

U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS—MILTON WHITNEY, Chief.

---

# SOIL SURVEY OF MADISON COUNTY, KENTUCKY.

BY

A. M. GRIFFEN AND ORLA L. AYRS.

---

[Advance Sheets—Field Operations of the Bureau of Soils, 1905.]



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.

1906.

[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.]

U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS—MILTON WHITNEY, Chief.

---

SOIL SURVEY OF MADISON COUNTY,  
KENTUCKY.

BY

A. M. GRIFFEN AND ORLA L. AYRS.

---

[Advance Sheets—Field Operations of the Bureau of Soils, 1905.]



WASHINGTON:  
GOVERNMENT PRINTING OFFICE.  
1906.

## LETTER OF TRANSMITTAL.

---

U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., May 24, 1906.*

SIR: The problems of the introduction of new crops and of the handling of the soils of the plateau region of west-central Kentucky have been suggested to this Bureau at various times through letters from the citizens of this general region. In order that the work in this investigation might be begun a survey of Madison County, Ky., was directed for the field season of 1905.

I have the honor to transmit herewith the map and report on the Madison County area, Kentucky, and recommend the publication of this report as advance sheets of the Field Operations of the Bureau of Soils for 1905 as authorized by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

Hon. JAMES WILSON,  
*Secretary of Agriculture.*

## CONTENTS.

---

	Page.
SOIL SURVEY OF MADISON COUNTY, KENTUCKY. By A. M. GRIFFEN and ORLA L.	
Ayrs.....	5
Location and boundaries of the area.....	5
History of settlement and agricultural development.....	5
Climate.....	6
Physiography and geology.....	7
Soils.....	8
Hagerstown loam.....	8
Hagerstown clay.....	10
Hagerstown stony clay.....	11
Wabash silt loam.....	11
Dekalb loam.....	12
Dekalb fine sandy loam.....	14
Dekalb silt loam.....	14
Dekalb shale loam.....	16
Cumberland loam.....	17
Guthrie clay.....	18
Muck.....	19
Rough stony land.....	19
Riverwash.....	19
Agricultural methods.....	20
Agricultural conditions.....	22

---

## ILLUSTRATIONS.

---

### TEXT FIGURE.

	Page.
FIG. 1. Sketch map showing the location of the Madison County area, Kentucky....	5

### MAP.

Soil map, Madison County sheet, Kentucky.



# SOIL SURVEY OF MADISON COUNTY, KENTUCKY.

By A. M. GRIFFEN and ORLA L. AYRS.

## LOCATION AND BOUNDARIES OF THE AREA.

Madison County is situated in the east-central part of the State of Kentucky and is included approximately between parallels  $37^{\circ} 30'$  and  $37^{\circ} 55'$  north latitude and meridians  $84^{\circ} 04'$  and  $84^{\circ} 30'$  west longitude. It comprises an area of 279,808 acres, or about 437 square miles. It forms the southeast corner of that part of Kentucky known as the "bluegrass section," though this term can not be applied to all portions of the county. The Kentucky River in its winding course forms the county boundary on the northeast, north, and northwest,

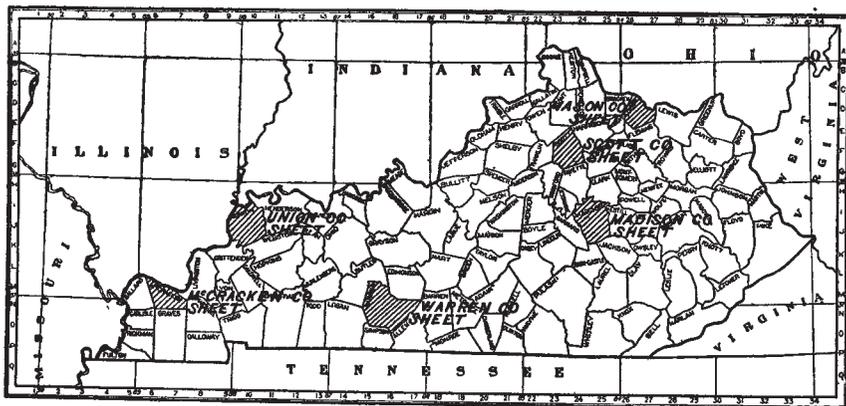


FIG. 1.—Sketch map showing location of the Madison County area, Kentucky.

and separates Madison County from Clark, Fayette, and Jessamine counties. The county is bounded on the east by Estill County, on the south by Jackson and Rockcastle counties, and on the west by Garrard County. Richmond, the county seat and largest town, is located nearly in the center of the county. Berea, in the southern part, is also a town of considerable importance.

## HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

The first permanent settlement in the region now included within the limits of Madison County was made in the spring of 1775, as the result of an expedition from Rutherford County, N. C., led by Daniel

Boone. A point upon the Kentucky River was selected for the site of the frontier town, called Boonesboro, and small forts were built here and at Fort Estill and several other points for protection against the hostile Indians. Immigration from North Carolina and Virginia increased rapidly after the close of the Revolutionary war. The productive and easily tilled soils of the region were in striking contrast with the rough country from which many of the settlers came, and the natural advantages thus offered for agricultural pursuits account for the settlement and early growth of the county. Soon after Kentucky was admitted into the Union as a State Madison County was reduced to its present size and the county seat changed from Milford to Richmond. The population of the county, in common with that of a large part of the State, is mostly native born.

Madison was one of the border counties during the civil war and suffered considerably from guerrilla warfare.

The early farm products of the county consisted of corn, wheat, and tobacco, and were floated down the Kentucky, Ohio, and Mississippi rivers and marketed in New Orleans. Wheat does not hold the place it once did in the list of products. Except during the early period of settlement, stock raising has been and is now the leading industry on the farms of the county.

#### CLIMATE.

The climatic conditions in Madison County are similar to those prevailing over the greater part of central Kentucky. There are no extreme temperatures in winter or summer. In the following table the normal monthly temperature and precipitation are given for as many months of the year as are available from the records kept at Richmond, while complete figures for the year are given from the Weather Bureau station at Lexington, situated in an adjoining county. Though usually sufficient for crop purposes, the rainfall varies considerably from year to year. At Richmond the average date of the last killing frost in spring is April 12 and of the first in fall October 16.

*Normal monthly and annual temperature and precipitation.*

Month.	Lexington.		Richmond.		Month.	Lexington.		Richmond.	
	Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.		Temper- ature.	Precipi- tation.	Temper- ature.	Precipi- tation.
	° F.	Inches.	° F.	Inches.		° F.	Inches.	° F.	Inches.
January.....	33.1	4.82	.....	.....	August.....	74.0	3.52	75.5	2.94
February.....	36.2	3.70	.....	.....	September...	68.9	2.54	70.7	2.30
March.....	42.6	4.90	.....	.....	October.....	55.8	2.22	58.0	2.33
April.....	55.9	3.72	55.2	3.40	November...	44.5	3.72	46.0	2.78
May.....	63.0	3.49	65.4	3.38	December...	38.6	3.40	34.4	2.70
June.....	73.6	4.25	73.6	3.62	Year...	55.1	45.38	.....	.....
July.....	75.4	5.10	77.1	3.64					

## PHYSIOGRAPHY AND GEOLOGY.

Madison County lies largely in that part of the State known to geologists as the Lexington peneplain. In the area surveyed the general elevation of this plain above sea level is from 800 to 900 feet, only a few points reaching an elevation of 1,000 feet. The Kentucky River makes a semicircuit of the county on its northern side and flows through a narrow, deeply eroded valley whose sides are prominent bluffs and precipitous cliffs from 200 to 300 feet high. All the main creeks of the county flow in a northward direction and empty into this river, whose level is about 550 feet above sea level. Starting from the comparatively high elevation of 900 feet the streams have a rapid descent until the river level is reached, and in their progress have carved out deep, narrow valleys, their side tributaries making deep indentations into the long ridges. These streams are all actively engaged in deepening their channels, which accounts for the absence of extensive bottom lands along their courses. In the central part of the county and about the stream heads the topography is gently rolling, and in the eastern part there are some quite extensive level areas.

A less extensive physiographic division consists of a series of rough and broken hills, locally called mountains, rising about 500 feet above the plain in the southern and southeastern parts of the county. These are probably the remains of a former higher plain which has been so cut and eroded as to form the sharp peaks and narrow ridges now characteristic of this section of the county.

Geologically,<sup>a</sup> the area surveyed presents some very interesting features. A large number of members of the Paleozoic age are found exposed, extending from the Lower Silurian period to the Carboniferous. In nearly every case each formation is represented by a distinct type of soil. The rocks are all stratified deposits laid down in an ancient ocean, and are inclined slightly to the southeast, which is accounted for by their position upon the southern slope of the great Cincinnati anticline. The lowest members, in the western part of the county, consist largely of limestones, showing that they were deposited in a comparatively deep and quiet water. The later deposits of shales indicate a shallower and more sediment-laden condition of the sea.

The principal soil-forming rocks in the western and central parts of the county are a fine-grained calcareous sandstone, known as the Garrard sandstone, and the Richmond limestone formation, from which are derived the Dekalb loam and the Hagerstown series of soils, respectively. These formations are part of the group now

---

<sup>a</sup> The discussion of the geology of Madison County is based principally upon information obtained from the Richmond folio of the U. S. Geological Survey.

classified as Cincinnati. In the eastern part of the county the Richmond limestone passes into a series of greenish shales, probably corresponding to the Clinton or Niagara, and named Panola by the U. S. Geological Survey. Over this is found an Upper Silurian limestone, which weathers to a rusty brown. The Devonian era is represented by a series of black shales, which give rise to the Dekalb silt loam. The principal mountain formation is the Waverly, a subcarboniferous shale, overlying which there is usually a capping of Newman limestone, as well as some sandstone and conglomerate. A few of the tops of the high, isolated hills or mountains are covered by coal-bearing shales.

The predominating surface formations in the eastern part of the county are but a few feet in thickness, a feature which is responsible for a change of soil type with any considerable change in topography. In the extreme eastern part there are limited deposits of clays and fine sands classed as of Neocene age. Sink holes are sometimes found in the Richmond formation, but these are not numerous.

The rocks of the area are utilized to a considerable extent as road material, and certain kinds are used in constructing stone fences and foundations for buildings. Brick kilns are established at several points, and an excellent pottery clay is worked to a limited extent in the vicinity of Waco.

#### SOILS.

Owing to the diversified character of the geological formations outcropping within the area, 13 different types of soil were found in Madison County. Over one-half the entire area is occupied by limestone soils, while those derived from shales are next in importance. The following table shows the actual and relative extent of each type:

*Areas of different soils.*

Soil.	Acres.	Percent.	Soil.	Acres.	Percent.
Hagerstown loam.....	107,072	38.3	Cumberland loam.....	4,288	1.5
Hagerstown clay.....	43,392	15.5	Rough stony land.....	1,728	.6
Hagerstown stony clay.....	33,792	12.1	Dekalb fine sandy loam.....	832	.3
Dekalb silt loam.....	31,424	11.2	Muck.....	320	.1
Dekalb loam.....	20,800	7.4	Riverwash.....	128	.0
Dekalb shale loam.....	18,880	6.8			
Wabash silt loam.....	12,672	4.6	Total.....	279,808	.....
Guthrie clay.....	4,480	1.6			

#### HAGERSTOWN LOAM.

The Hagerstown loam is the most extensive, as well as the most valuable, type of soil in the county. It is locally known as "blue-grass land." The soil is a brown or dark-brown very heavy loam, silty loam, or clay loam from 8 to 18 inches deep, with an average

depth of about 12 inches, becoming lighter in color with depth and grading into a heavy, dark-yellow clay subsoil, which in turn usually rests upon solid limestone rock 5 or 6 feet below the surface. Occasionally the subsoil has a reddish or reddish-brown tinge, but its usual color is yellow. In some localities the soil is of a yellow or light-yellow color, with a gray surface, and in many places it contains small iron concretions and nodules of cherty material. As a rule, this type contains very little or no rock débris. The main difference between it and the typical Hagerstown clay is in the greater depth of the brown loamy top soil and the greater depth to bed rock.

The Hagerstown loam is found principally in the western and central parts of the county, extending north and south in a wide and rather irregular belt, broken by areas of the Hagerstown clay, which borders the stream courses. The topography of the type is gently undulating or rolling, which insures almost perfect natural drainage.

It is a residual soil and owes its origin to the disintegration, in place, of bedded limestone. The western edge of the belt of this type is coincident with the running out of the limestone, its place as a surface formation being taken by the Garrard sandstone. In some areas the soil is derived from the upper shaly members of the Richmond formation, and instances were observed where the soil was formed from the limestone, but was influenced to a certain extent by small disintegrated portions of the shale, which were left as a result of incomplete erosion.

The Hagerstown loam for the most part was originally covered with a growth of hickory, oak, black walnut, locust, and maple, with a papaw and wild-cane undergrowth. It was one of the first types of soil in the county to be used for farming purposes, and now practically all of it is under cultivation. Upon this type are to be seen a number of those old colonial mansions which are found scattered over much of the bluegrass region of Kentucky.

The Hagerstown loam is well suited to a variety of crops, including corn, wheat, clover, oats, rye, hemp, tobacco, millet, hay, and bluegrass. Its adaptability to corn, forage crops, and pastures has tended to make stock raising the most important farm industry. The luxuriant pastures seen upon this type surpass those of some of the bluegrass counties farther north, since as a rule the soil is deeper and better able to withstand drought. The leading crops grown at present are corn, wheat, hay, and tobacco. Corn produces from 25 to 70 bushels per acre, averaging about 50 bushels; wheat from 12 to 16 bushels; tobacco 1,000 pounds, and hay from 1 to 1½ tons per acre. The yield of wheat, as well as the acreage in this crop, has decreased during the last few years, while tobacco and hemp are being more extensively grown.

The market value of the Hagerstown loam has increased rapidly within a few years, the price now ranging from \$50 to \$130 an acre, according to location and improvements.

The following table gives the average results of mechanical analyses of samples of this soil:

*Mechanical analyses of Hagerstown loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13265, 13580, 13784, 13786, 13794.	Soil.....	1.5	2.9	1.2	1.8	3.4	61.0	27.9
13266, 13581, 13785, 13787, 13795.	Subsoil.....	1.5	3.0	1.3	1.6	2.4	57.1	32.8

#### HAGERSTOWN CLAY.

The Hagerstown clay to a depth of 3 or 4 inches usually consists of a dark-brown or yellowish clay loam or clay, grading into a very heavy dark-yellow clay subsoil. As a rule solid limestone rock is encountered 25 or 30 inches below the surface. Sometimes there is practically little or no difference in texture between soil and subsoil, both being a heavy clay. Some rock fragments and occasional outcrops of the bed rock are found in nearly all of such areas.

The type as mapped covers a wide range of soil conditions. The weathering of thin beds of massive limestone, in connection with the shales which directly underlie it, has formed a phase of the Hagerstown clay which in a single field often varies widely. In one place this may be a stiff, tenacious yellow or tan-colored clay 3 feet deep, in another place a light-yellow clay a few inches deep, underlain by lighter shaly material, while in other small spots it may be a greenish or drab heavy "soapstone" clay mingled with pieces of shale. This phase also occurs to a considerable extent in and coincides with a part of the badly washed and eroded sections in the northeastern part of the county.

The Hagerstown clay is found in all parts of the county, except the southern end. The clay areas are not broad, as a rule, but they are very numerous and border many stream courses. Through the central part of the county the soil is usually typical. With the deepening of the valleys toward the river and larger creeks which border the county there is a corresponding thinning of the soil covering their sides and an increased exposure of rocky material.

The Hagerstown clay is naturally well drained. Over much of the type, owing to its rough and steep topography, drainage is so rapid and excessive that serious damage from erosion has resulted.

The formation of this soil is due to the weathering in place of thin-bedded limestone, most of which belongs to the Richmond formation. There is a great contrast in the agricultural value of different parts of

the type. Some areas, especially about the stream heads, compare favorably with the Hagerstown loam in productiveness, but the type as a whole is not so desirable. It is more difficult to work, and being a comparatively shallow soil it lacks the power to conserve a large quantity of moisture. There is also a tendency during a dry season to bake and become hard. Where not too badly eroded, the type is devoted to corn, tobacco, and pasture. In the western part of the county corn grown on this soil produces from 30 to 45 bushels per acre, and tobacco about 1,000 pounds per acre. Many of the clay hillsides, lying below the Dekalb loam, have received a certain amount of material washed from that type, making them especially suitable for the growing of Burley tobacco.

The following table gives the average results of mechanical analyses of the fine earth of Hagerstown clay:

*Mechanical analyses of Hagerstown clay.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13259, 13782.....	Soil.....	1.0	3.3	1.4	1.9	2.2	46.9	42.9
13260, 13783.....	Subsoil.....	.3	2.9	1.3	1.9	2.1	39.4	51.8

HAGERSTOWN STONY CLAY.

The Hagerstown stony clay, in both soil and subsoil, is very similar to the Hagerstown clay. It is distinguished from the latter type by the quantity of stones or rock fragments it carries and by its rougher topography. The stones for the most part consist of flat slabs of thin-bedded limestone, with a few ledge outcrops. Although interfering seriously with cultivation, they are not so numerous as to preclude agriculture entirely except in a few cases. The greater part of the type occurs in the western portion of the county, while many small areas are found in the northern and eastern sections along the streams. Like the Hagerstown clay, the soil owes its origin to the weathering in place of thin-bedded limestone. Because of its topography it is a well-drained soil, and is often badly eroded. Where cultivated, the principal crops are corn and tobacco, and the yields are usually good.

WABASH SILT LOAM.

The Wabash silt loam is the only bottom-land soil in the area, and is of relatively small extent. The soil to a depth of 12 or 15 inches usually consists of a very heavy, dark-brown or nearly black silty loam or clay loam. The subsoil is a brown or slightly mottled clay. The type occurs principally along the creeks and smaller streams of the county in strips from one-eighth to one-fourth of a mile in width. The narrow flood plain of the Kentucky River has also been included

in this type. Owing to the lighter material about the headwaters of this river, as well as the greater sorting power of the larger stream, the soil here is of a more variable texture than that found in the areas bordering the creeks. On the immediate river bank the soil is sometimes sandy, while in other parts of the bottom it may have a heavier texture than the average for the type.

The Wabash silt loam is a sedimentary soil, composed of stream deposits laid down in times of high water. Along some of the creeks it is not more than from 2 to 4 feet deep, resting upon a rock floor which is nearly level with the stream bed. The most of the type is overflowed occasionally, but never during the growing season. Sycamore is the usual timber growth.

Composed, as it is, of wash sediments from the fertile uplands, it is a very productive soil, and is highly esteemed for farming purposes. Practically all of the type is cleared and under cultivation. The larger proportion of it is planted to corn nearly every year, the yield ranging from 40 to 85 bushels per acre. Considerable areas are also devoted to pasture and the production of hay, the usual yield being from 1 to 2 tons per acre, even in an unfavorable year. Sorghum and millet are grown to a small extent. It is often difficult to work the soil early in the spring, thus making the crops later than upon the upland soils. It is difficult to arrive at the value of this soil per acre, as it is seldom sold separately, but it is always considered the most valuable part of the farms upon which it occurs.

The following table gives the average results of mechanical analyses of the Wabash silt loam:

*Mechanical analyses of Wabash silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13261, 13778.....	Soil.....	1.1	1.8	1.0	1.9	5.1	61.6	27.4
13262, 13779.....	Subsoil.....	1.6	2.1	1.3	2.4	4.6	55.6	32.3

DEKALB LOAM.

Excepting possibly the Hagerstown loam and the Wabash silt loam, the Dekalb loam, or "sandstone" land, as it is locally termed, is the most highly esteemed soil in the county. As typically developed the soil is a fine-textured loam of a light-brown or yellowish color, from 10 to 15 inches deep, the immediate surface covering sometimes having a gray, silty appearance. Becoming heavier in texture and lighter in color with increase in depth, it grades into a light-yellow silty clay or clay subsoil, often mottled with gray or drab, which extends to a depth of 3 feet or more and finally passes into a mass of freshly disintegrated sandstone resting upon bed rock. Sandstone fragments are usually

scattered over the surface to some extent, and a boring often passes through pieces of partially disintegrated rock. Irregular ferruginous concretions or "iron stones" are sometimes found.

The Dekalb loam is found in the western part of the county, the smaller areas appearing at intervals along the western and northern edges, near the Kentucky River. The largest area is found along Posey Ridge, a high divide between Silver and Paint Lick creeks. The next largest area is found on the ridge between Silver and Tate creeks, commencing about 4 miles west of Richmond. Not infrequently small patches of limestone soil are found associated with the areas of this type.

The Dekalb loam occupies a deeply eroded and dissected portion of the county, although the ridges in some cases are quite broad and gently rolling. The valleys of the small streams flowing through the main areas of the type have exceedingly abrupt terminations and steep sides, and in most cases the soil extends for a distance down these slopes. The soil is well drained, and in some locations washing is likely to occur. The nature of the soil is favorable to the retention of moisture, and it is better able to withstand drought than are the limestone soils.

The Dekalb loam is a residual soil derived from a very fine grained, calcareous sandstone, known as the Garrard sandstone. As shown by chemical analysis, this formation contains a considerable quantity of calcium phosphate, which may account in part for the productiveness of the soil.

This type is considered the best tobacco soil in the county. The yield averages about 1,000 pounds per acre, and its quality is usually superior to that grown on the Hagerstown loam. It is also preferred by many for general farming purposes, since it is easily worked and does not suffer from drought. For permanent bluegrass pastures it does not equal the limestone soils, though there is considerable stock raising upon farms of this type. Corn yields from 35 to 60 bushels, hay from 1 to 1½ tons, oats from 35 to 50 bushels, and wheat about 15 bushels per acre. It is an excellent soil for potatoes, garden vegetables, melons, and small fruits. The value of the Dekalb loam ranges from \$30 to \$90 an acre.

The following table gives the average results of mechanical analyses of this type of soil.

*Mechanical analyses of Dekalb loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13263, 13788, 13790.	Soil.....	1.7	4.2	1.4	1.6	4.9	59.9	26.1
13264, 13789, 13791.	Subsoil.....	1.4	3.3	1.4	1.5	5.4	53.6	33.5

## DEKALB FINE SANDY LOAM.

The Dekalb fine sandy loam to a depth of from 10 to 16 inches is a brown or light-brown to gray fine sandy loam, underlain by a subsoil which varies from a heavy fine sandy loam to a sandy clay extending usually to a depth of 3 feet. Fragments of sandstone and shale are scattered over the surface and through the soil and subsoil, and sometimes bed rock is found within 3 feet of the surface.

This type occupies the narrow tops of some of the lower mountains, or hills, in the southeastern corner of the county. Its usually rolling topography, together with its high-lying position, insures good drainage. It is a residual soil, derived from weathered sandstone and sandy shale of the Carboniferous period, found capping some of the high, isolated hills or low mountains in this region.

Nearly all of the Dekalb fine sandy loam is cleared and in a cultivable condition. Corn is generally grown four years in succession, and then the land is allowed to remain idle for some time. A yield of from 18 to 30 bushels per acre is usually obtained. It is an excellent soil for small fruits and potatoes, but is little used for these crops.

The following table shows the results of mechanical analyses of the fine earth of this soil:

*Mechanical analyses of Dekalb fine sandy loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13578.....	Soil.....	Tr.	1.1	1.0	47.5	9.1	25.9	15.2
13579.....	Subsoil.....	0.1	.3	.4	44.0	9.5	24.2	20.5

## DEKALB SILT LOAM.

The soil of the Dekalb silt loam, to a depth of from 10 to 16 inches, consists of a light-yellow or yellowish heavy silt loam or silty clay, the immediate surface covering frequently having a light-gray color, especially when dry. The subsoil is a heavy silty clay or clay of a light-yellow color, usually mottled to some extent with gray, and rests upon a bed of black shale a few feet from the surface. Thin layers of hard siliceous concretions are sometimes found within a few inches of the surface.

There are two phases of this type of soil. The first phase consists of areas in which black shale fragments outcrop in spots upon the surface, forming a slaty soil which is more or less mixed with the dark yellow or slightly reddish clay material of the freshly disintegrated rock. Usually these areas are badly washed and are covered with a scrubby growth of timber. These shaly areas are indicated upon the map by the use of symbols. The second phase occurs in small, flat, poorly drained areas where the soil is an ashy gray or dirty white silty clay

grading into a heavy gray or drab mottled clay subsoil. This phase of the type has little value even when drained.

The Dekalb silt loam is found only in the southern and eastern parts of the county. In the eastern part the surface of the type is very nearly level, but farther south it becomes somewhat rolling. It also occupies the valley floors in this region. The rolling areas as a rule lie at the foot of the mountains and contain many slaty spots. Except in the rolling areas, the type is not naturally well drained nor does it hold moisture well during a dry season. Crops upon it suffer considerably during a drought. The soil owes its origin to the disintegration in place of thin-bedded black Devonian shales which are quite bituminous in certain sections. The composition of the soil has been influenced to a certain extent by the addition of wash material from higher elevations.

The natural forest growth consists of several species of oaks, besides some hickory, chestnut, and Virginia pine. When first cleared, the soil produces fairly good crops, but it becomes much less productive after two or three years' cultivation. The common practice has been to allow it to lie idle or in pasture for two or three years and then to plant it to corn again. The yield of corn ranges from 10 to 25 bushels per acre, the average being about 15 bushels. Some hay is grown, and a very little grain, principally oats. With good drainage and proper rotation of crops there is no reason why the Dekalb silt loam should not be made a productive soil for various crops. There is often difficulty in securing a good stand of clover, especially in a dry year, so it is not advisable to include that crop in the rotation. Cowpeas, however, will answer the same purpose of supplying humus and nitrogen to the soil, and at the same time will afford excellent feed for all kinds of stock. It is strongly recommended that this crop be more extensively grown upon this soil. During the past few years lespedeza, or Japan clover, has gained a foothold, and besides furnishing good pasture is improving the soil to a marked extent. The value of this type of soil varies from \$10 to \$20 an acre.

The following table gives the average results of mechanical analyses of samples of the Dekalb silt loam:

*Mechanical analyses of Dekalb silt loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13363, 13771, 13773.	Soil.....	2.0	1.9	0.7	1.3	4.5	70.0	19.1
13364, 13772, 13774.	Subsoil.....	1.2	1.7	.6	1.2	3.3	61.0	30.8

## DEKALB SHALE LOAM.

To a depth of from 6 to 9 inches the Dekalb shale loam is usually a light-gray silt loam or clay loam which becomes a dirty white color when dry. The soil grades into a gray, yellowish, or reddish clay subsoil. Light-colored shale fragments are usually present, but because of its position and derivation the type is far from uniform in this respect, even in small areas. On the smoother hillsides adjacent to the valley floors the clay subsoil continues to a depth of 3 feet or more and the shale fragments are not conspicuous. Higher up the slope the shale often constitutes a large part of the soil, and the bed rock is encountered within 18 or 24 inches of the surface.

The type is found principally in the southern and southeastern parts of the county. It occupies very steep hillsides, which are often badly eroded, especially where the forest covering has been removed. The soil is formed by the weathering of a thick stratum of thin-bedded shales of the Carboniferous period, designated as Waverly.

A phase of the Dekalb shale loam occurs in narrow strips in the southwestern and northeastern parts of the county. These areas contain outcrops of calcareous green shale, which in some cases have weathered to a greenish or almost white clay with the characteristics of soapstone, and in other cases have formed a gray sandy soil mixed with numerous shale fragments. Almost without exception the areas are badly washed and gullied and are practically worthless for agricultural purposes, except in a limited way for pasture. A light growth of cedar is frequently found upon this phase of the type.

The Dekalb shale loam is naturally the poorest soil in the county, and for the most part is covered with a growth of small timber, the largest trees having been removed. The most valuable timber is white oak; hickory, chestnut, and scrub pine are also found. Very little of the type is under cultivation, except the small strips forming the edges of the narrow valley floors. Along the hillsides of the Red Lick Valley fair crops of corn are produced, and other crops are sometimes grown with success.

In connection with the Dekalb shale loam, but not as a part of the type, should be mentioned a number of very small areas which play some little part in the agriculture of the so-called mountainous section, but which could not be shown upon the accompanying map because of their small extent. These are steep and very stony areas, seldom more than a few acres in extent, and are found well up on the hillsides directly under the limestone outcrop. The soil is formed by the combined wash material from the limestone and sandstone, or conglomerate which usually lies above it. Upon this dark, productive, sandy soil are found growing papaw, hickory, black walnut, poplar, and "sugar-tree." Where cleared and cultivated it produces from 35 to 40 bushels of corn per acre for a few years, and is then allowed to

grow up to bushes for a few years, after which it is again cleared and planted to corn. By judicious management these areas could be made to produce some crop every year.

The following table gives the average results of mechanical analyses of samples of fine earth of the Dekalb shale loam:

*Mechanical analyses of Dekalb shale loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13576, 13775.....	Soil.....	2.5	3.1	0.6	1.2	5.3	65.4	21.5
13577, 13776.....	Subsoil.....	1.8	3.3	.9	1.5	4.9	65.3	22.1

CUMBERLAND LOAM.

The soil of the Cumberland loam is a yellowish and sometimes gray, rather compact fine sandy loam from 10 to 14 inches deep, containing very little humus. The subsoil is a clay or loam of a light-yellow color, usually mottled with gray below 25 or 30 inches from the surface. Occasionally small areas, in the nature of "pockets," of fine yellow sand 3 feet or more in depth are encountered.

This type is found only in the northeastern part of the county, near the Kentucky River, where it occupies a number of rather broad, gently rolling hilltops. Though its surface drainage is not excessive, the soil dries out quickly after a rain and crops are liable to suffer from drought during the summer months.

The Cumberland loam, like two other minor soil types of the area, has been formed by deposition of materials in water rather than by the disintegration of rocks in place. The formation has been assigned, provisionally, to the Neocene age, and consists of unconsolidated stratified sands and clays laid down by the flood waters of an earlier stream than the present Kentucky River, which occupied a much higher, broader, and shallower channel.

Deposits of a superior pottery clay are found within a few feet of the surface in some parts of this formation.

This soil is not very productive, and the use of fertilizers is generally necessary to secure satisfactory crop yields. Under favorable conditions and proper fertilization corn yields about 20 bushels per acre. This is the principal crop grown at present, it being customary to grow corn successively for two or three years and then use the land for pasture for a number of years. As the soil is almost too light for clover, it is advisable to grow cowpeas in its place. Small fruits, berries, potatoes, and all kinds of vegetables do well.

The following table shows the average results of mechanical analyses of samples of the Cumberland loam:

*Mechanical analyses of Cumberland loam.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13703,13798.....	Soil.....	0.1	0.9	3.4	18.6	15.7	48.9	12.0
13704,13799.....	Subsoil.....	.1	.9	4.6	15.5	10.9	48.2	19.4

## GUTHRIE CLAY.

The soil of the Guthrie clay consists of a gray or ashy-gray silt loam varying in depth from 8 to 20 inches. The subsoil is a gray silty clay or mottled gray and yellow clay. Both the soil and subsoil usually contain a large number of small iron concretions. In a few small areas near Moberly and in one or two other places the soil is a very dark brown or nearly black clay loam with a clay subsoil. Large numbers of crawfish holes are found in all parts of the type.

The Guthrie clay occurs in the south and east central parts of the county in connection with the Hagerstown loam. It generally occupies nearly level areas, but sometimes occurs upon hillsides of considerable inclination. For the most part its natural drainage is poor, and the soil is in an acid condition. The heavy texture of the subsoil prevents the ready movement of water through it, thus giving rise to the poor drainage conditions.

This type is derived principally from some of the top portions of the Richmond formation, which have not been calcareous enough to weather down into a characteristic limestone soil.

Fairly good crops of corn are produced on this soil, the yields usually ranging from 20 to 35 bushels per acre. Aside from this its use is largely as pasture land. Grass does very well upon it in the early spring, but dries up during the summer months. Drainage, either by open ditches or by tile drains, and applications of lime would greatly improve the physical condition of the soil. It needs barnyard manure to increase its organic matter content, and the growing of cowpeas is also recommended.

The following table gives the average results of mechanical analyses of samples of the Guthrie clay:

*Mechanical analyses of Guthrie clay.*

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
13608,13796.....	Soil.....	9.1	5.7	0.7	2.5	8.9	59.8	13.2
13609,13797.....	Subsoil.....	6.5	5.0	.8	2.3	8.3	60.5	16.1

## MUCK.

The occurrence of Muck, locally known as "glade," is limited to a few small flat areas in the vicinity of Berea. To a depth of from 12 to 18 inches it consists of black organic matter containing a considerable admixture of earthy material. This is underlain by a heavy plastic brownish or drab clay, which becomes mottled with iron stains below 28 or 30 inches from the surface. The water table is usually within 3 or 4 feet of the surface even in the driest seasons.

The origin of the Muck is no doubt due to the existence in comparatively recent geological time of a body of water over the present areas. The fine clay sediments of the subsoil were deposited in this water, and the organic matter represents the decayed remains of vegetation which later obtained a foothold over the areas. Erosive agencies finally opened an avenue of escape for the water, and at present streams flow in two directions from the main Muck area.

Early attempts to grow crops upon this soil failed because of the deficient drainage and the acid nature of the soil, and it was considered almost worthless except for a limited amount of pasturage. A part of the Berea College farm located upon the type has been brought to a state of productivity by thorough tile drainage and the application of lime. At the present time these reclaimed areas will produce from 35 to 45 bushels of corn per acre.

## ROUGH STONY LAND.

The areas classified as Rough stony land consist partly of a line of rocky bluffs found along the Kentucky River in the northwest corner of the county. These are so steep and are covered with such a thin mantle of soil that they are worthless for any agricultural purpose. They are usually covered with a scrubby growth of timber. Other areas of Rough stony land, too small to be shown on the map, occur on the steep hillsides in connection with the Hagerstown stony clay. Areas of Rough stony land are also found about the tops of some of the mountains, or high isolated hills in the southern part of the county. The massive limestone of these areas has broken into various sized bowlders which are strewn along below the outcrop. The soil derived from the limestone is a very productive red clay, and small fields are sometimes planted to corn with excellent results. These areas were originally heavily forested.

## RIVERWASH.

Along a few of the larger streams within the county, notably Tate, Silver, Otter, and Paint Lick creeks, a few small areas are mapped as Riverwash. These are almost completely covered with waterworn rocks and small limestone slabs transported and deposited by the

streams in times of flood. This material usually rests upon a solid limestone floor. Occasionally a small patch of soil is found, but upon the whole the areas are worthless even for pasture.

#### AGRICULTURAL METHODS.

The system of agriculture and methods of cultivation now prevailing in Madison County are those which have been practiced for many years. While there are a great many farmers who are probably securing as large returns as is consistent with a proper maintenance of the productivity of the land, there are also a large number who are either not securing the best results or are allowing their farms to run down. In many cases the farmers have depended too much upon the natural productiveness of the soils, especially the limestone soils, and have neglected proper precautions to maintain the crop-producing power of the fields. There is little question that the productivity of most of the soil types can be permanently maintained, and in many cases increased, by the proper rotation of crops and the intelligent handling and application of such manures as are available.

Corn is the most important cultivated crop, and in many cases it has been grown upon the same land for several years in succession. This practice, however, is not so prevalent now as in former years. Except possibly upon some of the bottom lands, corn should not be grown continuously upon the same field except in rotation with other crops. Successive cultivation to this crop not only causes a decline in the productiveness of the soil, but also gives greater opportunity for the increase of the insect pests and diseases, which also lower the yields.

To prevent corn fodder from molding, it is generally necessary to cut it very late, after the leaves are dried up, and thus much of its feeding value is lost. The fodder is left in the field in large shocks and hauled and fed as needed through the winter months. The winters are often wet and comparatively warm and much of the fodder is spoiled and wasted. Upon a large number of farms where cattle are raised the better plan would be to grow fodder corn and store it in a silo for winter feed. By this method there is no loss of nutriment and the entire stalk is readily eaten by cattle. The loss in grain caused by sowing the corn thickly would be offset by the increased amount of fodder produced. A more careful selection of seed corn is also recommended.

It is the general custom to sow wheat upon corn land after the fodder is cut in the fall, without preparation of the land other than that given by the drill or harrow. The average yield of wheat per acre has decreased during the last few years, owing in a great measure to insufficient preparation of the land. The wheat is often of a some-

what inferior quality, but this or some similar crop is necessary to prepare the land for sowing grass after it has been planted to corn. Since one year in the rotation should be devoted to this crop, it should be made to produce as heavily as possible by thorough preparation of the seed bed. The increased yield of the crop and the benefit resulting to the soil from a more thorough preparation of the wheat land would, it is believed, more than pay for the added labor.

The rotation usually practiced by the best farmers consists of corn, wheat, clover, and then hay or pasture for a number of years. Clover should be grown at least every fifth or sixth year. Rye is sometimes sowed in the fall and plowed under in the spring. Care should be taken to do the plowing before the rye becomes too large, since if plowed when too high it makes the soil too loose. Alfalfa would probably prove a success upon the Hagerstown loam, Dekalb loam, and Wabash silt loam, and also upon the better areas of the Hagerstown clay. Its feeding value, as well as its beneficial effect upon the soil, is unquestioned.

In the eastern and southeastern parts of the county a systematic rotation of crops should be followed and better methods of cultivation practiced, besides applying all the manure possible. It is recommended that cowpeas be given an important place in the crop rotation. Lime in considerable quantities is also essential to successful crop production upon some of the soils in this region.

Tobacco should be planted on sod land as a rule, and followed by a crop of small grain. Successive crops of tobacco should not be grown except upon land recently cleared. It is believed that the growing of both tobacco and hemp more extensively on the Hagerstown loam would prove profitable. At present the largest acreage of tobacco is upon the steep hillsides in the western part of the county. Many of these hillsides have been cleared but a comparatively short time, and their virgin soil is well suited to tobacco. No fertilizer is used in growing this crop. Continuous cultivation of both tobacco and corn upon these hillsides is depleting the humus of the soil and causing serious erosion in many places. Unless more care is used upon the farms in this part of the county a few years more will find them much reduced in value.

Proper attention has not been given to the question of erosion on many of the farms in the area surveyed, and this neglect results in much loss every year. Even such simple methods as deep plowing and leaving a narrow strip of unplowed land, or plowing a back furrow as a contour line along a hillside, will serve to prevent much damage.

Under the system of crop rotation generally followed, much of the land is plowed but once every five or six years, and unless this one plowing is very thorough it does not pulverize the soil properly nor

prevent it from becoming too compact. The Hagerstown loam, Dekalb loam, and Wabash silt loam all admit of deep plowing, and in many cases subsoiling would be beneficial.

As a rule no shelter is provided for stock during the winter, and very little barnyard manure is saved and applied to the soil. It is believed that in many cases stock is allowed to run upon the fields too early in the spring, thus puddling the soil and making it more likely to bake hard during the summer months.

The cattle raised are mostly of the Shorthorn breed. Some corn is used for fattening the beef cattle. The extent of pasture allowed for each 3-year-old steer varies from  $2\frac{1}{2}$  to 5 acres, according to the season and the character of the land. Where land is valued at \$100 an acre this method of using it does not yield very large returns upon the money invested.

#### AGRICULTURAL CONDITIONS.

Taken as a whole, the farmers of Madison County are in a prosperous condition. The degree of prosperity varies in different parts of the county, owing principally to differences in the soils. Over the greater part of the county the farm dwellings are neat and well built, especially upon the Hagerstown loam areas, but except for an occasional tobacco barn the outbuildings are small. The farms are usually well fenced. Comparatively few of the farmers are burdened with debt.

The most striking departure from the general state of prosperity is found in the southeastern part of the county, which includes a slightly mountainous section. It is not often that a contrast is so great as that which is presented in the short distance between this section and the bluegrass lands of the county. The eastern section of the county is likewise not so favored by natural conditions as is the larger part of the county, but by intelligent management, good cultural methods, and proper rotation of crops many of the poorer farms can be made productive and profitable.

About 65 per cent of the farms in Madison County are operated by their owners. Many tracts of the Hagerstown loam are held by persons residing in Richmond or outside the county. Many owners reside upon their farms and rent the land to tenants. The share and the cash-rent systems are both practiced. The amount of rent depends not only upon the desirability of the land, but also upon the crop to be grown. Good pasture land rents for from \$4 to \$6 an acre, land for corn and hemp for from \$7 to \$10, and for tobacco for from \$12 to \$18. The latter crop is usually cultivated on shares. In the eastern section of the county the cash rents are much lower, averaging from \$3 to \$5 an acre, and much of the renting is done on the share basis. The desirability of the farms through the central part of the county is such that a tenant can always be easily found.

The size of the average farm is about 100 acres. In the central part of the county there are several holdings of from 300 to 500 acres, and some of the wild land in the southern end of the county is held in even larger tracts. In 1900 the average valuation of the improved farm lands in the county was about \$27 an acre, but since that time it has increased probably by 20 per cent.

The prevalence of stock raising over a large part of the county and the large acreage devoted to pasturage has made the labor problem less important than is generally the case in agricultural communities. Negro labor is mainly employed and is generally satisfactory. The wages paid vary from \$13 to \$18 per month, without board, but including a dwelling and fuel. Laborers hired by the day receive from 60 cents to \$1.20. Negroes compose about one-sixth of the population of the county.

The principal industry in Madison County is stock raising. According to the census of 1900 the value of live stock was \$1,719,462. The stock consists principally of heavy export steers but also includes large numbers of hogs, sheep, mules, and some thoroughbred horses.

Of the cultivated crops corn is the most important. The average yield for the county is about 30 bushels per acre. The yield in the bluegrass section is above this, but is offset by the lower yields in the eastern part of the county. The value of the wheat and tobacco crops was about equal in 1900, but at present that of the latter is the greater. The large number of new tobacco barns seen in the county indicates that the farmers intend to grow tobacco more extensively. White Burley is the most suitable and profitable variety, but some red Burley is also grown. A lack of competition among the buyers has resulted in low prices for a number of years, and at present an independent farmers' organization is being perfected to control the marketing of the crop. Some rye, oats, millet, sorghum, and potatoes are grown, but these are not important products. Sufficient fruit is grown for home consumption and to supply the local market at certain seasons of the year. The hemp crop is limited to a few hundred acres. While both clover and timothy are grown for hay, the latter is not in special favor, since when cut it leaves a rather bare, open stubble which does not later supply good pasture if the season be at all dry. Considerable bluegrass seed is harvested. Little dairying is done, except for the local market. Some forest products are shipped from Berea.

As a rule, the crops best suited to the various soils are now being grown upon them. The Wabash silt loam is best suited for corn, timothy, oats, sorghum, alfalfa, and pasture. The Hagerstown loam is adapted to a wide range of crops, including corn, wheat, oats, rye, millet, tobacco, alfalfa, clover, hemp, hay, and pasture. The Dekalb silt loam should be principally devoted to corn, oats, pea-vine hay, sorghum, vegetables, pasture, and the raising of young stock. Upon

the Cumberland loam should be grown corn, rye, oats, vegetables, pea-vine hay, berries, and fruits. The Dekalb loam will produce corn, wheat, oats, rye, tobacco, potatoes, hay, alfalfa, melons, vegetables, and fruits. The Hagerstown clay should be confined principally to corn, tobacco, hemp, oats, hay, and pasture.

The county is favored with excellent transportation facilities. A main line of the Louisville and Nashville Railroad between Cincinnati and Knoxville crosses the area from north to south, while a branch line from a point below Richmond reaches the southwest corner of the county. The Louisville and Atlantic Railroad passes through the area in a northwest and southeast direction. Excellent macadam roads radiate in many directions from Richmond and are being added to every year. The heavy clay subsoil makes some of the crossroads difficult to travel during wet weather. At the present time there is no direct means of communication between Richmond and Lexington, but it is expected that an electric railway line will soon connect these two points.

Cincinnati, 112 miles distant, is the nearest market of any size. To this city many of the lesser products of the county, such as poultry, calves, hogs, light cattle, etc., are shipped. The heavy export cattle are shipped direct to Jersey City or some other eastern point. Richmond furnishes a local market for the fruits and dairy products of the county, and on the monthly "court day" mules, sheep, horses, and cattle are brought to this place and disposed of either at auction or by private sale.

# **NRCS Accessibility Statement**

---

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at 1-800-457-3642 or by e-mail at [ServiceDesk-FTC@ftc.usda.gov](mailto:ServiceDesk-FTC@ftc.usda.gov). For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at <http://offices.sc.egov.usda.gov/locator/app>.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotope, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.