears have been removed. On many of the farms corn is grown for 4 or 5 years in succession on the same field, and in some cases it has succeeded itself for 20 years or more. Better results are obtained where corn is rotated with small grains and leguminous crops. With better farm management the average yield could easily be increased.

The growing of oats is steadily increasing in importance. At present about one-eighth of the improved farm land of the county is devoted to the production of this crop. It does well on all the soils except the bottom-land types, where it is likely to lodge, and the Kherson oat, a very short, stiff-strawed variety, has given excellent results on these soils. The average yield is only 27 bushels per acre, but this yield is greatly exceeded on well-managed farms. As a

corn just before the last cultivation and sow vetch and rye, oats and rye, or crimson clover in the fall between the rows of cotton. A cover crop of oats, wheat, rye, or barley, to be used as pasturage, should follow the removal of cowpeas as the third step in the rotation.

There may be some difficulty at first in securing stands of crimson clover and vetch, but experimental crops would seem to indicate that these can be successfully produced. Where trouble is encountered the use of slaked lime and a soil taken from some patch where these crops have succeeded would assist in securing a stand. About 1,000 pounds of lime and a few hundred pounds of soil to the acre would be sufficient in most cases. Some of the land in the county has been under cultivation for a hundred years, although the greater proportion has not been in constant use for more than fifty years. The soils have been largely used for the production of cotton and corn. The uplands have produced most of the cotton and the river and stream bottoms most of the corn. When it is considered that the uplands have produced cotton year after year almost to the exclusion of all other crops, it is not surprising that the yields have declined. The yield of corn on the bottom lands has not been reduced to the same extent, on account of the renewal of the soil by deposition from the rivers and streams while in flood. There are small areas in some of the bottoms that are not flooded annually, and here the effects of careless cultivation are reflected in declining yields.

The census of 1910 shows an expenditure of $62,274 for fertilizer, as compared with $8,068 in 1880, $20,916 in 1890, and $26,800 in 1900. Most of the fertilizer is used for the cotton crop. The greater proportion is bought in the form of 10–2–2 or 10-2-4 mixtures. Some of the farmers mix their own fertilizer, using 16 per cent acid phosphate and kainit (muriate of potash). Where mixed at home the proportion of the potash and acid phosphate varies considerably. Barnyard manure is commonly used, but the supply is generally inadequate. Applications are usually confined to small patches of upland corn and cotton. It gives better results than the commercial fertilizers.

The essentials for the development and maintenance of productiveness in local soils consist of a more thorough preparation of the seed bed, the incorporation of a good supply of organic matter, the growing of winter cover crops, and systematic crop rotation, including particularly the legumes. Most of the plowing done in Madison County ranges in depth from 3 to 10 inches, the average being about 5 inches. The depth should not be less than 8 inches nor more than 15 inches for cultivated crops, and it should be attained gradually, as the turning up of large quantities of unweathered subsoil is detrimental to crops for a time. This is the experience with all the soils having a yellow subsoil, and more particularly with the Col-

bert series. The exposure of the red clay subsoils is apparently not as detrimental, although care should be taken even here to deepen the tilth gradually. Most of this trouble can be obviated if the disk plow is used, although the cost of breaking will be greater. A deep, well-drained soil, thoroughly pulverized by the plow and harrow, insures a greater moisture content than a shallow one, and the soils are more retentive of moisture where there is abundant organic matter. By increasing the water-holding capacity of the soil a greater protection is afforded to slopes that are subjected to surface wash during seasons of heavy rainfall, the development of bacteria is stimulated, and the decomposition of organic matter is hastened. The roots of crops have more freedom and a greater feeding range. The deep breaking of the soil also allows the heat to penetrate more readily and the air to circulate more freely, thus developing other conditions necessary for the profitable production of crops.

Organic matter can be quickly incorporated in the form of stable manure, or green manuring crops, or, more slowly, by the growth of winter and summer forage crops, depending upon the roots and stubble to supply the amount needed. Oats, rye, barley, winter vetch, and crimson clover, or such combinations as oats and vetch, or rye and vetch, are best for this purpose. These crops not only afford good winter pasturage, but they lessen the erosion resulting from the heavy rains of winter and early spring where the fields are left bare.

SOILS.[1]

Geological investigations show that the Cumberland Plateau in ages past extended unbroken and continuous over the greater part of Madison County, with an altitude probably higher than the present highest flat-topped mountains of this section. The mountains, spurs, knobs, and hills bear evidence of this fact in that they are composed of similar strata occurring in about the same order and of approximately the same elevation. Decomposition and erosion extending over long periods of time have reduced the plateau to its present configuration of mountains, plateaus, coves, isolated hills, and broad, rolling valleys. Erosion has reduced the plateau levels in some cases from 800 to 1,300 feet.

The exposed rocks of the area belong largely to the Carboniferous period and consist of sandstones, limestones, conglomerates, and shales, of which the limestones predominate. These are all sedimentary rocks and represent material deposited in an ancient sea and subsequently consolidated and uplifted. Since the consolidation and elevation of the strata they have not been subjected to any great change as a result of heat and pressure, which agencies in some

[1] The geology in this report is based upon the work of the Geological Survey of Alabama. See report on "The Valley Regions of Alabama."

regions have resulted in much folding or faulting of the strata. The rocks here lie in a general horizontal position. Where subjected to the agencies of weathering they have disintegrated and decomposed, giving rise to the soils of the region.

The soils have been divided into two general groups, residual and alluvial. The former group is derived from the disintegration and decomposition of the rocks in place, while the latter represents material derived from the same source washed from the land areas by the rains, and transported and deposited by the rivers and smaller streams.

Devonian rocks do not enter into the composition of the soils. They are represented here by the "black shales," which outcrop in the bed of Flint River below the confluence of Mountain and Brier Forks and at intervals along these branches. They also occur in similar positions along Limestone Creek and other small streams, while less important outcrops occur in other parts of the county. The black shales do not contribute to the soil material, as they are largely buried by alluvial deposits.

The Carboniferous strata are represented by the Lauderdale or Keokuk chert, the Tuscumbia or St. Louis limestone, the Hartselle sandstone formation, including the Bangor limestone, and the Coal Measures. The rocks comprised in the Lauderdale group consist of chert or cherty limestones. The cherty limestone is interstratified with layers of hard siliceous limestone. The resistance offered to weathering by these layers is largely responsible for the development of the smooth topography of the Barrens. This formation is well developed in the north and northwestern part of the county, where it has given rise largely to the Clarksville series of soils, characterized by gray or brown surface soils and yellow clay subsoils, underlain at depths varying from 2 to 6 feet by red clay. The types of this series represented here are the Clarksville silt loam, Clarksville clay loam, and to a less extent the Decatur cherty loam.

The Tuscumbia or St. Louis formation consists of blue or gray limestone, cherty limestone, and chert. The chert usually occurs as irregular fragments embedded in the limestone and more rarely in thin seams. The limestones, which are much purer and softer than the Lauderdale, have not resisted weathering to the same degree, and hence the resulting soils have a more rolling topography. This formation is characterized by numerous sinks, through which the drainage water finds its way into subterranean channels. Many springs issue from fissures in the rocks or seep from the bluffs or hillsides. The weathering of the St. Louis formation has given rise mainly to the Decatur series of soils, known locally as the "red lands." It is represented by the Decatur clay loam, Decatur silty clay loam, and Decatur cherty loam. The residual product usually exceeds 20 feet

in depth in the valleys, but thins out as the mountains are approached. Chert fragments are uncommon within the soil profile (36 inches) over the greater part of the areas, although they are quite conspicuous in some places, particularly near the foot of the mountains.

The sandstone member of the Hartselle formation has not given rise to any large area of soil, but has influenced many areas sufficiently to result in types of sandy texture. The weathering of this sandstone in conjunction with the Tuscumbia formation has given the Hagerstown fine sandy loam and Hagerstown loam. The limestone correlated with the Hartselle formation is very much thicker than the sandstone layers and consists largely of massive blue or gray rock, although some of the layers are thin bedded and shaly, with colors that range from gray to dull blue. The depth of the weathered material is quite variable, as this formation occurs on the steep mountain slopes, where, over many areas, soil wash or erosion has kept pace with decomposition and very little soil has remained. Here the land has been classed as Rough stony land. In the flats or "prairies" the decomposition products of the rock attain a depth of 5 feet or more, and the land here has been mapped as soils of the Colbert series, characterized by a tough, plastic, yellow clay subsoil. Two types—the Colbert silt loam and the Colbert silty clay loam—are found.

The Bangor limestone, or "Mountain limestone," consists of a massive gray or blue limestone, occurring only on the highest mountain slopes of the area or capping some of the hills. Most of the area occupied by these rocks has been classified as Rough stony land. It consists of slopes too steep and too broken with outcropping ledges of the rock to be suitable for agriculture.

Above the Bangor limestone lie the Coal Measures, which here form the tops of the highest mountains or plateaus of the Cumberland Plateau. This formation consists of sandstones, sandy shales, and to a less extent of conglomerates. The sandstone or sandy shales are the only rocks that contribute to the formation of valuable soils, the other rocks occupying the slopes too steep for cultivation. The sandstone and sandy shales are yellow or reddish-yellow and the weathered product has been classified as the Dekalb fine sandy loam.

In general, the soils bear an intimate relation to the geology of the region, although there has been more or less mixing of materials where the different formations meet, or as a result of surface wash or erosion.

The alluvial group of soils is divided into two general divisions: the present flood plains of the rivers, streams, etc., and the older terraces or second bottoms. In the first division in this area three soil types, representative of as many different series, have been encountered. These are the Huntington silt loam, Abernathy silty clay

loam, and the Holly silt loam. In the other division three types were also encountered, the Elk loam, the Cumberland gravelly loam, and the Tyler silt loam.

Eighteen soil types, including Rough stony land, are shown on the accompanying map. The soils are given the names of certain series as determined by their origin, and separated into types within the series as variations in texture require.

The following table gives the name and extent of each soil type mapped in the county:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Decatur clay loam	73,152		Dekalb fine sandy loam	15,232	3.0
Cherty phase	17,280	20.3	Colbert silt loam	14,976	2.9
Sandy phase	13,504		Abernathy silty clay loam	10,816	2.1
Rough stony land	78,400	15.3	Holly silt loam	10,624	2.1
Clarksville clay loam	65,216	12.7	Hagerstown fine sandy loam	6,720	1.3
Clarksville silt loam	52,032	10.2	Colbert silty clay loam	5,376	1.1
Huntington silt loam	41,920	8.2	Hollywood clay loam	1,920	.4
Decatur silty clay loam	38,976	7.6	Cumberland gravelly loam	960	.1
Hagerstown loam	25,408	5.0	Tyler silt loam	576	.1
Decatur cherty loam	23,040	4.5			
Elk loam	15,872	3.1	Total	512,000	

DEKALB FINE SANDY LOAM.

The Dekalb fine sandy loam consists of 6 to 10 inches of light-brown or grayish-brown fine sandy loam or heavy fine sandy loam, grading into a pale-yellow to yellowish-brown, friable fine sandy clay. This extends to within a few inches of the underlying rock, where the subsoil becomes slightly more sandy and carries a high content of partly disintegrated sandstone or shale fragments. Bedrock is usually encountered at 30 to 40 inches. In a few local areas near the bluffs the immediate subsoil is lacking, the fine sandy loam resting directly upon the bedrock at a depth of 12 inches. As the distance from the bluffs increases the subsoil rapidly deepens until its average depth is reached.

On Mayo Mountain some areas having a brown to reddish colored subsoil are included with the type. These would have been mapped as Hanceville sandy loam had they been large enough or of sufficient importance to warrant separation.

The Dekalb fine sandy loam occupies level to undulating plateaus on the mountain tops or ridges. It has the greatest altitude of any of the types in the county, ranging in elevation from 1,400 to 1,700 feet above sea level and from 800 to 1,200 feet above the adjacent valleys.

Comparatively little of this soil is under cultivation, and most of it is covered with a thin growth of chestnut; red, white, and chestnut oak; hickory, and occasionally poplar. The farm clearings are small and widely separated. The products consist chiefly of cotton and corn, supplemented by garden truck and fruit, and an occasional crop of cowpeas, oats, wheat, and millet. The following yields are reported: Cotton from one-third to one-half bale, corn 10 to 30 bushels, Irish potatoes about 50 bushels, and sweet potatoes from 75 to 100 bushels to the acre. Watermelons, cantaloupes, turnips, cabbage, and lettuce all do well on this type. Cowpeas, oats, wheat, and millet are grown for forage and hay. Broom sedge, Japan clover, and vetch are chiefly relied upon for pasturage. The fruit grown on this type consists of peaches, apples, pears, cherries, and plums. The trees seen were in good condition, and are said to yield abundantly. The favorite varieties of apples are the Ben Davis, Arkansas Black, Sweet Limber Twig, Horse, and Winesap, and of peaches the Alberta, Robert E. Lee, and Stump of the World. The Bartlett and Kieffer are the leading varieties of pears.

Peaches are more certain on this type than on the other soils of the area, but even here crops are occasionally lost through damage by late spring frosts. Seedlings are said to be more resistant than the budded or grafted fruit. Apples are a much more dependable crop. Pear trees are said to be short lived. Plums are generally of the hardy varieties and are said to yield abundantly.

No systematic rotation of crops is practiced on the Dekalb fine sandy loam. Corn is usually grown on new ground, and when the yields begin to diminish the fields are put in cotton and a new area cleared for corn.

The soil is well drained, easy to work, and under virgin conditions has a good average supply of organic matter. The organic-matter content diminishes rapidly under the continuous production of clean-culture crops, and this is one cause of the decrease in yields. Organic matter may be returned in the form of stable manure, or, where there is not an adequate supply of this, by turning under green manuring crops, such as cowpeas, crimson clover, vetch, rye, barley, wheat, or oats. Under certain conditions it may prove more profitable to graze these crops and turn under only the stubble. Once a good supply of organic matter is incorporated in the soil the land should be farmed under a system of cropping which will increase the interval between clean-culture crops and provide for occasional renovating crops.

This type is naturally well adapted to the production of truck and fruit. The conditions at present do not justify the extension of truck farming, but the acreage in orchards could be profitably increased in areas favorably located with respect to transportation lines.

Lands of this type are valued at $2 to $6 an acre. The low value is attributed to the difficulty of access, as most of the roads are almost impassable. There is, however, a good toll road to the top of Monte Sano, near Huntsville.

HAGERSTOWN LOAM.

The Hagerstown loam, as typically developed in this county, consists of a brown silt loam from 8 to 14 inches deep, grading into a reddish-brown to dull-red, moderately friable clay extending to depths usually exceeding 3 feet. The type occupies gently rolling to rolling country and is derived from the decay in place of the underlying limestones of the Tuscumbia, and more rarely of the Hartselle formation, the latter including some sandstone. The soil is generally compact and occasionally lacks the crumblike structure characteristic of this type in other sections. Throughout its extent, and particularly where the topography is more rolling, the soil has been removed in spots by surface wash and the underlying clay exposed.

In addition to the typical material, three phases of the type occur. One is characterized by a soil similar in color and depth to the typical soil, but having a subsoil of heavy fine sandy loam. This occurs near the junction of the Tuscumbia limestone with the lower sandstone layers of the Hartselle formation. The second phase is usually found more remote from the mountain and the hill slopes, where the surface features are nearly level or slightly depressed. Here the soil is typical, but there is a layer of yellowish-brown clay between the soil and the characteristic reddish-brown clay subsoil. These spots are too small to justify separation and mapping as a distinct type. The third phase, which is found in the northern part of the area, represents a transitional soil between the Clarksville and Decatur series.

The Hagerstown loam has an altitude ranging from 600 to 800 feet above sea level. The soil is well drained, easily worked, and responds readily to careful treatment. The original timber growth was largely oak, hickory, and poplar, with some pine on the sandy phase of the type. There is very little waste land included in the Hagerstown loam, nearly all of it being under cultivation.

The chief crops are cotton and corn; the minor crops oats, cowpeas, and millet. The reported yield for cotton ranges from one-third to one-half bale, corn from 15 to 40 bushels, oats from 20 to 40 bushels, cowpea hay from 1 to 1½ tons, and millet hay from 1 to 2 tons per acre. Cotton is usually fertilized with 100 to 200 pounds of a 10–2–2 mixture. This crop and corn are usually grown year after year on the same land, cotton usually for longer periods than corn. The latter is rarely fertilized, and when the yields begin to decline oats are sown, followed by cowpeas, and the following year the land is put in cotton. Sometimes cowpeas are sown in the corn just before the last cultivation. Another system is to alternate corn and cotton,

renovating the fields occasionally by means of a grain and a leguminous forage crop.

The Hagerstown loam is naturally an admirable type for the production of general farm crops, being rolling enough to give good drainage and heavy enough to hold moisture well during periods of drought, if proper cultivation is practiced. The compactness of the soil can be reduced by the incorporation of organic matter. This will also increase the moisture-holding capacity, improve the mechanical condition generally, and lessen the tendency of the surface material to run together. Applications of stable manure, the turning under of green crops, grass sod, grain stubble, etc., will serve to build up the organic matter in the soil. More thorough preparation and the increase of the organic matter content will increase the productiveness of this type considerably. A definite system of crop management that will provide for winter cover crops and more frequent use of cowpeas as summer forage should be substituted for the present cropping practice. The clovers should be grown more extensively. The present difficulty in getting satisfactory stands of red clover may be in part attributed to the poor mechanical condition of the soil. The soil also needs liming, especially where the leguminous crops are to be grown. Either crushed limestone or burnt lime may be used.

Farms composed of the Hagerstown loam should be worth more than they are, since this is one of the most valuable soils of eastern United States.

HAGERSTOWN FINE SANDY LOAM.

The Hagerstown fine sandy loam consists of a light-brown to reddish-brown fine sandy loam, 6 to 8 inches deep, passing rather abruptly into a red or reddish-brown, friable fine sandy clay or clay, which usually extends to a depth of 3 feet. This type is influenced to a marked degree by the underlying yellow or reddish-yellow sandstones of the Hartselle formation. The Tuscumbia limestone and the limestone of the Hartselle formation also enter into the composition of this type. The sandstone is slightly calcareous and breaks down into a friable fine sandy clay giving the friable subsoil. Where the strata thin out or the resulting product has weathered more completely the subsoil is heavier. Near watercourses the red color of the subsoil is not so pronounced, the shades of brown or light brown prevailing. The red clay of the subsoil is frequently exposed by surface wash or erosion in small spots throughout the type. Where they were sufficiently large such spots were included with the sandy phase of the Decatur clay loam.

The Hagerstown fine sandy loam occurs mainly on the lower mountain slopes in the southern part of the county. In the areas more remote from the mountains it is found on low knolls and ridges. The type is well drained.

Where this type is not in cultivation it can usually be identified by its characteristic growth of pines. Some poplar, red oak, and white oak grow upon it.

The greater proportion of the Hagerstown fine sandy loam is under cultivation. It is used principally for the production of cotton and corn, with oats, sorghum, millet, cowpeas, potatoes, and clover of minor importance. Some truck and fruit products are grown. Cotton yields from one-third to two-thirds of a bale; corn, 12 to 25 bushels; oats, 15 to 30 bushels; millet hay, 1½ to 2 tons; sorghum, 2 to 2½ tons; and cowpea hay 1 to 1½ tons to the acre. The highest yields of cotton are obtained with applications of 200 to 300 pounds of 10–2–2 fertilizer, and of sweet and Irish potatoes with the use of stable manure. Corn, oats, and hay are not usually fertilized.

The Hagerstown fine sandy loam is easily worked. Crops mature much earlier on it than on the other valley soils. Considerable damage is caused by erosion in the more rolling areas.

A greater acreage of cotton than of corn is grown on this type and the former crop has been produced continuously in some fields for 10 or 12 years. This practice is responsible for the general lack of organic matter in the soil and the unproductive condition of much of the land. The soil can be improved by growing and turning under leguminous crops, such as cowpeas, soy beans, and velvet beans. Winter cover crops of oats or rye, or combinations of either with vetch, may be used for the same purpose and have the added value of protecting the fields from erosion, which is always more severe when the soil is bare of vegetation. Deep plowing and contour cultivation will also do much to reduce the damage from soil wash, which is of importance on the more rolling land. The former is not so essential where the surface sandy loam is deep, as here much more of the rainfall will be absorbed naturally.

The type is well adapted to the production of early truck crops, such as melons, cantaloupes, asparagus, tomatoes, beans, potatoes, strawberries, and cane fruits. However, the soils will have to be made more productive and markets developed before these crops can be grown on a commercial scale.

Average results of mechanical analyses of samples of the soil and subsoil of this type are given below:

Mechanical analyses of Hagerstown fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413813, 413819	Soil	0.0	1.3	10.8	46.4	13.3	20.9	7.1
413814, 413820	Subsoil	.1	.8	6.8	28.9	7.2	26.6	29.6

COLBERT SILT LOAM.

The Colbert silt loam consists of 10 to 12 inches of a grayish-brown to dark-brown heavy silt loam to silty clay loam, passing abruptly into a tough, plastic yellow clay, in many places delicately mottled with various shades of yellow and gray. This subsoil material usually extends to depths ranging from 5 to 12 feet, where it rests upon limestone. Throughout the soil and scattered over the surface are numerous black iron concretions, ranging from one-eighth to one-half inch in diameter. The iron concretions have given rise to the local name "buckshot" or "coalshot flats." Stains caused by oxide of iron are discernible in the subsoil.

The Colbert silt loam is probably derived largely from the limestone developed between the upper and lower sandstone strata of the Hartselle formation. This limestone is generally massive, though in places it is thin bedded and shaly. The rock ranges in color from gray to dull blue.

A large area of the typical Colbert silt loam is developed in the southeastern part of the county between the mountain spurs and the overflow bottoms of Paint Rock River. A distinct phase of the type is found in the southwestern part of the county. The soil here is a gray to grayish-yellow silt loam, grading into a light-yellow silty clay, underlain at depths ranging from 20 to 30 inches by mottled gray and yellow clay. The yellow mottling becomes less distinct with depth, the color changing in places to dull blue. Comparatively little of this phase is under cultivation. It supports chiefly a growth of sweet and black gum, ironwood, hickory, elm, black oak, white oak, and an occasional beech or ash.

The surface of the Colbert silt loam is generally level, with a slight sloping toward the water courses, and the areas are likely to be poorly drained. After heavy rains water frequently remains on the surface for a considerable time, sometimes long enough to injure crops. This is probably due to the impervious nature of the immediate subsoil and the slight fall of the water courses.

The timber growth of the typical soil consists largely of white, red, and black oak, poplar, walnut, hickory, cedar, and sweet gum. Most of the land is under cultivation. It is used chiefly for the production of cotton and corn. Occasional crops of oats, millet, and cowpeas are produced. The yield of cotton is usually from one-fourth to three-fourths of a bale, although some farmers have produced a bale to the acre with careful methods. Corn gives from 30 to 40 bushels per acre, millet hay from 1 to 2 tons, oat hay from one-half to 1 ton, and cowpea hay from 1 to 2 tons per acre.

Crops are usually late in starting and maturing on this soil, and if the season is short many unopened cotton bolls are caught by frost.

Of the several varieties of cotton grown, King seems to be the favorite, as it matures earlier than most of the other varieties used. Cotton is usually fertilized with 100 to 200 pounds of a mixture containing 8 per cent phosphoric acid and 6 per cent kainit or muriate of potash. This mixture has been substituted for the 10–2–2 mixtures formerly used and is said to give better results. No fertilizer is used for corn, although available stable manure is distributed over small fields. Comparatively little of the oat crop produced on this type is thrashed, it being sown usually to supply winter pasturage or forage during the early spring.

Where the soil is deep the Colbert silt loam is easily worked, but where the underlying clay comes within reach of the plow, breaking and subsequent operations are rather difficult. The soil has been allowed to become too compact, and plowing has been too shallow, but with proper management the type is well adapted to the general farm crops, as all kinds of machinery can be used on it to advantage. The structure of the soil can be improved by the use of stable manure or by turning under green manuring crops, grass, and green stubble. The natural drainage is inadequate, and artificial drainage should be established through the construction of open ditches or, better still, by laying tile. These improvements will cause the crops to mature earlier and the yields will be materially increased. A system of cropping that will lengthen the interval between clean-culture crops will also result in increased productiveness. Grass, small grains, and leguminous crops should have a place in the rotations.

Lands of this type of soil are valued at $20 to $50 an acre, the higher prices being asked for the deeper, better-drained areas.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Colbert silt loam:

Mechanical analyses of Colbert silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413809	Soil	0.2	0.6	1.5	9.0	5.2	69.6	14.1
413810	Subsoil	.0	.2	1.1	7.5	3.9	43.8	43.3

COLBERT SILTY CLAY LOAM.

The Colbert silty clay loam consists of a brown or yellowish-brown silty clay loam, passing abruptly at 2 to 5 inches into a tough, plastic yellow clay that usually exceeds 3 feet in depth. Faint mottlings of yellow and brown are noticeable in the subsoil. Small, round iron concretions occur on the surface and throughout the soil profile. In the subsoil their decomposition is largely responsible for the brownish-black stains and mottling.

The Colbert silty clay loam is probably derived from limestone strata of the Hartselle formation. These rocks range in color from gray to dull blue and are generally massive, although in places they are thin bedded and shaly.

In a general way this type may be considered a shallow phase of the Colbert silt loam, representing areas of that type from which most of the soil has been removed by erosion. The silty clay loam usually occurs on the lower slopes of the mountain spurs in the southeastern part of the county or as eroded areas in the Colbert silt loam, the surface features of which become more rolling as the mountains are approached. In places the county is badly dissected, and the yellow clay subsoil and not infrequently the underlying bedrock are exposed. Away from the mountains the surface features become less broken and the soil increases in depth until the type merges into the Colbert silt loam, or some of the other types. North of New Hope the surface soil of the silty clay loam is more uniform, the depth averaging 5 inches. Most of the type has good surface drainage.

Originally the Colbert silty clay loam supported a growth of cedar, oak, hickory, walnut, and poplar. There are some small areas still covered with timber, but most of the type, except local patches abandoned on account of erosion, is under cultivation. The chief crops are cotton and corn. Oats, wheat, millet, cowpeas, and sorghum are crops of minor importance. The yield of cotton ranges from one-fourth to one-half bale per acre, of corn 15 to 50 bushels, oats 10 to 30 bushels, wheat 10 to 20 bushels, hay one-half to 1 ton, millet hay 1 to 2 tons, cowpea hay 2 to 3 tons, and sorghum for sirup from 100 to 200 gallons to the acre. The yields of all crops vary widely with the condition of the land and the cultural methods. Commercial fertilizers are commonly used for cotton. These consist of mixtures with the average composition formula 10–2–2. Many farmers are now using home-mixed fertilizer composed of phosphoric acid and kainit in the ratio of 8 to 6, which is said to give better results than the usual low-grade brands, although the latter would be classed as "complete." An occasional yield of 1 bale of cotton to the acre is reported where heavy applications of stable manure are used.

On account of the tough, plastic clay subsoil, which is usually reached by most of the cultural implements, the type is rather difficult to work. Unless in the proper physical condition it does not plow well; if too wet it does not scour readily and if too dry it clods. On the whole it is well adapted to the production of general farm products, particularly grass and grain. It can be improved for all crops by modifying its physical condition through the incorporation of organic matter, deeper plowing, and a more thorough preparation of the seedbed.

Crops under present conditions do best in a wet season, but with an increased supply of organic matter and a deeper root zone the water-holding capacity of the type will be greatly increased and seasonal differences in yield minimized. The damage from hillside wash will also be reduced, and the productiveness increased generally. The same recommendations as to crop rotation apply in the case of this type as in that of the silt loam.

Land of this type of soil is valued at $20 to $60 an acre, depending upon the character of the soil—its depth, uniformity, and freedom from erosion—and upon the location and improvements.

DECATUR SILTY CLAY LOAM.

The Decatur silty clay loam consists of a dark reddish brown to chocolate-colored silty clay loam from 5 to 18 inches deep, grading into a dark-red clay. The soil is mellow and contains a fair supply of organic matter, especially in the deeper portions. The upper subsoil is open, but the lower section is heavy and compact. The line of demarcation between soil and subsoil is well defined.

The Decatur silty clay loam occupies level or nearly level areas and depressions in the limestone valleys. The soil is derived from the decomposition in place of the Tuscumbia or St. Louis limestone—a formation of Carboniferous age—or where developed in depressions and lower valleys its origin may be attributed to such decomposition, supplemented by slight wash from contiguous limestone soils. Some of these depressions are inclined to be wet, particularly in seasons of heavy rainfall, but with light rainfall they form some of the most productive lands in the county. Along the contact of the Decatur silty clay loam with other types the color becomes lighter, the soil shallower, and the texture less uniform.

Small patches of forest consisting of red, black, and white oak, hickory, black walnut, and poplar, remnants of the original timber growth, are still encountered, but nearly all of the type is under cultivation, as it is a valuable agricultural soil. The crops are cotton, corn, oats, wheat, millet, sorghum, and cowpeas. Bermuda grass, crab grass, timothy, redtop, and red clover are being grown experimentally. The ordinary yield of cotton ranges from one-half to 1 bale per acre, corn 35 to 50 bushels, oats 40 to 60 bushels, wheat 20 to 30 bushels, cowpea hay 1 to 2½ tons, millet hay 1 to 2 tons, and sorghum for sirup from 100 to 150 gallons per acre. All the grasses do well, but trouble is experienced in getting a good stand of red clover. Crops are uncertain in seasons of excessive rainfall. Even in dry seasons they have a tendency to rank growth, though where well drained the type is considered one of the most productive in the area for the general farm crops.

No systematic rotation of crops is practiced. Corn or cotton may be grown year after year in the same fields. Sometimes these crops are alternated, but even in this case each may be grown for three or four years in succession. When the yields of these staple crops decline, winter oats are sown, and the following summer a crop of cowpeas taken off, after which cotton or corn production is renewed. Corn usually does better on this type than on the Decatur clay loam, the small grains are said to be of better quality on the latter type. Red clover does not do well in the depressions or lower valley areas, but on the better drained land it is more successful. Millet is occasionally grown as a catch crop in the depressions or poorly drained areas where the stand of some cultivated crop has been impaired. A greater variety of crops should be grown and rotated systematically.

Most of the upland areas of this type show acid reaction to litmus and the application of lime would be beneficial. Analysis of one sample of this soil indicated the need of at least 700 pounds of lime per acre to neutralize the acidity.

Lands of this type are valued at $30 to $80 an acre, depending upon location and character of improvements.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Decatur silty clay loam:

Mechanical analyses of Decatur silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413805, 413857.....	Soil.....	0.2	0.9	1.5	10.0	4.7	53.2	29.5
413806, 413858.....	Subsoil.....	.1	1.1	1.4	8.3	4.2	46.2	38.6

DECATUR CLAY LOAM.

The soil of the Decatur clay loam consists of a dark-red to reddish-brown clay loam, averaging 5 or 6 inches in depth. The subsoil is a heavy or deep-red clay. The soil is usually much more compact than the soil of the Decatur silty clay loam, and the content of organic matter is not usually so high in the former as in the latter type. The surface is usually free of rock fragments, although there is a noticeable admixture of chert in places, especially in the surface soil as the mountains or chert hills are approached. The underlying rock lies at shallow depths in many places and outcropping ledges are common. In the lower subsoil irregular chert fragments in various stages of decay are common. Areas containing much fragmental rock on or near the surface were mapped as a cherty phase of the type.

The Decatur clay loam is derived in part from decomposition of some of the more calcareous layers of the Keokuk or Lauderdale

cherty limestone, but largely from the Tuscumbia or St. Louis limestone—formations of the Carboniferous age. In decomposition the calcium carbonate has been removed by solution, and the soil material represents the more resistant or less soluble residue of the rock. Great masses of limestone have weathered to contribute material to the formation of this type, as these rocks are 85 to 95 per cent of calcium carbonate. The line of demarcation between the rock surface and the subsoil is sharply defined.

The type is known locally as the "red lands." It has the greatest distribution of any of the soils encountered, occurring in disconnected areas throughout the county, on the lower mountain and hill slopes and low, gently rolling uplands. Besides the typical soil, two phases of this type—a sandy phase and the cherty phase—are shown in the map. The sandy phase is characterized by a slightly higher content of sand in the soil and immediate subsoil. In places a thin covering of fine sand, from 1 to 2 inches deep, is encountered in places overlying a red clay subsoil. The sand of this phase is derived from an outwash from the Hartselle sandstone material, where this occurs on the hill or mountain slopes just above the typical material. Some areas were included where the subsoil is derived directly from a sandstone, probably of calcareous nature. The sand in this phase gives the type a more open structure. It has about the same agricultural value as the typical material. The cherty phase of this type is not nearly so stony as the Decatur cherty loam, although it carries quantities sufficient to interfere slightly with cultivation. This phase differs little from the typical soil in crop value.

The topography of the Decatur clay loam favors erosion, and the surface soil has been entirely removed from many small areas, leaving the red clay subsoil or underlying rock exposed.

Nearly all the Decatur clay loam is under cultivation. A few acres here and there are covered with a growth of oak, hickory, black walnut, and poplar. On the sandy phase some shortleaf pine is mingled with the hardwoods mentioned. The crops consist chiefly of corn and cotton, with oats, wheat, cowpeas, sweet potatoes, Irish potatoes, peanuts, garden truck, fruit, and nursery stock of secondary importance. Experimental patches of alfalfa, red clover, and crimson clover were seen in the course of the survey. The yield of cotton ranges from one-third to 1 bale, with an average of about one-half bale per acre; corn gives from 20 to 50 bushels, with an average of about 30 bushels; wheat from 15 to 20 bushels, oats from 30 to 50 bushels, peanuts from 15 to 40 bushels, cowpea hay from 1 to 2 tons, and sorghum for sirup from 75 to 150 gallons per acre. Red clover appears to do better than alfalfa, although no general success is attained with it. A large number of vegetables, such as cabbage,

beans, peas, squash, lettuce, cucumbers, egg plant, onions, tomatoes, radishes, beets, and turnips, give fair to good results.

The fruit grown on this type consists of apples, peaches, plums, grapes, strawberries, and raspberries. Fruit of better quality is usually obtained from the thin soils, although the trees do not grow as large. Strawberries and raspberries do better on the deeper soil. Reported yields of strawberries range from 2,000 to 4,000 quarts per acre. Excelsior, Crescent, Haviland, Brandywine, and Burbank are the most popular varieties. The peach crop is rather uncertain, on account of late spring frost, but in favorable seasons the yields are usually heavy. A great many varieties are grown, the Sneed, Greensboro, Belle of Georgia, Early Alberta, Stonewall Jackson, and White Cling leading. Apples yield much more regularly than peaches. The leading varieties are the Early Harvest, Astrachan, Winesap, Ben Davis, and Huckworth. The Kinnard and Fall Queen do unusually well on this type. Plums and grapes also yield well.

The continuous cultivation of cotton and corn is followed on this type, as on the others so far described. Cotton is usually fertilized, applications of 100 to 400 pounds of a 10–2–2 mixture being given at the time of planting the seed. Corn is rarely fertilized. Sowing cowpeas between the rows just before the last cultivation is practiced, and the subsequent crop receives the benefit of the nitrogen and organic matter stored in this way. Sometimes corn and cotton are alternated one with the other every three or four years. A practice that is growing in favor is to follow the corn with winter oats and put the land in cowpeas the following summer. This is cut for hay or pastured and the following spring the land put in cotton again. This method is a great improvement over the old practice, but a winter cover crop could be advantageously put in after turning under the cowpea stubble.

The Decatur clay loam is a heavy soil to work, and 2 or 3 mules are required to do the plowing satisfactorily. If the soil is plowed too wet it does not scour readily from the plow, and if too dry it is apt to turn up in heavy clods. Unless the plowing is deep, the crops are likely to suffer during periods of protracted dry weather. Wheat used to be an important crop on this type, but in recent years it has rarely been successful. This can be attributed largely to the poor physical condition of the soil, the result of shallow plowing, and depletion of organic matter. The seed bed should be gradually deepened and organic matter incorporated in every practicable way. A more systematic rotation of crops should be adopted. This should include winter cover crops and leguminous crops and crops for forage. Trouble is experienced in getting a stand of red clover. The prevailing shallow seed bed, the lack of organic matter, and acid

condition of the soil is probably the cause of failure. Tests made in the laboratory of this bureau indicate that the lime requirements of the type range from 700 to 3,500 pounds per acre.[1] If ground limestone were used about twice this quantity would probably be required.

The Decatur clay loam is naturally well adapted to the production of general farming products, particularly grass and grain. Farms consisting of this type are valued at $20 to $60 an acre.

DECATUR CHERTY LOAM.

The Decatur cherty loam consists of a reddish-brown to dark-brown loam to silt loam 9 to 12 inches deep, grading into a reddish-brown clay, which becomes more compact and of a more pronounced red with increasing depth. Upon the surface and throughout the soil and subsoil are found large quantities of angular fragments or nodules of chert in varying stages of decomposition.

The Decatur cherty loam is derived from the decomposition of the Keokuk or Lauderdale chert and the Tuscumbia or St. Louis limestone formations. The soil in places is influenced by wash from other higher lying soils. The areas occupy the lower mountain or hill slopes or occur as isolated knolls in the valley. The slopes are frequently very steep and are subject to severe erosion. A few small areas of typical Clarksville stony loam were included with this type because of their small extent. These occur on some of the east slopes of Rainbow Mountain and along the uplands bordering the bottom of Prices Fork. Here the type is characterized by a yellow subsoil and excessive accumulations of chert and limestone fragments on the surface.

The Decatur cherty loam forms scattered areas throughout the valley portion of the county, usually at the base of the mountains or hills. The total depth of soil and subsoil rarely exceeds 3 feet, and in places

[1] Laboratory tests disclosed nothing beyond the fact that the soil is acid and would respond to lime, a fact confirmed by fertility tests. A specific test made for the harmful soil constituent dihydroxystearic acid showed this compound to be absent or present only in quantities too minute to respond to the test.

In fertility tests by wire-basket methods, superphosphate, sodium nitrate, and potassium sulphate were used singly and in combinations of two and three, varying in 10 per cent stages. Wheat was grown in the cultural tests.

Lime added at the rate of 1 ton to the acre increased the growth over 25 per cent.

This soil was treated with 21 different mixtures of the three fertilizers, and those which contained 50 per cent and over of phosphate gave a total green weight of 23.9 grams. In the same number of fertilizer mixtures composed of 50 per cent and over of nitrogen the total green weight was 35.4 grams, and for 21 mixtures containing 50 per cent and over of potash the green weight was 25.5 grams. From this it can be seen that the soil responds most readily to fertilizers high in nitrogen. Some of the soil was limed at the rate of 1 ton to the acre and fertilizer tests made for the limed soil. Twenty-one mixtures high in phosphate gave 28.7 grams green weight, and 21 mixtures high in nitrogen gave 35.5 grams green weight, while the same number of mixtures high in potash gave 30.6 grams green weight. This shows that the phosphate fertilizer and the potash fertilizer produced more growth with lime than without, while the nitrogen fertilizer produced the same growth with and without the lime.

the soil material has been entirely removed by erosion, exposing the underlying rock. A good deal of this type is covered with a mixed forest of oak, hickory, walnut, poplar, and cedar.

Where cultivated the type is used mainly for cotton and corn. Small fields of red clover were noted. The yield of cotton ranges from one-third to three-fourths bale and of corn from 20 to 40 bushels per acre. Cotton is usually fertilized with a commercial mixture of the formula 10–2–2, applied in quantities ranging from 100 to 200 pounds per acre. On new ground the yield of cotton is reported to be about half a bale and of corn 50 bushels per acre.

The rock fragments scattered over the surface and through the soil interfere slightly with cultivation. They are said to prevent in some measure the washing so injurious on the more rolling lands and they also lessen the loss of soil moisture by evaporation. This is reflected in the condition of the growing crops, which suffer less in protracted dry spells than do crops on the Decatur clay loam. Nevertheless the heaviest yields are usually obtained in wet years. Where the slopes are steep, lands of this type should be protected by terraces and side-hill ditches, or at least the intertilled crops should be planted with the contour of the slopes and not in straight rows. During the winter the fields should be protected from wash by thick-growing vegetation, such as is given by oats, rye, or wheat, or a combination of oats and vetch or rye and vetch.

Land of this type is valued at $10 to $30 an acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Decatur cherty loam:

Mechanical analyses of Decatur cherty loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413803, 413843....	Soil.....	1.5	2.4	3.3	14.9	6.2	47.6	24.2
413804, 413844....	Subsoil.....	1.0	1.4	1.9	8.3	3.2	38.5	45.4

CLARKSVILLE SILT LOAM.

The Clarksville silt loam consists of a gray to light-brown, compact, floury silt loam, from 5 to 12 inches deep, grading into a yellow or pale-yellow silty clay, which becomes denser and more compact with increasing depth. At depths varying from 20 inches to 5 feet the subsoil passes into a dull-red clay, in many places through a layer of reddish-yellow or mottled red and yellow clay. Over the surface and throughout the soil mass a slight scattering of small, angular chert fragments is encountered. Such coarse material is at the heads of draws in the more rolling country or in areas along the watercourses.

The Clarksville silt loam is derived from the weathering of the Keokuk or Lauderdale chert and, to a less extent, the Tuscumbia or St. Louis limestone. The Keokuk or Lauderdale is made up of interbedded seams of cherty limestone and siliceous limestone. Most of the soil and the upper subsoil is derived from the decay of the chert, which weathers into a white chalklike product, usually changing to a pale-yellow color where the drainage is good and to a grayish-yellow or gray where the drainage is imperfect. The red clay of the deeper subsoil is more extensively developed where the rocks are more calcareous and less siliceous. Where the Tuscumbia or St. Louis formation contributes to this soil it has been derived from the more siliceous and cherty layers of these formations.

The Clarksville silt loam occupies level to gently rolling uplands. Much of it occurs in the north and northwestern parts of the county on a portion of the plain known as the Highland Rim, or locally as the Barrens. A phase of the type is found in the more level uplands where the surface drainage is not well established. The fall here is so slight that the streams are very sluggish and have not developed distinct valleys. This phase has the same texture as the typical soil, but the subsoil is slightly mottled with gray, and the red substratum lies deeper below the surface. This phase is covered with a forest of oak, hickory, ironwood, gum, cypress, and ash.

On the more southern extension of the Highland Rim the soils are generally better drained, but the Clarksville silt loam is usually retentive of moisture and crops rarely suffer even during prolonged dry spells. Considerable damage is caused in the more level areas by the accumulation of water on the surface after heavy rains. The type is easily worked and, where well-drained, crops mature early on it. Usually the organic matter content is very low, and even in timbered areas the accumulation of humus has not taken place to any appreciable extent, the dark color rarely extending below 1 inch in depth. This deficiency is the cause of the compactness of the soil and the lack of that crumb structure essential to good tilth.

With the exception of the poorly drained areas, most of this type is under cultivation, although thinly forested tracts are occasionally encountered, the growth consisting chiefly of scrub oak and hickory.

Cotton and corn are the principal crops. Smaller acreages are devoted to oats, wheat, cowpeas, sorghum, red clover, and redtop. The pasturage consists chiefly of Bermuda grass, broom sedge, with some redtop. The yield of cotton ranges from one-third to one-half bale, corn from 15 to 30 bushels, wheat 10 to 20 bushels, oats 20 to 40 bushels, sorghum for sirup 100 to 150 gallons, and cowpea hay 1 to 1½ tons per acre. The production of redtop and clover is small, the former doing best in the damper situations and the latter on well-drained and improved soil. Cotton is usually fertilized with 100

to 200 pounds of commercial mixtures containing about 10 per cent phosphoric acid, 2 per cent nitrogen, and 2 per cent potassium. Other crops are rarely fertilized. Some of the most productive fields, however, have been improved by the use of stable manure. Lime will be found beneficial on this soil, especially where it has a sufficient supply of organic matter. The general farm practices are no better here than on the other soils of the county, and the changes suggested for the soils already described apply with equal force to this type. It is well to lay especial emphasis on the need for improving the drainage conditions in the more level areas. This should be done before the other steps are taken. Lands of this type are valued at $8 to $30 an acre, depending upon location and improvements.

CLARKSVILLE CLAY LOAM.

The Clarksville clay loam consists of a grayish-yellow to grayish-brown silty loam or silty clay loam from 1 to 5 inches deep, passing abruptly into a yellow silty clay, which becomes more compact as depth increases. At depths ranging from 20 to 40 inches this yellow clay changes in color to a dull red, the zone of transition being characterized by mottlings of red and yellow or reddish-yellow. Small chert fragments are scattered over the surface and through the soil mass, their number increasing as the underlying rock is approached. The accumulations on the surface are greater in the more rolling areas along the watercourses or in areas where this soil passes into stony types.

The Clarksville clay loam is derived from the weathering of the Keokuk or Lauderdale formation and to a less extent from the Tuscumbia or St. Louis. The soil and upper subsoil material may be derived largely from the cherty or siliceous limestones, and the lower stratum of dull-red clay from the more calcareous and less siliceous or cherty layers of the Keokuk.

This type is in reality a shallow phase of the Clarksville silt loam, from which much of the surface soil has been removed by erosion. It occupies some of the lower mountain and hill slopes or gently rolling to rolling country. The surface soil is usually quite variable in depth and texture. In many spots washing has exposed the yellow clay and, more rarely, the deeper stratum of red clay, and the maximum depth of surface soil is not greater than 5 inches.

The intermingling by cultivation of the clay in the shallow places with the original covering of silt gives the type a silty clay texture, but where the soil is deepest the original silt is only slightly modified by plowing.

The type is chiefly confined to the region known locally as the Barrens—an extension of the Highland Rim—and has a much greater distribution than the Clarksville silt loam. It is generally well

drained, and crops upon it reach maturity early. The soil is rather difficult to work; if plowed when too wet it sticks to the plow and will not scour, and if too dry it clods. Except where the soil is deep, crops usually suffer from lack of moisture in protracted dry spells, but good yields are ordinarily obtained in wet seasons. The organic matter content of this type, as of the Clarksville silt loam, is usually quite low, and even in areas covered with a forest growth but little has accumulated.

Cotton and corn are now the important crops. Some oats, wheat, cowpeas, sorghum, and small patches of red clover and timothy form the minor field products. Fruit and truck are grown in a small way. The yield of cotton on new land is about one-half bale per acre. On lands that have been in cultivation for a number of years one-third to three-fourths bale per acre is obtained. Applications of 100 to 300 pounds of the ordinary low-grade commercial fertilizers are used. Corn ordinarily yields from 30 to 40 bushels per acre, and with the same fertilization as cotton the maximum rises to 50 bushels. Oats yield from 25 to 50 bushels and wheat from 12 to 25 bushels per acre. The yield of cowpea hay averages 1¼ tons and of sorghum sirup 85 gallons to the acre. All kinds of vegetables do well, but the soil seems particularly well adapted to the production of turnips, potatoes, eggplant, cabbage, lettuce, and tomatoes. The fruits grown on this type include peaches, apples, grapes, strawberries, and raspberries. The peach crop is uncertain, owing to the erratic occurrence of spring frosts, but in favorable seasons the trees yield abundantly. Elberta is the favorite variety. Of apples, the Early Harvest, Black Twig, and Winesap varieties are successfully grown. Grapes, raspberries, and strawberries rarely fail to give good crops. The leading varieties of grapes are the Concord, Ives, and Lutie.

This type is generally considered more productive than the Clarksville silt loam. It produces a better quality of the small grains, although the yield of straw is not quite so heavy. Corn and cotton are usually grown year after year on the same land or alternated one with the other at more or less extended intervals. A prevailing practice is to plant corn for two or three years and then follow with cotton for five or six years. Cowpeas are sometimes sown in corn just before the last cultivation. A less common practice, but one that is growing in favor, is to follow the corn with oats or wheat and the following summer sow cowpeas, planting cotton the succeeding spring. Oats may follow the corn and wheat follow the cowpeas. Where timothy and clover or redtop and clover can be grown they are substituted for cowpeas.

The Clarksville clay loam is well adapted to the production of the general farm crops, and particularly grass and grain, but continuous cropping with cotton and corn has reduced its productiveness con-

siderably. To secure the best results the organic matter content of this type must be increased and the seed bed deepened. The means of supplying organic matter have been discussed in connection with the other soils. The depth of plowing should be increased gradually, where the turnplow is used. A depth of 10 to 12 inches can be secured with a disk plow, for if the disk is set properly none of the unweathered subsoil will be brought to the surface. Restoring the organic matter content and deepening the seed bed will greatly reduce the erosion which now causes much loss to the farmers on this type and will both directly and indirectly increase the yield of crops.

Land of this type is valued at $8 to $30 an acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Clarksville clay loam:

Mechanical analyses of Clarksville clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413851, 413855.....	Soil.....	0.7	1.7	1.6	5.1	3.1	73.0	14.3
413852, 413856....	Subsoil.....	1.2	1.7	1.5	3.6	4.5	63.2	24.1

HOLLYWOOD CLAY LOAM.

The surface soil of the Hollywood clay loam consists of 12 to 16 inches of black or very dark-brown clay loam. The subsoil is a tough, plastic yellow clay, faintly mottled with shades of brown. In places it has a drab color to a depth of 2 or 3 feet, where it grades into the yellow clay. In places the drab colored clay is developed as a thin layer between the soil and deeper subsoil. As the other types are approached the soil becomes lighter in color and the yellow clay subsoil lies nearer the surface. This clay resembles the subsoil of the Colbert series, and carries the same small iron concretions and mottlings of brown or brownish-black where these have decomposed or disintegrated as the subsoils of this series.

The Hollywood clay loam is derived through weathering from limestones, probably belonging to the Hartselle formation. This rock as shown by the records of wells lies at depths varying from 5 to 25 feet.

This type is of small extent, and confined to small areas or long, narrow strips lying at the foot of the mountains in the eastern and southeastern parts of the county. The surface is usually level, although occasionally depressed.

Originally these areas were covered with forests of red cedar, white, black, red, and chestnut oak, hickory, walnut, and honey locust. Most of the land is now under cultivation and is used chiefly

for the production of corn, with occasional crops of oats, wheat, cowpeas, sorghum, millet, timothy, redtop, and red clover. Ordinarily the yield of corn ranges from 5 to 45 bushels, of oats from 20 to 30 bushels, wheat 10 to 15 bushels, cowpea hay from 1 to 2 tons, and millet hay from 1½ to 3 tons per acre. Little success has been attained in attempts to grow cotton on this soil. The sirup made from sorghum grown on this soil is said to be almost black.

Crops do best on the Hollywood clay loam in dry years. When wet weather prevails little or no profit is made. The soil is heavy and unless plowed at the right time does not scour well but turns up in clods. The subsoil is almost impervious to moisture and water stands on the surface after heavy rains, resulting in much damage to crops. The type is naturally a strong soil for the production of grass and grain crops, but needs artificial drainage. This provided, much of the present uncertainty of yield would be eliminated.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Hollywood clay loam:

Mechanical analyses of Hollywood clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413817, 413825.....	Soil.....	1.0	2.4	1.7	5.3	4.1	64.7	20.8
413818, 413826....	Subsoil.....	4.5	4.4	2.4	6.1	5 1	41.9	35.8

ROUGH STONY LAND.

Under the term Rough stony land all those areas unsuited for agriculture on account of outcropping ledges of rock and the abundance of rock fragments on the surface have been mapped. In this area the type comprises steep mountain sides and hill slopes from which the soil has been largely removed by erosion. The rocks consist largely of limestone, although narrow bands of sandstone and conglomerate occur. These lands have no value except for the very scanty pasturage afforded and the growth of cedar and other woods.

HUNTINGTON SILT LOAM.

The Huntington silt loam consists of a brown silty loam or silt loam, 12 to 15 inches deep, grading into a light-brown or yellowish-brown silty clay loam to silty clay, which extends to depths ranging from 3 to 30 feet. In places near the streams the subsoil has about the same color as the soil, but the texture is heavier. Here the mass of soil material usually is deeper, the deposits thinning out as they approach the uplands. Thin sandy or gravelly strata are en-

countered at various depths through the soil section, and conspicuous sandy ridges occur near the bluffs of the Tennessee River.

The Huntington silt loam is an alluvial soil derived from the weathering of material transported and deposited by the river and streams during seasons of high water. Nearly all the area of this type is subject to annual overflow. In early spring, when the Tennessee River is in flood, most of the tributary streams overflow their banks and inundate large areas. Such floods, however, rarely occur during the growing season.

Most of the Huntington silt loam is under cultivation, although there is a considerable area yet covered with hardwood forests, largely white, black, and red oak, hickory, and sweet gum. Occasional areas of canebrake exist. The surface of the type is generally flat and slopes slightly toward the watercourses. In places there are depressions eroded by the flood waters, and these are rarely dry.

Where the Huntington silt loam is cultivated it is used almost exclusively for the production of corn, although some fields of cotton and oats and patches of Bermuda, crab, and Johnson grass are encountered. The yield of corn ranges from 30 to 70 bushels, of cotton from one-half to 1 bale, and of oats from 20 to 40 bushels per acre. The grasses appear to thrive, although no definite state ments as to the yield of hay were obtainable. The yield of cotton on the sandy ridges ranges from one-third to one-half bale and of corn from 15 to 25 bushels per acre. The growth of cotton on the typical soil is rank and the plants have a tendency to rust. Many of the lower bolls rot on account of the thick foliage which shades them and prevents their ripening.

Land of this type is easily worked. It has an average content of organic matter. Its chief deficiency is in drainage, which is good naturally in only a few places. The fall is usually so slight that water remains on the surface for a long time after inundations. The best results are usually obtained on this type in dry seasons.

Land of the Huntington silt loam type is held at $30 to $60 an acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Huntington silt loam:

Mechanical analyses of Huntington silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413811, 413839.....	Soil.....	0.1	0.4	0.2	1.8	4.2	69.5	23.7
413812, 413840....	Subsoil.....	.3	.8	.7	2.4	5.8	58.2	31.7

HOLLY SILT LOAM.

The Holly silt loam, to a depth of 5 to 12 inches, consists of an ashy gray silty loam to silt loam. Beneath this is found a mottled gray and yellow silty clay, extending to 3 feet or more, where it passes into a heavy silty clay of a dull-blue, gray, or drab color. The soil and upper subsoil are quite uniform throughout the distribution of the type, but the deeper subsoil shows more variation, occasional layers of sand and sandy clay being interspersed through the mass of silty clay.

The Holly silt loam is an alluvial type, being derived from material transported and deposited by the streams and rivers while in flood. In distribution it is confined to the first or present overflow bottoms of the streams.

The Holly silt loam is usually poorly drained and the soil is cold. It is locally known as " white land " and is considered unproductive. Very little of it is under cultivation and most of it is covered with forests of beech, hickory, oak, and gum. A few patches of corn and redtop grass, the latter for hay, were encountered. Corn is estimated to yield from 15 to 20 bushels and hay three-fourths to one ton per acre. Where the type is subject to overflow the use of tile drains is recommended. On one area drained in this way the yield of corn was increased from 15 to 45 bushels per acre, and profitable yields of oats, hay, sorghum, cowpeas, and cotton were produced.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Holly silt loam:

Mechanical analyses of Holly silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413845	Soil	0.2	0.4	0.5	9.3	10.3	59.8	19.4
413846	Subsoil	.2	.3	.4	4.7	6.7	51.0	36.8

TYLER SILT LOAM.

The Tyler silt loam to a depth of 5 to 12 inches consists of a brown or yellowish-brown silty loam to silt loam, underlain by a sandy clay subsoil, mottled with brown and gray and usually underlain by sand and gravel.

This type occupies a portion of the well-drained second bottoms of Flint River, west of Gurley.

Drainage conditions are poor, but as the surface has a gentle slope toward the river most of the surface water could be removed by open ditches. When drained the type produces fair yields of corn, oats, hay, sorghum, cowpeas, and cotton.

ABERNATHY SILTY CLAY LOAM.

The Abernathy silty clay loam consists of 6 to 24 inches of dark-red to reddish-brown silty clay loam, underlain by a compact yellowish-gray or nearly white silty clay loam, becoming heavier and more sticky with depth and grading in many places into a mottled gray and yellow silty clay, sometimes showing a bluish cast. The soil usually attains its greatest depth along the outer edge of the bottoms, thinning out toward the stream courses.

The Abernathy silty clay loam occupies the overflowed first bottoms along some of the streams in the western and southwestern parts of the county. It is an alluvial soil, derived largely from material washed from the Decatur soils. The subsoil is similar to that underlying the Holly soils.

Very little of the Abernathy silty clay loam is under cultivation. It supports a forest growth of various oaks, hickory, hackberry, sweet gum, black gum, walnut, poplar, and ironwood. Near the Tennessee River it is characterized in places by an exclusive growth of Tupelo gum.

Where the Abernathy silty clay loam is under cultivation it is used chiefly for the production of corn. A small acreage is sowed to oats for hay. The yield of corn ranges from 15 to 40 bushels and of oat hay from one-half to 1 ton per acre. Owing to poor drainage conditions the yields vary widely, being much better in seasons of deficient rainfall.

Naturally the Abernathy silty clay loam is a good type of soil for the production of general farm crops. It contains a good supply of organic matter and is friable and easy to work. The main hindrance to profitable cultivation is the lack of drainage. When properly drained it will not only give much larger yields of corn and grass but will become adapted to the other crops of the region, for which it can not be used in its present condition.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of this type:

Mechanical analyses of Abernathy silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413807	Soil	0.0	0.3	0.2	1.8	2.1	72.6	22.3
413808	Subsoil	.2	.5	.6	7.0	5.2	59.3	26.8

ELK LOAM.

The Elk loam consists of a brown or yellowish-brown silt loam, from 8 to 12 inches deep, grading into a yellow, friable silty clay,

which rests upon a bed of cherty gravel or sand and gravel at depths ranging from 1 to 18 feet from the surface.

This soil is an alluvial type, consisting of material transported, sorted, and redeposited by streams when the water reached higher levels than at present. The type occupies terraces standing now above overflow.

In addition to the typical material several variations are found. One of these occurs in the vicinity of Huntsville, where the soil and subsoil are slightly heavier, the soil consisting of a silty loam and the subsoil of a silty clay. Another occurs in the vicinity of Owens Cross Roads, where the soil and subsoil are lighter, the former being a heavy fine sandy loam, and the latter a light sandy clay. A third phase is more local and consists of small, poorly drained flats, in which the subsoil is characterized by mottlings of gray and yellow.

The Elk loam is confined to the second bottoms along Flint River and its forks and some of the larger creeks. It is also encountered near the Paint Rock River, east of McKinney Mountain and west of New Hope. The occurrence of this type in these flats would indicate that Flint River flowed through Paint Rock Valley at one time, and this is further evidenced by the presence of well-rounded cherty gravel. This is usually encountered at about 15 feet below the surface.

Most of the Elk loam is under cultivation, although there are small areas of forest consisting of scrub oak, hickory, gum, and pine. Pine is most conspicuous on the lighter areas found near Owens Cross Roads and the gum on the poorly drained areas. Cotton, corn, oats, wheat, cowpeas, sorghum, potatoes, and red clover are the principal crops. The yield of cotton ranges from one-third to two-thirds bale, of corn from 25 to 30 bushels, oats 30 to 40 bushels, wheat 15 to 25 bushels, cowpeas for hay 1 to 1½ tons, and sorghum for sirup 100 to 150 gallons and for hay 2 to 3 tons to the acre. Sweet potatoes range from 100 to 150 bushels and Irish potatoes from 50 to 75 bushels per acre. Red clover has been grown successfully.

Cotton is usually fertilized with commercial mixtures of low grades, similar to those used on the other soils of the county. From 100 to 400 pounds per acre is the ordinary range in quantity. A few farmers are using mixtures containing more nitrogen and potash and less phosphoric acid. They are said to give profitable increases in yield. Where available, stable manure is usually applied to the corn land, with good results.

The Elk loam is easy to handle. Except in poorly drained areas crops usually reach early maturity. In general, the type can not withstand much dry weather and crops do best in a wet year. Deep plowing and the incorporation of organic matter will do much to increase its water-holding capacity and materially increase the yields.

Definite crop rotations should be planned to increase the interval between the production of clean cultivated crops. Vetch and rye or oats and rye as winter cover crops and cowpeas for summer forage should be more largely used. Lands of this type are valued at $30 to $50 an acre.

The following table gives the average results of mechanical analyses of samples of the soil and subsoil of the Elk loam:

Mechanical analyses of Elk loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
413827, 413861.....	Soil.....	0.8	1.7	3.9	16.1	10.7	52.9	13.6
413828, 413862....	Subsoil.....	.4	1.1	2.6	9.2	8.2	55.4	23.2

CUMBERLAND GRAVELLY LOAM.

The surface soil of the Cumberland gravelly loam consists of a brown or yellowish-brown loam from 8 to 12 inches deep, containing much well-rounded gravel. The upper subsoil is a yellow or reddish-yellow clay, rarely more than 4 inches in depth. This grades into a brittle, red silty clay, which persists to 3 feet or more. The gravel particles, which vary from one-eighth inch to 2 inches in diameter, are largely confined to the surface soil, although pebbles are encountered here and there throughout the subsoil.

Areas of this type lie from 20 to 30 feet above the second bottoms along Flint River and probably are the remains of an older river terrace now largely removed by erosion. The distribution of this type is restricted. The largest area occurs west of New Hope.

The Cumberland gravelly loam has a gently rolling surface. In places the type is badly eroded and the underlying red clay exposed. Where the soil has been removed by erosion the gravel frequently rests upon the red clay. Nearly all of this type is under cultivation, although a small proportion is covered with a forest consisting of pine, oak, and hickory. Broom sedge and crab grass are characteristic plants of smaller growth.

Cotton is the most important crop on this land, although occasional crops of corn, oats, and cowpeas are grown. The yield of cotton ranges from one-fourth to three-fourths bale, of corn from 15 to 20 bushels, oats from 1 to 1½ tons of hay, and cowpeas from 1 to 2 tons of hay per acre. Cotton is usually fertilized with 100 to 200 pounds per acre of mixtures containing approximately 10 per cent phosphoric acid, 2 per cent potash, and 2 per cent nitrogen. Equally good results are obtained by the use of stable manure, but the supply

is entirely inadequate. Crops on this type usually do best in years of ample rainfall, although on properly prepared seed beds they are said to withstand periods of prolonged drought better than crops on the Colbert soils. Late spring frosts damage cotton to a greater extent than on the upland types. Deep plowing and the incorporation of organic matter will do much to increase the productiveness of this soil, particularly as the result of their effect upon the moisture conditions. With care good yields should be obtained even in seasons of light rainfall. The loss from surface wash and erosion will also be reduced to a minimum. The rougher portions of this type are better fitted for pasture land than for cultivation.

The Cumberland gravelly loam is valued at $30 to $50 an acre.

SUMMARY.

Madison County lies in the north-central part of Alabama. It has an area of 800 square miles, or 512,000 acres. It includes spurs and knobs of the Cumberland Mountains, and the broad, rolling valleys of the Tennessee River. The mean elevation is between 550 and 850 feet above the sea level, although there are mountains and hills that rise from 200 to 1,000 feet above the surrounding plain.

The climate is mild and pleasant. The summers are usually long and the winters short. There are few times in the year when the ground can not be occupied by crops of some kind.

The leading agricultural products are corn and cotton, with wheat, hay, millet, oats, vegetables, sorghum, sweet potatoes, Irish potatoes, fruit, nursery stock, red clover, crimson clover, peanuts, rye, and alfalfa, of minor importance in the order named.

Eighteen soil types are shown on the accompanying map. Thirteen of these are derived from the weathering in place of the underlying rock formations; five are alluvial types.

The Decatur clay loam is the most extensive soil in the area. It occupies low, rolling country, and is subjected to considerable wash and erosion. It is considered a strong soil for general farm products, and is particularly valuable for grass and grain.

The Decatur silty clay loam has a smaller area. It occupies level benches, valley floors, and depressions in the limestone country. It is a good soil for the production of corn and cotton, but in many places needs artificial drainage.

The Decatur cherty loam occurs in scattered areas throughout the county on the lower slopes of mountains and hills. It is subject to severe wash or erosion. It produces good crops of cotton and corn, but owing to its stony nature and the steep slope in many places it is rather better suited to the production of grass and pasturage than cultivated crops.

The Clarksville clay loam is an extensively developed type occupying the gently rolling to rolling country of the Barrens. General farm products, particularly grass and grain, do well upon it.

The Clarksville silt loam occupies level to gently rolling country in the Barrens. This type is not considered a strong soil, but can be easily improved and is well suited to the production of general farm products.

The Colbert silty clay loam has a small area. It usually occurs on the lower slopes of the mountains and spurs or in the more eroded areas within the Colbert silt loam. It is well adapted to the production of grass and grain.

The Colbert silt loam is extensively developed in the southwestern part of the county, where it occupies level to gently rolling country. Over much of this type surface drainage is not well established. Where well drained it is suited to general farm products.

Most of the Hagerstown fine sandy loam occurs in the southern part of the county. It occupies lower mountain slopes, knolls, and ridges. It is a light soil for the production of corn and cotton and is better adapted to fruit and garden truck.

The Hagerstown loam covers considerable territory, but as small, scattered areas. It has a gently rolling to rolling surface and is a fine type for the production of general farm products.

The Hollywood clay loam is a type of small extent, occupying level or gladelike areas. In seasons of light rainfall it produces large crops of corn, but in wet years most crops fail. With thorough drainage this would become a strong soil for grass and grain.

The Dekalb fine sandy loam is confined to the flat-topped mountains, and because of its altitude and texture is admirably adapted to the production of fruit and garden truck.

The Cumberland gravelly loam occupies rolling ridges and is subjected to severe erosion. When properly cared for this is a strong soil for the production of cultivated crops. The rougher areas should be used largely for pasture.

The Elk loam is an alluvial soil, occupying the second bottoms of the rivers and streams. This type is well adapted to the production of general farm products.

The Holly silt loam and Tyler silt loam are soils of small extent. Drainage is generally not well established, and their usefulness can be greatly increased by the installation of tile drainage systems.

The Abernathy silty clay loam is an alluvial type, occupying the overflow bottoms of some of the streams. It needs artificial drainage to eliminate the present uncertainty of crops.

The Huntington silt loam is the most extensive of the alluvial types. Drainage is only partly established, but where well drained it is one of the best soils in the county for the production of corn.

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[PUBLIC RESOLUTION—No. 9.]

JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

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