

SOIL SURVEY OF THE HUNTSVILLE AREA, ALABAMA.

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LOCATION AND BOUNDARIES OF THE AREA.

The Huntsville area comprises the southwestern part of Madison County and the southeastern part of Limestone County, both of which

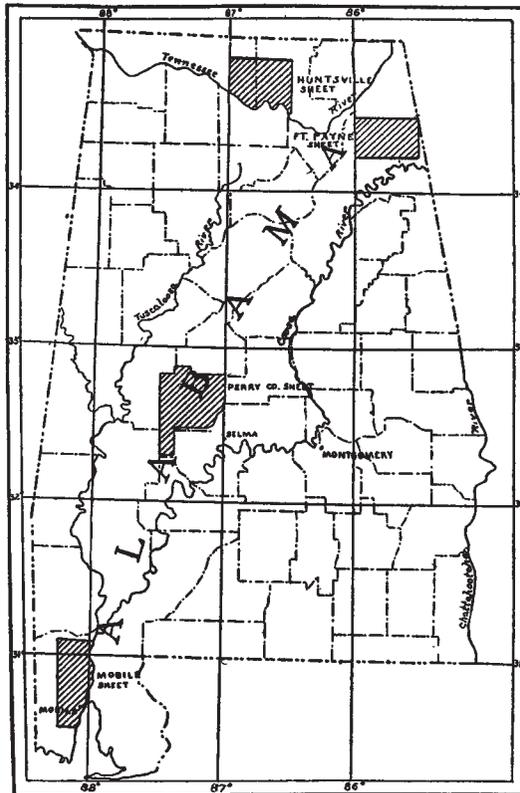


FIG. 15.—Sketch map showing location of the Huntsville area, Alabama.

are northern tier counties, lying about midway of the State boundary line. Their southern boundary, which coincides with the southern limit of the survey, is formed by the Tennessee River. The area surveyed has an extent of about 506 square miles.

The chief town in the area is Huntsville, in Madison County, a few miles from the eastern boundary of the survey. Madison Station, situated about the middle of the area, and Athens, in the northwestern corner, are the other important railroad towns.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Madison County was organized in 1808, and Limestone County, then for the most part unsettled, a few years later. Most of the early settlers in this region came from Virginia and Georgia. They took up lands in the limestone valleys in the eastern part of the area, gradually opening up the country to the west.

By 1820 the area had developed into something of an agricultural region, and the decade from 1820 to 1830 was one of prosperity. At this time cotton was hauled to Nashville by wagons, which returned laden with dry goods and groceries, and the lack of transportation facilities was the chief drawback the planters had to contend with. The Tennessee River was used to a certain extent as a means of transportation, and at a later period all the cotton grown in the area was floated down to the Mississippi and thence to New Orleans.

Even in 1830, however, much of the land was covered with a heavy growth of oak and a thick undergrowth of cane. The cane afforded excellent pasturage for cattle and hogs, and these were generally raised for home consumption. Considerable corn was also grown for this purpose, but cotton was the only crop which would pay for transportation to market. During this period the breadstuffs produced locally did not suffice for the needs of the people, and large quantities of these products were shipped in from Tennessee and the headwaters of the Tennessee River.

Between 1830 and 1840 occurred the financial crisis which ruined many of the wealthy planters. The panic was due to low prices and speculation. The farms, after twenty or thirty years of continuous cultivation to cotton, had fallen off in producing power. Many of the settlers abandoned these and moved farther west in an effort to retrieve their lost fortunes on virgin lands.

Between 1840 and 1850 the area began to resume its once prosperous condition, and by 1850 most of the available upland had again been put into cotton. The bottom lands, which were comparatively new to cultivation at this time, were planted to corn, and the resulting yields were very large. The area continued to prosper from 1850 up to the civil war, but the sudden change in the industrial system resulting from that war left the agriculture in a crippled condition, and much of the land was thrown out of cultivation.

Soon after the war many northern settlers came into the area, and among the industries introduced by them was the cultivation of

nursery stock, which has since assumed considerable importance. Between 1880 and 1890 a great many Germans settled in the "Barrens," which were at that time considered worthless for agricultural purposes, and they have done much to develop this part of the area.

CLIMATE.

The climate of the Huntsville area is comparatively equable and mild. The running streams are never frozen. The winters are short and the summers long, and it is seldom too cold or too hot to work outdoors. There is a difference of several degrees between the temperature of the valleys and that of the mountains.

The following table, compiled from records of the Weather Bureau stations at Madison, Scottsboro, and Valleyhead shows the normal monthly and annual temperature and precipitation:

Normal monthly and annual temperature and precipitation.

Month.	Madison.		Scottsboro.		Valleyhead.	
	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January.....	41.9	5.02	39.9	4.29	39.3	5.39
February.....	41.5	4.63	41.3	4.58	42.7	5.68
March.....	55.1	6.60	51.8	7.06	49.7	6.68
April.....	61.3	4.84	61.2	6.06	59.5	5.01
May.....	70.2	2.90	68.8	3.68	66.7	3.75
June.....	75.6	5.86	75.9	4.43	74.5	5.22
July.....	78.5	5.22	78.5	5.52	76.3	5.11
August.....	78.9	2.82	77.7	3.30	75.7	4.75
September.....	72.6	2.30	71.7	2.67	70.7	3.50
October.....	61.6	2.81	61.7	2.52	58.2	2.86
November.....	50.6	2.78	50.3	3.69	48.7	3.29
December.....	42.8	4.46	43.2	4.69	41.9	4.51
Year.....	60.9	50.24	60.2	52.49	58.7	55.75

PHYSIOGRAPHY AND GEOLOGY.

The principal geological formations outcropping in the Huntsville area are the Lauderdale or Keokuk chert, the Tuscombina or St. Louis limestone, a subgroup known as the Hartselle sandstone, and the Bangor limestones and Coal Measures.

The Lauderdale or Keokuk chert consists of strata of chert and limestone from 2 to 18 inches in thickness, the same stratum varying greatly in character in different parts of the area. This formation is mainly confined to the "Barrens," although a few narrow strips occur along the streams. As a rule, the rock is hard and cherty and gives rise to a poor soil—the "Barrens"—mapped as the Hagerstown silt loam. Where the rock is a purer limestone, it weathers into the Hagerstown loam, a very desirable soil for general farming.

Another important formation is the Tuscumbia or St. Louis limestone. These rocks consist of a fossiliferous limestone from 125 to 150 feet thick, containing some chert, generally in the form of irregular nodules. The chert is also filled with fossils. This group occurs principally in the eastern and southeastern parts of the area surveyed, forming the gentle slopes at the foot of the most eastern mountain spurs, and the gentle slopes of all the higher mountains, as well as the summits of many of the lower peaks and knolls. This formation is approximately coextensive with the Hagerstown loam and the Hagerstown clay, locally known as the "redlands." Many large springs and sinks occur in this formation in the southeastern part of the area.

The subgroup of rocks known as the Hartselle sandstone, consisting principally of limestone, with some sandstones and shales, occurs entirely in Madison County. The rocks of this subgroup form all of the higher detached mountain spurs and peaks west of the mountains, and also the greater part of the steep sides of Monte Sano. Occasionally the sandstones are found in the valleys near the mountains, in close proximity to the limestone, and where the material derived from them has been mixed with the weathered limestone they give rise to the Hagerstown sandy loam.

The Bangor limestone and Coal Measures formations outcrop high up on Monte Sano, and while the latter are worked to some extent for coal, neither formation is of any interest in connection with the soil types mapped in the area.

SOILS.

The soil map accompanying this report shows in colors nine distinct types of soil. These types range in texture from sandy loam to clay, but by far the greater part of the area is occupied by intermediate loam types, two of these—the Hagerstown loam and the Hagerstown silt loam—having an extent of over 60 per cent of the total area surveyed.

The following table gives the extent of each of the types mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Hagerstown loam	138,944	42.9	Hagerstown clay	9,024	2.7
Hagerstown silt loam	59,520	18.4	Hagerstown sandy loam	8,064	2.5
Meadow	42,240	13.0	De Kalb fine sandy loam....	2,240	.7
Hagerstown stony loam.....	41,984	13.0	Total	323,904
Clarksville clay.....	11,840	3.7			
Guthrie clay	10,048	3.1			

HAGERSTOWN CLAY.

The surface soil of the Hagerstown clay is a red clay, from 4 to 8 inches in depth, which becomes quite loamy when in a high state of cultivation. The subsoil is a stiff, red clay, extending to a depth of 3 feet or more. When this type occurs near the mountains or on some of the more rolling ridges, it occasionally has a small percentage of limestone, chert, and sandstone fragments scattered over the surface.

It is very uniform in character, the most noticeable variation being where it occurs within areas of the Hagerstown sandy loam and the Hagerstown silt loam, in which cases both the soil and subsoil contain a small percentage of sand, which may be detected by the eye or can be felt when the soil is rubbed between the fingers. The quantity of sand is so small that it makes but very little difference in the structure of the soil.

The type occurs in very small areas, and one-half square mile would cover the largest tract encountered. Probably 90 per cent of it is badly washed and gullied. It was once the Hagerstown loam, but excessive erosion has washed off the loam covering, exposing the underlying clay.

This soil is unproductive and of very little importance. The eroded condition of the fields, due to careless methods of cultivation, has grown to be a serious matter in many sections of the area surveyed. A comparatively level and unwashed area producing good crops is a very rare occurrence, and those which do exist have been reclaimed from the eroded state by careful cultivation, rotation of crops, and the use of large quantities of fertilizer. Spots of the Hagerstown loam are found in the Hagerstown clay, but these areas are too small to be shown on the map. If this type were reclaimed by cultivation and filling in the gullies, the small spots of the Hagerstown loam and Hagerstown clay would be mingled, thus giving the soil the character of a loamy clay.

It may be noticed from the soil map that this type occurs much more extensively in Madison County than in Limestone County, which is due to the fact that Madison County, owing to its rolling topography, has been subjected to greater erosion.

The value of the Hagerstown clay is very low, and there are few tracts of any size which could be put on the market. The price of cultivable tracts ranges from \$10 to \$15 an acre. Where it has been brought to a high state of cultivation it is well adapted to corn, wheat, and oats.

The table following gives mechanical analyses of typical samples of this soil.

Mechanical analyses of Hagerstown clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
				P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
10196	2 miles NE. of Harris.	Red loamy clay, 0 to 5 inches.	1.67	0.26	0.98	0.90	5.76	7.72	58.18	25.90
10198	3 miles NW. of Huntsville.	Red loamy clay, 0 to 6 inches.	.71	.58	1.04	1.28	16.70	9.46	38.22	32.72
10194	1½ miles E. of Greenbrier.	Red loamy clay, 0 to 7 inches.	.81	.22	.90	1.16	9.62	8.10	45.46	34.30
10197	Subsoil of 10196....	Red stiff clay, 5 to 36 inches.	.32	.16	.60	.52	4.50	5.58	48.44	39.90
10199	Subsoil of 10198....	Red stiff clay, 6 to 36 inches.	.38	.12	.70	1.30	16.96	7.88	25.38	47.66
10195	Subsoil of 10194....	Red stiff clay, 7 to 36 inches.	.50	.52	.88	.72	5.38	4.58	37.20	50.72

HAGERSTOWN SANDY LOAM.

The Hagerstown sandy loam consists of a reddish-yellow sandy loam, with a depth of 6 inches, underlain by a stiff red clay which contains a considerable quantity of sand. The chief difference between this type and the Hagerstown loam is the greater proportion of sand in both the soil and subsoil of the former. The difference is caused by outcropping gray sandstone in the limestone. The Hagerstown sandy loam is derived in part from both these rocks, while the Hagerstown loam is derived entirely from the limestone.

This soil type covers only a few square miles in the Huntsville area. It occupies a central-southern position, being scattered over Madison County in comparatively small areas. Only two small areas extend across the line into Limestone County.

This soil has a rolling surface, and wherever the slopes are at all steep washing is very severe. One of the worst eroded districts occurs around Triana Ferry, and the extent of the denudation there may be appreciated by an inspection of the map, the many patches of Hagerstown clay in that vicinity being the result of the removal of the surface soil and the exposure of the clay subsoil by washing.

The soil is usually thin and unproductive, but in depressions the sand content is higher, and the subsoil is a brownish-red sandy clay loam, and here the soil is much more productive, the yields being nearly twice those on the type as a whole. Such areas would have been classified as a distinct type had they not been too small to be shown on a map of the scale used.

All of the Hagerstown sandy loam has at some time been under cultivation, but at present a large part of it is idle and covered with a

growth of weeds or scrub pine. Pine is the characteristic growth on this soil.

The crop yields range from one-eighth to one-fourth of a bale of cotton and from 10 to 18 bushels of corn per acre. If the soil were well cared for, these yields could doubtless be somewhat increased. It is naturally well adapted to the production of truck and small fruits. The price of land of this soil type ranges from \$10 to \$15 an acre.

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

Mechanical analyses of Hagerstown sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
10206	3 miles NE. of Triana.	Brown sandy loam, 0 to 6 inches.	0.31	0.12	0.90	5.72	59.40	14.18	12.90	6.60
10208	3½ miles E. of Madison.	Brown sandy loam, 0 to 7 inches.	.49	.04	2.26	13.96	36.38	8.64	25.88	12.84
10207	Subsoil of 10206...	Brown clay loam, 6 to 36 inches.	.28	.08	.78	3.28	21.10	5.96	45.88	22.92
10209	Subsoil of 10208...	Red clay, 7 to 36 inches.	.31	.46	2.10	8.96	23.56	7.50	20.90	36.44

MEADOW.

The term Meadow includes low, wet, and swamplike areas, lying usually along streams and in depressions. The soil in these areas comprises many different materials washed down from the higher elevations into the streams and deposited in their flood plains or accumulated from surface wash into the depressions. As a general rule, however, the soil consists of a heavy brown, yellow, or whitish-yellow loam to a depth of from 6 to 15 inches. Underlying this may be found a drab, yellow, or whitish-yellow clay and in a few cases an almost white clay. The subsoil in some places contains a high percentage of chert fragments.

The most extensive area of this type is found along Huntsville Spring Creek, just above its junction with Prices Fork. Many portions of this area would remain unproductive even if well drained, on account of included spots of Guthrie clay. In this tract an occasional ridge, if sufficiently elevated for cultivation, is productive, but even then the yields of crops are small.

In the extreme southwestern corner of the area surveyed, bordering Swan Lake, is another extensive area of Meadow, which is covered by

a vigorous growth of beech. This is the only extensive forest of this tree found in the area. This broad flat occupies an elevation higher than that on which Meadow usually occurs. It has fair drainage, but is unproductive.

The Meadow in Madison County is more productive, and is cultivated to a greater extent than that found in Limestone County. The cultivated areas are usually confined to narrow strips along the small streams. The broad areas can not be profitably drained.

Along the smaller streams which rise in the Hagerstown loam in Madison County, the soil is very productive, and is well adapted to corn, yielding from 25 to 35 bushels per acre. Such areas are often planted to cotton, but the soil is too cold and wet in the average season to give this crop time to mature, and while producing a vigorous growth, the frost usually catches it with many bolls unmaturing. When planting can be done early enough to allow the plant to mature all its fruit, cotton will produce on this soil as much as a bale to the acre, but this yield is an exception, and corn is, in the long run, the more profitable crop.

In some cases Bermuda grass has been planted on this type. It produces a vigorous growth, furnishing excellent grazing during the summer, or good yields of hay for winter feed. It would seem that the larger proportion of Meadow could be more profitably utilized for this crop than for any other.

Much of the area of Meadow was once covered with a heavy growth of timber, consisting of red oak, white oak, water oak, post oak, gum, and hickory.

CLARKSVILLE CLAY.

The soil of the Clarksville clay is a rich, heavy brown or brownish-gray loam with a depth of 12 inches. The subsoil is a drab clay loam or yellowish-drab clay, grading into brown sandy clay loam next to the river. Where this type passes into the uplands the soil is lighter in color and more loamy in texture than in the lower lying areas.

This soil is alluvial in origin, having been deposited by the river during floods. It occurs along the Tennessee River as a terrace, varying in width from a few rods to more than a mile. Near the river the terrace is from 20 to 30 feet above the normal level of the water. In its wider parts it slopes downward for some distance before beginning the upward slope to the higher lying lands. This forms a troughlike basin which often contains sloughs or small ponds. While this soil occupies a comparatively small area, it is one of the most important soils found in the area surveyed. Excepting a few small undrained areas, it is all under cultivation.

The old settlers say that there has been but one total loss from overflow on the Clarksville clay in sixty years. Inundations are experi-

enced nearly every winter, but very seldom occur during the growing season. A certain proportion of the hay and cotton crops is destroyed every few years along the lower portions, but the corn crop rarely suffers.

This type is the typical corn soil of the area, to which crop it is usually planted, and yields from 40 to 60 bushels per acre. Some cotton is planted, especially on the second bottom, and yields from one-half of a bale to a bale per acre in a favorable season. This soil is rather cold for cotton, and as it does not warm up until late in the spring the fall frosts often come before half of the bolls are matured. Cotton makes a vigorous growth, and if the soil were farther south where the season is longer it would be admirably adapted to this crop.

As a general rule, corn is the most profitable crop planted on the Clarksville clay. The narrow sandy ridge which follows the river terrace would be well suited to truck, as it is well drained, warms up early in the spring, and is overflowed only during exceptionally high water.

During the past few years timothy has been experimented with on the Clarksville clay, and has proved very successful, yielding from 1 ton to 2 tons per acre. Considerable hay is made each year from the native grass of these bottoms.

The timber growth consists principally of several varieties of oak, gum, and hickory; with occasionally a thick undergrowth of cane. The price of the Clarksville clay ranges from \$30 to \$40 an acre.

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

Mechanical analyses of Clarksville clay.

No.	Locality.	Description.	Organic matter.								
				Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.	
10182	½ mile N. of Whitesburg Ferry.	Brown loam, 0 to 12 inches.	<i>P. ct.</i> 1.79	<i>P. ct.</i> 0.20	<i>P. ct.</i> 0.62	<i>P. ct.</i> 0.50	<i>P. ct.</i> 1.82	<i>P. ct.</i> 7.48	<i>P. ct.</i> 58.14	<i>P. ct.</i> 31.20	
10184	2 miles NE. of Triana.	Brown heavy loam, 0 to 10 inches.	2.30	.40	.90	.52	1.20	4.50	54.22	37.82	
10186	½ mile NE. of Decatur.	Brown heavy loam, 0 to 12 inches.	1.80	.08	.34	.32	1.60	3.24	55.02	39.26	
10183	Subsoil of 10182.....	Gray clay, 12 to 36 inches.	1.07	.50	2.00	1.80	3.34	4.54	48.26	39.18	
10185	Subsoil of 10184.....	Brown stiff loam, 10 to 36 inches.	1.48	.44	.78	.48	1.70	6.84	44.70	44.82	
10187	Subsoil of 10186.....	Brown clay loam, 12 to 36 inches.	.88	.00	.16	.24	1.46	3.46	46.20	48.48	

HAGERSTOWN LOAM.

The Hagerstown loam consists of about 10 inches of brown or yellowish-brown loam, underlain by 6 inches of yellowish-red clay loam, which rests on a stiff red clay extending to a depth of 3 feet or more. Where the soil is thin, as on the sides and tops of the steeper ridges, it is underlain immediately by the red clay. In slight depressions the soil is quite deep, and the underlying yellow clay loam often extends to a depth of 2 feet or more before the red clay is reached. As this type approaches the foot of the mountains and grades into the mountain soils both the soil and subsoil become lighter in color and often contain fragments of weathered limestone and chert, and occasionally of sandstone. Where this phase occurs near the highest mountains, which are capped by a layer of sandstones, the soil contains more or less sand, which has been washed down from the mountains.

The Hagerstown loam passes very gradually into the Hagerstown silt loam, and some difficulty was experienced in drawing the line of separation. In some cases the gradation extends over a strip as much as $1\frac{1}{2}$ miles wide. The soil in the zone of transition is much the same as that near the mountains, both the soil and subsoil becoming lighter in color and containing a considerable quantity of sand.

Among other phases of this type there is one occupying stony knolls or steep, narrow ridges, thickly strewn with fragments of limestone, chert, and a small amount of sandstone, the limestone predominating. This phase and the stony areas near the mountains have been represented on the map by the gravel symbol.

The Hagerstown loam is derived from the St. Louis limestone, which is a massive blue rock frequently containing chert. The soil is the insoluble residue of this rock, and as limestone is one of the most soluble rocks known it has required many feet of solid rock to form a few inches of soil.

The Hagerstown loam is the most extensive and widely distributed soil type of the area. In Madison County it usually occurs as a series of rolling valleys running north and south. These are occasionally broken by a stony ridge or some of the mountain soils. In the vicinity of Greenbrier, Bellemina, and Harris Station a deep, productive soil of this type forms a broad plateau. The surface in this vicinity is quite level, but the areas have excellent drainage through Beaverdam, Limestone, and Piney creeks, which run almost parallel in a southerly direction at a distance of 2 to 3 miles apart. As a rule this type in Limestone County is very level, and owing to its topography has been subjected to very little erosion, and hence the soil is deeper than that of a large proportion of the Madison County area, where the erosive action has been much greater. There are, however, some beautiful little valleys and level areas of this soil and these are in a comparatively good state of cultivation.

Only a few acres of the Hagerstown loam are now covered with the original timber growth. This consisted of large red, post, and white oak, hickory, and chestnut.

Almost all of the Hagerstown loam has been under cultivation or is being cultivated at the present time. It is well adapted to all the crops grown in this region. It yields from one-fourth to three-fourths of a bale of cotton per acre, from 20 to 30 bushels of corn, from 12 to 20 bushels of wheat, and from 20 to 30 bushels of oats. It is also well adapted to nursery stock. The price of this land varies from \$20 to \$30 an acre, depending on improvements, location, and the extent of erosion. Some of the best improved farms, within easy reach of the towns, will bring from \$40 to \$50 an acre.

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

Mechanical analyses of Hagerstown loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.06 mm.	Silt, 0.06 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
10204	3 miles S. of Huntsville.	Brown loam, 0 to 8 inches.	0.74	0.34	1.50	3.06	22.04	11.84	42.14	19.04
10202	2 miles NE. of Harris.	Brown loam, 0 to 9 inches.	.68	.10	.80	1.32	7.66	7.52	61.78	20.64
10200	½ mile NW. of Greenbrier.	Brown loam, 0 to 12 inches.	1.91	.46	.80	.76	4.60	5.50	63.92	23.96
10201	Subsoil of 10200...	Red stiff clay, 12 to 36 inches.	.66	.24	.70	.48	3.64	3.88	53.58	37.22
10205	Subsoil of 10204...	Red stiff clay, 8 to 36 inches.	.45	.42	.80	1.22	9.10	5.60	44.28	38.46
10203	Subsoil of 10202....	Red stiff clay, 9 to 36 inches.	.32	.24	.90	.82	4.88	4.46	40.50	47.74

GUTHRIE CLAY.

The first 10 inches of the Guthrie clay consists of a whitish-gray silty loam or clay loam, with a slightly greasy feel and a tenacious texture. When dry it has the properties of a silt rather than a clay, and looks like powdered chalk. The subsoil—a clay—varies in color from yellowish gray to drab, and is often stained a yellowish red by iron. Occasionally the subsoil contains so much chert that it is impossible to bore to a depth of 3 feet.

This type occurs in upland depressions, basinlike areas, and sink holes, and also as low areas where the drainage is very poor along some of the stream courses. It is the least productive soil in the area, and at present has little or no agricultural value. It has been

formed from cherty limestone, like many of the other types, its low value being due mainly to imperfect drainage conditions. Even where it has been possible to drain this soil the crop yields are small. The subsoil is impervious, and in very dry seasons moisture may be found in abundance at a depth of 10 or 12 inches. Around the edges of the depressions, where the Hagerstown loam or some one of the other types has been washed down over this type, it is very productive and has yielded as much as a bale of cotton per acre. Such areas, however, are but a few rods in width, encircling the depressions.

One or two areas of Guthrie clay cover a section or more, but the areas are usually small, many of them too small to be shown on the map. They are scattered over the southern half of the area, and altogether amount to about 15 square miles. This type is associated with all the other types found in the area, with the exception of the mountain soils.

Water remains on many areas of the Guthrie clay throughout a large part of the year, and the areas along the small streams and the Tennessee River, where they are low and flat, are subject to inundation. Such areas are the last to drain after an overflow.

The typical timber growth on this type is water oak, though gum is occasionally found. The oaks often grow to great size.

Where this soil can be drained Bermuda grass and sorghum do very well. The yield of molasses is small, but is said to be of superior quality.

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

Mechanical analyses of Guthrie clay.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
				P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
10188	2 miles NW. of Swancott.	Gray silty clay, 0 to 12 inches.	1.79	0.10	1.06	1.00	10.44	11.94	65.00	10.18
10192	5 miles W. of Huntsville.	Yellow silty clay, 0 to 8 inches.	.85	.08	.60	1.10	6.20	7.00	63.70	21.14
10190	1½ miles W. of Greengrove.	White silty clay, 0 to 12 inches.	.96	.18	.40	.76	6.14	5.86	62.64	23.52
10193	Subsoil of 10192.....	Light gray clay, 8 to 36 inches.	.13	.04	.34	1.06	5.80	6.32	56.60	29.76
10189	Subsoil of 10188.....	Gray clay, 12 to 36 inches.	.31	.24	.50	.54	5.40	6.04	54.52	32.74
10191	Subsoil of 10190.....	Gray clay, 12 to 36 inches.	.61	.04	.10	.54	3.92	4.12	50.90	39.90

HAGERSTOWN STONY LOAM.

The soil of the Hagerstown stony loam is a yellowish-brown loam, yellowish clay loam, or a reddish-yellow clay, underlain by a stiff yellow or reddish-yellow clay. The soil is thickly strewn with large and small bowlders and frequently broken by rocky cliffs. The rock consists of cherty limestone, sandstone, and conglomerates, the sandstone and conglomerate usually outcropping high up on the mountain sides. This type is confined entirely to the mountains, and includes all the mountain soils with the exception of the De Kalb fine sandy loam. It is found entirely in Madison County, the most extensive area being on Monte Sano. The Hagerstown stony loam comprises areas which are usually too stony for cultivation.

The following table shows the texture of the fine-earth constituents of this type:

Mechanical analyses of Hagerstown stony loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
10218	½ mile W. of Monte Sano Hotel.	Brown heavy loam, 0 to 8 inches.	2.77	1.58	3.60	3.14	9.06	6.12	41.90	34.44
10219	Subsoil of 10218.....	Yellow stiff clay, 8 to 36 inches.	1.17	1.04	1.96	1.58	4.88	4.66	40.94	44.90

DE KALB FINE SANDY LOAM.

The De Kalb fine sandy loam is a compact sandy loam from 8 to 12 inches in depth, resting on a subsoil with similar characteristics as the soil, but becoming more loamy as the depth increases. Occasionally, along the outer edge of this type, fragments of sandstone are found scattered over the surface.

This type has the smallest extent of any of the soils of the area, and occurs on the highest points of Monte Sano in the form of a narrow plateau. It has been derived from a Carboniferous sandstone.

Very little of this soil is under cultivation, and unless heavily fertilized the crop yields are small. With proper care and cultivation it is apparently well adapted to fruit and truck.

The principal timber growth is chestnut oak, and in the fall the ground is thickly strewn with mast, which makes excellent feed for hogs.

The following table gives mechanical analyses of typical samples of the fine earth portion of the soil and subsoil of this type:

Mechanical analyses of De Kalb fine sandy loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.		Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	
10216	Monte Sano Hotel.	Yellow sandy loam, 0 to 10 inches.	1.02	0.36	1.44	8.84	44.00	8.14	24.88	11.94	
10217	Subsoil of 10216....	Yellow sandy loam, 10 to 36 inches.	1.10	.18	1.00	6.22	36.34	7.56	33.70	14.68	

HAGERSTOWN SILT LOAM.

The soil of the Hagerstown silt loam is a yellowish-gray loam from 8 to 10 inches in depth, frequently containing gravel and small fragments of chert and cherty limestone. The soil rests on a stratum of yellowish clay loam, from 6 to 12 inches thick, which is in turn underlain by a yellow clay. Varying proportions of rock fragments similar to those in the soil occur in both the clay loam and clay strata of the subsoil. The virgin soil has a greasy feel, and is quite loamy, while that which has been cultivated for several years, and contains organic matter in much smaller quantities, assumes a character more like that of a heavy sandy loam.

Probably 50 per cent of the Hagerstown silt loam contains a small amount of gravel and small stones, composed of chert and cherty limestone, in the soil and subsoil. But it is very seldom that this coarse material is plentiful enough to make cultivation difficult.

Underlying this soil type at a depth of from 3 to 10 feet is usually found a stiff red clay, with the same character as the subsoil of the Hagerstown loam and the Hagerstown clay. Occasionally a narrow ridge, too small for representation on the map, may be found, where this clay comes to within 2 feet of the surface, and it has been noted that the timber growth is much larger and the soil more productive where this condition exists. Where a tract of land is spotted with such areas its value is considerably enhanced.

The Hagerstown silt loam extends in broad bodies over the northwestern part of the area, occupying about one-fourth of the total area surveyed. These bodies are separated by ridges of the Hagerstown loam, extending north as spurs from the broad areas of that type farther south. The principal one of these is the ridge upon which Athens is located.

The surface of this soil is flat or gently rolling, though small, hilly areas or knolls often occur, usually along the stream courses. Often these hills are so thickly strewn with chert and cherty limestone fragments that cultivation is impracticable unless they are removed. These extremely stony areas are very small, although a tract of land may often be spotted with them, making it less desirable for general farming. They are found, with but few exceptions, in Madison County and the extreme eastern part of Limestone County, principally along Limestone Creek and its tributaries.

The Hagerstown silt loam is locally known as the "Barrens," and probably less than 50 per cent of it is under cultivation. It is covered with a thick growth of scrub, red, and post oak, with here and there some pine. Near the stream courses the timber is much larger, and tulip and hickory are often found. Twenty years ago this soil was considered worthless, and little if any of it was cultivated. It is deficient in organic matter, and after one or two years of cultivation in cotton this constituent becomes exhausted and a decided decrease takes place in the crop yield. Where rotation of crops has been practiced, and both barnyard manure and fertilizers applied, the soil has retained its productiveness, and fair crops are being produced on fields that have been in cultivation for ten years or more. While the farmers ascribe the rapid decrease in the productiveness of this soil to the loss of fertilizers due to the porous nature of the soil and subsoil, the subsoil seems to be quite tenacious and retentive of moisture, and it is more probable that the lack of organic matter is the chief factor in the reduction of yields. Most of the productive portions of this type occur where it grades into the Hagerstown loam, and the greater part of this phase is now under cultivation.

This soil will yield, on an average, about one-fourth of a bale of cotton per acre, and 10 to 15 bushels of corn. The soil seems well adapted to truck and fruit, especially sweet potatoes, grapes, and apples, all of which are grown quite extensively in some localities. The price of the Hagerstown silt loam ranges from \$3 to \$10 an acre.

The table following gives mechanical analyses of the fine earth of typical samples of the soil and subsoil of this type.

Mechanical analyses of Hagerstown silt loam.

No.	Locality.	Description.	Organic matter.	Gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0.0001 mm.
				<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
10212	2 miles SE. of Fairmount.	Light-gray loam, 0 to 10 inches.	1.05	0.38	0.64	1.54	9.12	10.52	60.26	17.56
10214	1½ miles SW. of Athens.	Light-gray loam, 0 to 10 inches.	.95	1.60	1.50	.84	3.40	5.78	67.62	19.26
10210	¼ mile S. of Coalton	Light-gray loam, 0 to 10 inches.	1.06	.84	1.06	1.22	8.12	7.12	62.18	19.32
10213	Subsoil of 10212....	Yellow clay, 10 to 36 inches.	1.01	.88	3.26	5.46	13.84	9.14	52.38	15.04
10211	Subsoil of 10210....	Yellow clay, 10 to 36 inches.	.80	.88	3.94	2.36	10.82	4.48	52.94	24.46
10215	Subsoil of 10214....	Yellow clay, 10 to 36 inches.	.37	.84	1.20	.66	3.14	4.94	63.62	25.60

AGRICULTURAL CONDITIONS.

For convenience in discussing agricultural conditions the area will be divided into three sections, as follows: First, the river soils, which include the Tennessee River bottoms and rolling land that is badly washed and in a poor state of cultivation, extending back from the bottoms a distance of from 1 to 3 miles. Second, the fertile limestone valley lands north of the river soils, which extend across the central portion of the map west of Monte Sano. Third, the "Barrens," occupying the northwestern portion of the map. Each of these three divisions has distinct agricultural characteristics.

The plantations on the river soils are usually large, and consist of both bottom and upland. The principal crops grown are corn and cotton. The corn is planted in the bottoms and the cotton on the uplands. The Clarksville clay, which occurs along the Tennessee River, is productive and well adapted to corn, and it is on this soil that a large part of the corn grown in the area is produced. More hogs are raised on the river plantations than in any other part of the area. A great many cattle are also found on these plantations, as this same type of soil is well adapted to grass and hay, and the canebrakes that remain uncut furnish good winter pasturage. The canebrakes are not extensive, and are gradually being cleared and brought under cultivation. It also seems that extensive grazing has a tendency to kill the cane, and it is only a matter of time until these brakes will cease to exist. Unless a plantation on the river soils is composed in part of bottom lands very little profit can be realized, as the upland

soils are thin and badly washed. Very little attention is being given to the reclamation of these upland soils.

The river-bottom farms are usually cultivated on the share system, although a few are rented for cash, in which case the price varies from \$2 to \$5 an acre, depending on the quality and location of the land. Many of the leading farmers cultivate a portion of the farm with labor hired by the day or month, and the remainder under the share system. The usual price for labor ranges from \$9 to \$10 a month, with board and lodging. The share system is the same as that found in many other parts of the South. The landlord furnishes the land, live stock, farm implements, seed, fertilizer, etc., while the tenant furnishes the labor, and in return receives one-half of the crop grown. A mortgage is taken by the landlord on the tenant's half of the crop for the supplies furnished him during the year. After this is paid the tenant receives the remainder. When cotton is worth as much as 10 cents a pound the tenant usually realizes a profit, but when the price is low he often can not pay for his yearly supplies. Some of the farmers live on and operate their plantations, while others live in the towns and employ overseers.

The limestone valley soils which lie north of the river soils constitute the most fertile part of the surveyed area. The farms, as a rule, are much smaller than those on the river soils, although there are some in the vicinity of Greenbrier and Bellemina, and in a few other sections, which cover tracts of several thousand acres. They are in a comparatively high state of cultivation, and improved with well-built houses, outbuildings, and fences. Some of the farms in this part of the area have been allowed to run down, but these could be improved very readily, as the naturally strong soils respond quickly to proper methods of cultivation. On these valley soils all the crops grown in the area may be produced, and they are the most desirable soils for general farming. While cotton and corn are at present the principal crops grown, the production of other crops is gradually increasing.

The "Barrens," occupying the northwestern corner of the map, and represented as Hagerstown silt loam, contain more forest than any other part of the area. They constitute the most extensive areas of unproductive soil in the region surveyed, and it is only within the last ten or twelve years that they have been extensively cleared and cultivated. The greater part of this land is farmed by Germans, who have bought small tracts in different parts of this section. These people are among the most energetic farmers in the State and are making a good living and some profit on a soil that was once considered almost worthless, at the same time bringing the soil into a high state of cultivation. These farmers are not dependent entirely upon cotton and corn, as is the case over the greater part of the area, although they

raise a great deal of each. They raise cattle and hogs, and often have a small flock of sheep, to which the land is well adapted. They produce considerable quantities of sweet and Irish potatoes, and other kinds of truck, which command a good price in the local markets. They also grow quite extensively grapes and apples, to which the soil seems well adapted. The grapes are usually made into wine, which is sold on the local market at an average price of \$1 a gallon. They practice the rotation of crops, with careful and thorough cultivation, and use chiefly barnyard manure in fertilizing their fields.

The "Barrens" have the appearance of a newly settled country. Many of the fields contain the stumps from the original timber growth. Clearing is being carried on, new roads constructed, and many buildings erected. While small farms occur throughout the "Barrens," and a few large farms are found here and there in this region, probably less than 50 per cent of this land is under cultivation. New settlers are coming in, however, and it is being rapidly cleared. There are many areas well adapted to sheep raising that could be bought at a low figure.

The area as a whole is susceptible of improvements that would make it one of the most prosperous farming sections of the State. The products are cotton, corn, cowpeas, the small grains, clover, sorghum, grass, and hay, as well as nursery stock and fruit. While not all of these products are grown extensively, they are all, with one or two exceptions, well adapted to the soils. The acreage of cowpeas is increasing each year. This crop is grown both to add plant food to the soil and for the hay, which brings a good price. Cowpeas are usually sown after wheat or oats and in a good season give from 1 ton to 2 tons of hay per acre, worth in the fall from \$9 to \$10 a ton and in the late winter from \$15 to \$16 a ton. The hay is thus worth almost as much as the preceding grain crop.

The principal grasses used for grazing and making hay are Bermuda grass, orchard grass, herd grass, and tall meadow oat grass. All do well, but are not grown very extensively. A large acreage is planted in sorghum for forage and molasses. Crimson clover, barley, and rye are sown for winter pasturage. Wheat grown in the area is said to be harder than the winter wheat grown farther north and to make a better grade of flour. When the northern wheats are planted here they also produce a harder berry. The price of wheat ranges from 10 to 15 cents higher than on the Chicago market.

The growing of nursery stock is a very important industry in the area. The largest of the nurseries are owned by northern men who have come here to take advantage of the low price of land and labor. The soils and climate induce rapid growth, and the trees are as healthy as those grown in the North. There are several large nurseries and a

great many small ones within and around the area. The largest of these was not included in the survey. Probably between seven and eight millions of fruit trees, shrubs, and other trees are shipped annually from the area. A great many of the pear and cherry seedlings are imported from France, the cherry coming almost entirely from that source. The French trees seem to be of a healthier growth, and can be bought much cheaper than they can be grown in the United States. The soils seem to be especially adapted to pears, cherries, plums, and peaches. The cherry trees are said to be of a very superior quality, and more of these than of the other fruits are grown. The nurseries are located on the Hagerstown loam and Hagerstown clay.

Fruit could be profitably raised to a much greater extent than at present. There are many areas of the Hagerstown stony loam on which apples would produce large yields, and it is surprising that in these mountains, so admirably adapted to this fruit, so few orchards of any consequence exist. Grapes and peaches would also succeed on the mountain soils.

The number of cattle and hogs in the area is gradually increasing. The cattle, as a rule, are a cross between the native scrub stock and the Jersey breed. Some interest is being taken in improved breeds, and there are some fine herds of Jersey and Shorthorn blood owned in the area. The hogs raised are principally Poland-China, Berkshire, and Duroc-Jersey. There are some registered animals among nearly all the breeds of both cattle and hogs. Several good breeds of horses and some mules are also produced.

There are a great many northern settlers in the area, and both northern and southern methods of cultivation are practiced, each class showing a tendency to grow the crops to which they have been accustomed. Yet, even with the diversification found here, with the exception of cotton and nursery stock, not nearly enough is produced to satisfy the home demand.

Large quantities of timber, consisting of hickory, oak, gum, tulip, and chestnut, have been cut from the area, and the supply is now nearly exhausted. Very few large timber tracts are left, although the industry is still being carried on. The lumber is floated down the Tennessee River to Decatur, and hauled to Huntsville, Athens, and some of the smaller towns. Large quantities are used in manufactures in Huntsville and Decatur.

The county roads consist of many pikes and well-graded roads, which make hauling from the farms to the railroads very easy. There are no farms more than 10 or 12 miles from a railroad.

The area is traversed by three railroads: The Southern Railway, the Nashville, Chattanooga and St. Louis Railroad, and the Louis-

ville and Nashville Railroad. These furnish direct transportation to Birmingham, Memphis, Chattanooga, and Nashville. The Southern Railway runs diagonally across the area from northeast to southwest. The Nashville, Chattanooga and St. Louis Railroad runs along the eastern edge, while the Louisville and Nashville Railroad extends along the western border in a north-and-south direction. A few small boats run on the Tennessee River, and are used to a limited extent for transporting farm products.

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