Issued July 29, 1915.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE TENNESSEE GEOLOGICAL SURVEY,
A. H. PURDUE, STATE GEOLOGIST.

SOIL SURVEY OF JACKSON COUNTY, TENNESSEE.

BY

R. F. ROGERS, OF THE U. S. DEPARTMENT OF AGRICULTURE,
AND J. H. DERDEN, OF THE TENNESSEE
GEOLOGICAL SURVEY.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1913.]

WASHINGTON:
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1915.

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., February 25, 1915.

SIR: In the extension of soil survey work in the State of Tennessee a survey was made of Jackson County during the field season of 1913. This work was done in cooperation with the Tennessee Geological Survey, and the selection of the area was made after conference with State officials.

I have the honor to transmit herewith the manuscript report and map covering this area and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1913, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. D. F. HOUSTON,
Secretary of Agriculture.

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MAP.

Soil map, Jackson County sheet, Tennessee.

SOIL SURVEY OF JACKSON COUNTY, TENNESSEE.

By R. F. ROGERS, of the U. S. Department of Agriculture, and J. H. DERDEN, of the Tennessee Geological Survey.

DESCRIPTION OF THE AREA.

Jackson County, Tenn., is situated in the northeastern part of the geographic division known as Middle Tennessee. It is bounded on the north by Clay County, which separates it from the Kentucky line, on the east by Overton County, on the south by Putnam County, and on the west by Smith and Macon Counties. It comprises 315 square miles, or 201,600 acres.

Middle Tennessee consists physiographically of the Central Basin, a rolling lowland area with Rutherford County lying near the center and the Highland Rim, consisting of a dissected plateau lying a few hundred feet above the general level of the Central Basin and differing from it mainly in having a rougher topography. Jackson County lies wholly within the Highland Rim at a point where two factors combine to produce a deep and thorough dissection of its surface. It lies on the inner edge of the rim, adjacent to the lowland, so that even its small streams, on account of their great amount of fall, have been able to cut deep into the surface. The Cumberland River, the largest stream of the region, runs across the county, cutting a valley to a lower level than that of the Central Basin, thus permitting a thorough dissection of a belt along both sides of the stream wide enough to include the greater part of the county. The largest areas of the unreduced Highland Rim surface found in the county lie in the southeastern part at a maximum distance from the Cumberland River. The surface of the Highland Rim remnants lies at an elevation of about 1,000 feet above sea level.

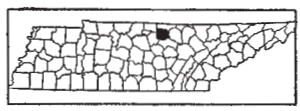

FIG. 1.—Sketch map showing location of the Jackson County area, Tennessee.

The greater part of the area of the county consists of the slopes along the valleys of the numerous streams, but on account of the nature of the rock large areas are not too steep for cultivation. There are narrow strips of flat land along all the larger streams.

All the smaller streams are swift-flowing, their courses being over rocky floors. Most of them are fed by constant springs, so that they flow the year round. They afford potential power for mills and other small industrial plants.

The surface drainage is rapid, and after heavy rains the streams rise quickly to flood stage. At such times the smaller branches often

bring down large quantities of gravel from the uplands and deposit it on the silty bottom lands of the larger streams, to their damage.

Jackson County was established in 1801. It originally embraced territory that now composes parts of White, Clay, and other adjoining counties. Most of the early settlers came from the Carolinas, Virginia, and the "East Tennessee Settlements." The present population is composed largely of descendants of the early Scotch-Irish pioneers. There has been practically no immigration into the county during recent years.

Jackson County has a population of about 15,036, practically all white. Most of the negroes live in or near Gainesboro and Granville. Agriculture is by far the most important industry, although lumbering is carried on in some localities.

Gainesboro, the county seat, is located in the center of the county on Doe Creek, 1 mile south of the Cumberland River. The town was established in 1817 and incorporated in 1820. It has a population of about 400, and is an important shipping point during the season of navigation. Granville, in the southwestern part of the county, is a progressive town of about the same population as Gainesboro.

There are no railroads in the county. The Cumberland River is navigable for five months or more in the year, and with projected improvements it will be made navigable the year round. It is of great commercial importance to the county.

The roads are, in general, in poor condition, and many, especially those along the bottom lands, are practically impassable except during favorable seasons. Systematic road improvement has, however, recently been begun. Good road-building material, limestone rock, is readily available. A good highway has been constructed to Double Springs, 18 miles south of Gainesboro, on the Tennessee Central Railroad. Another important highway is being constructed along Jennings Creek through Whitleyville to the northwestern part of the county.

Schoolhouses and rural mail routes are well distributed over the county and telephones are in general use.

CLIMATE.

The region is characterized by fairly mild, short winters, usually accompanied by light snows, which rarely remain on the ground for more than a week. The summers are moderate, with occasional hot periods during which the temperature rises to about 90° or 100° F. The average date of the last killing frost in the spring is April 7, and of the first in the fall October 24, giving a growing season long enough to mature practically all the crops produced in this section. The earliest recorded date of a killing frost in the fall is October 3, and of the latest in spring April 18. Rainfall is well distributed during

the summer, the monthly means for June, July, and August being nearly the same, a little more than 4 inches. The fall is decidedly the dry season.

As there is no Weather Bureau station in Jackson County, the following table giving the normal monthly, seasonal, and annual temperature and precipitation has been compiled from data collected at Carthage, in the adjoining county of Smith, where the climatic conditions are very similar to those in Jackson County:

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

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° *F.*	° *F.*	° *F.*	*Inches.*	*Inches.*	*Inches.*
December	40.0	74	− 4	4.10	5.13	6.08
January	38.0	75	−17	4.26	1.49	7.62
February	40.0	76	−18	4.62	1.69	9.28
Winter	39.3	.....	.....	12.98	8.31	22.98
March	50.0	88	− 4	5.45	7.14	7.66
April	58.5	92	90	4.14	3.03	5.68
May	68.2	94	33	3.70	4.04	4.05
Spring	58.9	.....	.....	13.29	14.21	17.39
June	75.5	101	41	4.67	5.51	4.04
July	78.4	103	51	4.24	3.08	1.27
August	76.4	101	47	4.24	2.09	7.18
Summer	76.8	.....	.....	13.15	10.68	12.49
September	71.2	99	36	3.30	1.92	5.46
October	59.1	94	24	2.24	0.70	3.64
November	48.1	82	12	3.95	2.03	1.68
Fall	59.5	.....	.....	9.49	4.65	10.78
Year	58.6	103	−18	48.91	37.85	63.64

AGRICULTURE.

At the present time agriculture is the leading industry in Jackson County, but formerly lumbering occupied this place. The county was heavily forested with many varieties of hardwoods, including poplar, walnut, hickory, beech, elm, buckeye, maple, gum, ash, chestnut, white oak, red oak, post oak, dogwood, and persimmon. Practically all the walnut and most of the poplar has been removed, but lumbering is still carried on, the other hardwood varieties being cut. A large part of Jackson County is best adapted to forestry.

The soils and climate of Jackson County favor a widely diversified agriculture, but the lack of transportation facilities has retarded

agricultural development. Owing to the roughness of the topography travel and commerce are attended with difficulty. The early settlers produced practically all the supplies needed for home use, including both food and clothing, and many of the farmers still depend largely on their own resources.

The growing of cotton and tobacco began at an early date, but cotton never became a staple crop, as local conditions are not particularly suited to its production. Its cultivation was practically discontinued about 1850 and it is not now grown, except in a few small patches for home use. Hemp was formerly grown for market, but its production was abandoned at a very early date. At the time of the Civil War the leading crops were corn, wheat, oats, rye, clover, and the grasses. Tobacco became a staple crop about this time, and its production has gradually increased. The chief grasses grown are bluegrass, orchard grass, and timothy. At present the most important agricultural product is corn. Cattle raising has never been important, but many hogs are raised. Many farmers produce only tobacco, corn, and pork.

Corn is grown with varying results in all sections and on all the soil types, including areas which are too stony and rough for careful cultivation. The greater part of the crop is grown on the Hagerstown gravelly loam and the Huntington soils. These soils are especially suited to corn, and yields of 75 bushels or more per acre are had without fertilization or crop rotation. All the Hagerstown soils which are topographically suitable and sufficiently stone-free for satisfactory cultivation are very well suited to this crop, as is also the Elk silt loam, but the Clarksville soils produce light yields under ordinary management, and must be plowed deeply, liberally supplied with vegetable matter and lime, and provided with good drainage to give yields of much more than 25 bushels per acre. The yields are good on the principal corn soils, but there is room for considerable improvement on soils such as the Elk silt loam and the Clarksville silt loam and gravelly loam, where, owing to long cultivation to practically one crop, without the restoration of vegetable matter and with shallow plowing, much of the land has declined in productiveness. The average yield of corn per acre during 1909 was 22.2 bushels. The 1910 census reports a production of 861,587 bushels in 1909 from 38,764 acres. Most of the farmers feed a part of the corn produced to hogs for market. A large part is shipped, although probably the greater part of the crop is consumed in the county. Corn is grown on beds thrown up with the turning plow. The practice of pulling the fodder is generally followed.

Wheat, the crop of second importance, is grown chiefly on the Hagerstown soils, the Elk silt loam, and to less extent on the Clarksville soils. It does best on the Hagerstown soils, particularly the

loam, and, where the slope is not too steep, on the gravelly loam. The level and moderately rolling uplands are better adapted to wheat than the stony soils of the steep slopes, on account of the difficulty of plowing and harvesting on the hillsides. Where the surface is smooth the crop is seeded generally with a drill. The 1910 census reports a production of 35,509 bushels of wheat from 5,035 acres.

Oats are grown on the same soils as wheat and require about the same treatment. In 1909 oats occupied an acreage of 3,591 acres, with a yield of 34,743 bushels.

Rye is grown to a very small extent. It is a valuable winter cover crop for some of the types, especially the lighter soils. It supplies organic matter and affords fair pasturage during the season when it is most needed. Only 225 acres are reported in rye, with a production of 1,494 bushels. The low average yields of this and other crops are due largely to the fact that they are grown on soils not best suited to their production.

The Clarksville silt loam and other members of this series require special treatment before any grain crop can be profitably grown. The yields are higher on the Hagerstown loam and the Elk silt loam. These upland and terrace soils are naturally suited to the growing of small grain, but much of this land is in a poor physical condition, due in great measure to the land having been planted year after year to the same crop. Erosion, resulting from poor farming methods, has also been a factor in the deterioration.

Cowpeas thrive on all the soils of the county, while clover does best on the limestone soils.

Much of the wheat, oats, and rye produced in the county is consumed at home, being milled chiefly by water power.

Tobacco is grown for market by a large number of farmers. This crop requires considerable labor. Cultivation of 3 to 5 acres of tobacco and 20 acres of corn demands all of one man's time during the growing season. Tobacco is confined to the Clarksville and Hagerstown soils. The average yield per acre for the county is about 750 pounds, but on the better lands 1,200 pounds or more is obtained. Tobacco production here has not nearly attained the importance it has in certain other parts of the State, especially on the Clarksville soils, and the growing and curing of the crop is not as efficiently done as in some other sections, although the soils in Jackson County are just as well suited to the crop. The 1910 census reports a production of 1,980,448 pounds of tobacco from 2,647 acres.

The soils of Jackson County are adapted to a wide variety of grasses and other forage crops. Clover and bluegrass thrive on the Hagerstown soils. The principal grasses grown for hay are timothy and clover. Timothy is sometimes grown alone, but more often it is seeded with clover. Other grasses successfully grown are orchard

grass, Hungarian grass, and millet. Cowpeas are grown for forage to a limited extent. They do well on all the soils, but best on the Hagerstown and bottom soils. This crop is of great value as a soil improver and as a stock feed. A small acreage is devoted to alfalfa and many farmers are making trials with this forage crop. The best soils for it are the Hagerstown soils, the Elk silt loam, and the Huntington soils where well drained and protected from overflows.

The vegetable crops are of little commercial importance. Irish and sweet potatoes are among the foremost. The 1910 census reports 436 acres in Irish potatoes, with a yield of 31,117 bushels, and 263 acres in sweet potatoes and yams, producing 22,119 bushels. Many varieties of berries thrive. Blackberries, raspberries, strawberries, and cantaloupes of excellent quality are produced. Grapes are grown successfully. The principal tree fruits grown are apples, peaches, plums, pears, and cherries. Fruit growing is neglected; many farmers do not produce enough for home use.

On the whole, Jackson County affords good opportunities for stock raising. Already hogs are raised in large numbers. Some are shipped as mast-fed hogs, fattened on acorns and nuts with little additional feed. The census reports 16,694 swine in the county in 1909, valued at $83,983. Some loss has been caused by hog cholera, but this disease is giving way to scientific treatment. Improved breeds of cattle, horses, sheep, and other live stock are not common. Most farmers keep a few cows. Only a small number of beef cattle are marketed each year, and these are mainly grade animals taken from the various farms. Sheep raising should prove profitable in the very stony and rough areas, which, while offering good pasturage, are unsuitable for cultivation. Sheep-killing dogs have interfered with the development of this industry. The census reports 9,833 sheep in the county in 1909, valued at $31,680.

Dairying also could be successfully conducted if better transportation facilities were available. There are a few dairy cows of the Jersey breed in the county.

Considerable poultry, including geese, chickens, and turkeys, is marketed, with large quantities of poultry products.

Commercial fertilizers are often used on the Clarksville soils and to a less extent on the Elk silt loam and Hagerstown loam. The grades are prevailingly low in the case of mixed brands and usually the applications are light. Acid phosphate chiefly is applied. The moderate use of commercial fertilizers is profitable as a rule on the thinner soils. The Tennessee experiment station advises farmers as to the formulas and quantities needed. Lime is used to some extent on the Clarksville soils, and, by consensus of opinion, to advantage. It is easily obtained from the underlying limestone formations. The presence of lime is essential for good results with

clover and bluegrass, and the yields of the grain crop are increased by its use. The acid condition of certain soils may be corrected by applying burnt lime or ground limestone.[1]

The census of 1910 classed 90,167 acres in Jackson County as improved farm lands. The average size of farms is given as 71.9 acres, and, counting the entire holding, timbered and rough areas, they range in size from 3 to over 1,000 acres. Most of the upland farms are operated by their owners, but the bottom lands are operated both by owners and tenants. Practically all the large farms are operated wholly or in part by tenants, usually on shares. Sometimes a cash rent, varying with the character of the land, is paid. Some of the best lands rent for over $10 an acre cash.

Farm labor is not plentiful. The labor is mainly white. The monthly wage is about $15 or $20 with board, and day laborers are paid 75 cents to $1 per day. Most of the farm hands prefer to rent a small farm rather than work by the day. There is practically no transient labor in the county, and most of the work is done by the farmer and his family, help being employed during the busiest season.

Land values range widely, from less than $10 an acre for the more remote and rougher tracts, to about $100 for the broader strips of bottom land. The average land value in Jackson County, according to the 1910 census, is $18.23 per acre, while in 1899 it was only $8.72.

There has been a marked improvement in agricultural and living conditions in the county within recent years. The farm homes are being improved, many of the older houses giving place to modern ones. Inadequate outbuildings are being repaired or replaced, but many farmers still neglect to shelter their machinery and implements. To better the agricultural conditions there is general need for improved methods of cultivation. The tenant system is largely responsible for the poor condition of much of the land, the object of the renters being to produce immediate returns without consideration for the upkeep of the farm. Much farming land is almost worthless, having been allowed to run down under poor methods or ruined by erosion. One of the most serious problems confronting the agricultural interests of the county is the prevention of erosion.

[1] Prof. H. A. Morgan, of the Tennessee Agricultural Experiment Station, summarizes the reasons for the use of lime as follows: (1) It cures the soil acidity and improves the mechanical and physical condition of the soil; (2) it increases crop production; (3) it increases the activity of the soil and the value of commercial plant food; (4) it encourages the growth of legumes and these add nitrogen to the soil; (5) it makes possible the growing of alfalfa and clover; (6) it permits more economical rotations; (7) it is especially beneficial to meadow and pasture grasses; and (8) it makes animal husbandry possible. Lime in the form of ground limestone should contain at least 90 per cent of calcium and magnesium carbonates, and may be applied to the soil in almost any quantity without danger, although it is generally recommended at the rate of 2,000 to 2,500 pounds per acre. It should be applied every three or four years. Burnt lime, also known as "lump lime," "quicklime," and "caustic lime," is the most active form of lime and may be used at the rate of 1,000 to 1,200 pounds per acre. Hydrated lime and air-slaked lime are forms that may be applied to the soils in almost the same amounts as burnt lime. The lime may be applied by means of a lime spreader, the ordinary fertilizer drill, with gloved hands, or spread with a shovel.

SOILS.

Jackson County comprises three broad soil divisions which correspond to the physiographic sections: (1) Soils of the smooth, plateau-like uplands—the Highland Rim region; (2) soils of the valley slopes between the high uplands and the stream bottoms; and (3) soils of the comparatively level stream bottoms. There are some small areas of stream-terrace land, represented by a single type, the Elk silt loam, which stand above the overflowed first bottoms.

The predominant soil of the smooth remnants of the Highland Rim is the Clarksville silt loam. It is in a sense the oldest soil in the county, having been subjected to leaching and weathering longer than any other soil in the area. The result of the long-continued action of these processes is manifest in the gray color and low lime content of the soil. Its material is residual from limestone.

The slopes stretching down from the upland are the result of ages of erosion of the former extensive plateau, of which the present Highland Rim is a remnant. These slopes are occupied by narrow, roughly parallel strips of soil of varying character, which follow the contours conforming with the level of the parent rock, and appear on the soil map as ribbonlike strips, the same soil types holding the same definite positions relative to the other types uninterruptedly for long distances.

The upper reaches of the slopes are occupied by the Clarksville gravelly loam. The fine material of this soil is essentially the same as that of the Clarksville silt loam, but it contains a much larger quantity of small chert fragments and the depth of the soil is less, red clay being reached nearer the surface.

Just below the areas of Clarksville gravelly loam there is usually a strip of Clarksville stony loam. That portion of the slope occupied by this type is prevailingly steeper than that along which the gravelly loam member of the series occurs, the chert fragments present are on the average much larger, and ledges of limestone appear. There is no important difference in the character of the fine material.

Immediately underlying the cherty limestone beds giving rise to the Clarksville soils there is a bed of greenish shale (Maury shale) overlying a bed of black shale (Chattanooga shale). The soil material derived from these two shale formations, together with varying amounts of colluvial wash from the Clarksville soils above, where in strips sufficiently wide, has been mapped as Westmoreland gravelly loam. Most of the outcrops of these shales are of such steep gradient that the derivative soil is too narrow to map. In such case this type was included with the Clarksville stony loam, but where cultivable it is mapped with the Hagerstown gravelly loam.

Beneath the bed of Chattanooga shale there are quite pure limestone beds of Ordovician age whose slope exposures have largely

given rise to the Hagerstown soils. The residual limestone material has been mixed more or less with colluvial wash from the Clarksville and Westmoreland soils.

The Hagerstown gravelly loam is the prevailing type beneath the outcrops of Chattanooga shale, while below this and extending down to the edge of the stream bottoms the Hagerstown stony clay, stony loam, and loam are developed.

The first bottoms of the streams, those subject to overflow, are occupied by the Huntington series, five members of which, the silt loam, silty clay loam, loam, fine sandy loam, and gravelly loam, were mapped. The material of the Huntington soils represents alluvium or sediments deposited by overflow waters from the streams. This material has been washed down from the various soils found in the drainage basins of the streams. That along the smaller streams rising in the limestone soils of the region is composed almost wholly of wash from the Clarksville and Hagerstown soils, while that along the Cumberland River probably contains some wash from the sandstone and shale soils of the Cumberland Plateau.

The Elk silt loam, which represents the stream-terrace soils, occupies bench land (second bottom) standing considerably above the overflowed first bottoms. The material of this terrace soil apparently has the same origin as that of the first bottoms, but it was deposited when the waters of the streams flowed at much higher levels than at present. However, some of this soil material is doubtless local wash subsequently modified by erosion.

The soils of the county have been grouped into series upon the basis of similarity in origin, in color or range of color of the surface soils, and in the color and structure of the subsoils. A series includes various types differentiated merely upon the basis of texture of the material and the presence of gravel and stone fragments. In the following chapters each soil type is described in detail and its economic value brought out in so far as practicable.

The following table gives the names and actual and relative extent of the several soils mapped in Jackson County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Clarksville gravelly loam	52,480	26.0	Huntington fine sandy loam	2,176	1.1
Hagerstown stony clay	37,120	18.4	Elk silt loam	1,984	1.0
Clarksville stony loam	32,256	16.0	Westmoreland gravelly loam	704	.3
Hagerstown gravelly loam	26,240	13.0	Riverwash	576	.3
Clarksville silt loam	12,480	7.7	Huntington silty clay loam	576	.3
Rolling phase	3,072		Decatur silt loam	320	.2
Hagerstown loam	10,304	5.1	Huntington loam	256	.1
Huntington silt loam	6,336	3.1	Hagerstown clay loam	128	.1
Huntington gravelly loam	5,184	2.6			
Hagerstown stony loam	5,184	2.6	Total	201,600	.....
Rough stony land	4,224	2.1			

Clarksville Series.

The surface soils of the types included in the Clarksville series are gray. The subsoils are yellow and usually a silty clay in texture, frequently underlain by a reddish substratum. Cherty material is usually present in varying quantities, considerable areas being gravelly throughout the soil profile. These soils occur over both level and undulating uplands and rough, hilly country, with steep slopes. In the smoother areas chert and stone are less abundant. These soils in places are derived from cherty limestone. Those areas carrying little chert seem to be derived from limestone which originally carried less chert than that giving rise to the gravelly and stony areas. The soils of this series are typically and extensively developed in northern Alabama, Tennessee, and Kentucky. In Jackson County the silt loam, gravelly loam, and stony loam types are mapped.

CLARKSVILLE SILT LOAM.

In its typical development the Clarksville silt loam consists of a gray to brownish-gray silt loam, grading at an average depth of about 6 to 8 inches into a pale-yellow, friable silty clay loam, which in turn passes at about 12 to 18 inches into yellow silty clay loam or silty clay of a moderately friable structure. The yellow subsoil material extends to 3 feet or more without important change. Grayish mottlings are common in the lower portion, especially in the leveler and more poorly drained areas. The loose soil has a soft, flourlike feel when dry, although it is likely to be very compact, especially where it has been plowed when too wet and has not been supplied with organic matter, in which it is usually deficient. The deep substratum, which is reached generally at a maximum depth of 4 feet, is usually a red clay carrying varying quantities of chert fragments. In places, especially on slopes, the red clay is found within the 3-foot section. Occasionally fragments of chert appear on the surface and throughout the soil section, but as a rule they are of rare occurrence, except near bodies of the rolling phase. Rock fragments are more abundant on the slopes, the quantity increasing with the steepness. The type is usually bordered by the Clarksville gravelly loam, which represents the predominant soil of the upper slopes.

The Clarksville silt loam occupies the high plateaus, the crests of broad ridges, and the flat tops of hills where erosion has not seriously dissected the surface, and occurs at elevations ranging from about 900 to over 1,000 feet. The topography is level to undulating or very gently rolling. The type is most extensive in a belt extending across the eastern part of the county. Small detached areas occur on the tops of the ridges in the northwestern part. Many areas of the type are too small to map, and have been included with the Clarksville

gravelly loam. The flat or slightly undulating areas are locally known as "barrens," or "flatwoods," and "gray" or "white" land.

Much of the land is still forested, the principal tree growth consisting of white oak, post oak, red oak, and hickory. Sweet gum, black gum, elm, chestnut, persimmon, dogwood, maple, beech, and poplar are present to a less extent. Much of the merchantable timber has been removed.

The Clarksville silt loam is not considered a strong soil. Crops are apt to suffer from drought unless well cared for. Under proper treatment, including drainage, deep plowing, and the incorporation of organic matter, fair yields of the staple crops can be obtained. This is a good tobacco soil, and in certain parts of Tennessee and Kentucky it produces a high grade of dark export tobacco. The yields vary from 600 to over 800 pounds per acre. Sweet and Irish potatoes, as well as many other vegetables, do well. Apples, plums, pears, peaches, cherries, cantaloupes, strawberries, and grapes are grown, but only for home use. The early summer and fall varieties of apples do best. The farmers pay little attention to their orchards. Truck gardening would be profitable on this type if good markets were available.

Mixed farming is usually practiced. Corn is the principal crop, and yields from 12 to over 20 bushels per acre under prevailing methods of farming. Wheat is second in importance, the yields ranging from about 8 to 15 bushels. Oats, rye, and other grains are grown to a small extent, oats giving 15 to 25 bushels per acre. Cowpeas do particularly well on this land, and clover, lespedeza, and several species of vetch thrive with good management.

Fertilizers of the ordinary grades in light applications are generally used by most farmers. Acid phosphate is said to give better results than complete-fertilizer mixtures. Applications of lime have generally been found beneficial, either in the form of burnt lime or ground limestone. Crop rotations, which include a leguminous crop, such as cowpeas, have proven valuable in increasing the productiveness of the land.

After heavy rainfall this soil sometimes becomes saturated, owing to the rather impervious character of the subsoil. Especially over the larger, flat areas, where the water flows away very slowly, it is often late in the spring before the soil is in condition to be worked to best advantage. However, over the greater proportion of the type, the natural drainage is usually sufficient to carry off the surplus water.

Land of this type is valued at about $15 to $40 an acre, according to location, improvements, and condition of the soil as affected by farm practice.

Clarksville silt loam, rolling phase.—The rolling phase of the Clarksville silt loam consists of a gray to pale-yellow or grayish-brown silt

loam, about 6 to 10 inches in depth, overlying a yellow friable silty clay loam, often grading into a reddish-yellow silty clay within the 3-foot section. This phase differs from the typical soil chiefly in its more rolling topography and in the higher content of angular fragments of chert. These rock fragments, however, are not so abundant as to make the soil a gravelly loam, and in places the soil and subsoil are almost free of them. The surface soil of the rolling phase is also shallower and the red clay substratum lies nearer the surface than in the case of the main portion of the type. Layers of chert may occur in the subsoil, even within a few feet of the surface.

This phase is inextensive and occurs in the southeastern and northeastern parts of the county. Some smaller areas have been mapped with the typical Clarksville silt loam.

Owing to the rolling topography the surface drainage is ample; in fact, the run-off is frequently too rapid and causes erosion if not checked.

This soil was originally timbered with the same growths as that on the typical soil, but most of the merchantable timber has been cut, and the greater part of the land is in cultivation.

The topography is not so rough nor the gravel content so high as to interfere seriously with cultivation. The soil is often preferred to the typical Clarksville silt loam, which is practically free of stones. It is largely devoted to corn, wheat, oats, rye, and grasses. It is adapted to practically the same crops as the Clarksville silt loam and requires about the same methods of improvement.

CLARKSVILLE GRAVELLY LOAM.

In its representative development the Clarksville gravelly loam is a gray silt loam or silty loam which grades at about 5 to 8 inches into a pale-yellow silt loam or silty clay loam. The subsoil proper, beginning at depths varying from 8 to 15 inches, is a yellow or pale-yellow friable silty clay loam which usually passes into reddish or red clay within the 3-foot section. There are many places where the yellow material extends to a depth of 3 feet or more. Angular chert fragments are abundant on the surface and sufficiently numerous throughout the soil section to constitute a decidedly gravelly soil. Most of these fragments are not more than 1 inch to 3 inches in diameter, but there are included patches in which the fragments are much larger.

The Clarksville gravelly loam occupies the upper slopes between the stony loam and the silt loam, and much of it is too steep for successful cultivation. On the steep slopes the soil dries out quickly and is more or less droughty. The gravel fragments tend to check erosion, by making the soil more porous and absorptive, and in dry weather, acting as a mulch, they retard evaporation and aid in maintaining an adequate moisture supply. Some of the gentler slopes are

quite extensively cultivated to corn, the yield ranging from 12 to 25 bushels per acre. Wheat, oats, and sorghum produce fair yields. The Clarksville gravelly loam seems to be suited to the production of a wide variety of orchard fruits and berries, cherries and apples doing particularly well, while strawberries, cantaloupes, peaches, pears, plums, blackberries, dewberries, and grapes are also successfully grown. Fruit and vegetable growing is practiced on a commercial scale on this type in other parts of Tennessee and in northeastern Georgia, and is a promising industry for this county on this soil, though not profitable under existing economic conditions. This soil is greatly benefited by the addition of organic matter and the growing of leguminous crops, such as cowpeas, clover, and vetch. Lime and phosphate fertilizers, especially the former, have proved beneficial. A winter cover crop should be grown on this soil, especially in areas subject to erosion.

A considerable proportion of the Clarksville gravelly loam is forested, principally with oak, hickory, and chestnut. Probably 30 or 40 per cent of it is cultivated. Land of this type is valued at $10 to $35 an acre, depending upon location, the lay of the land, and the state of improvement.

CLARKSVILLE STONY LOAM.

The Clarksville stony loam occurs in rather small areas on the tops of rounded hills, the narrow crests of ridges, and as narrow bands on the upper slopes in the most deeply dissected portion of the county, as in the vicinity of the Cumberland River, Jennings Creek, Roaring River, and other larger streams.

The fine material is a gray to pale-yellow silt loam underlain by a pale-yellow silt loam or silty clay loam to reddish clay. Angular chert fragments of varying size are abundant throughout both soil and subsoil, and there are numerous outcrops of the underlying siliceous limestone. The type ranks low as an agricultural soil, being best suited to forestry and pasturage. Little of it is in cultivation. A few smooth and less stony patches are tillable.

A large aggregate area of this type occurs throughout the deeply dissected portions of the county on slopes below the Clarksville gravelly loam. It is mostly timbered, being purposely left so in many cases in order to protect the more valuable lower-lying Hagerstown soils from the washing down of material from above, and from excessive erosion, the surface material in the forested area acting as a mulch to check the rapid run-off.

The areas of the type that are suitable for cultivation are adapted to the same crops as the Clarksville gravelly loam, and in general require the same methods of treatment

Hagerstown Series.

The surface soils of the Hagerstown series are prevailingly brown. The subsoils are light brown or yellowish brown to dull red. These soils are typically developed in the limestone valleys of the Appalachian Mountain region and in the central basins of Kentucky and Tennessee, with outlying areas in the adjoining Piedmont Plateau region. They are residual from limestone and fragments and outcrops of limestone are common. The topography is undulating to gently rolling. In this county five members of this series are recognized—the loam, clay loam, stony loam, gravelly loam, and stony clay.

HAGERSTOWN LOAM.

The Hagerstown loam typically consists of a brown, mellow silty loam underlain at about 6 to 12 inches by a reddish-yellow, moderately crumbly clay to fairly stiff clay which frequently becomes redder with increase of depth until dull-red clay is encountered in the lower part of the 3-foot section. It is not uncommon, however, for the subsoil to consist of yellowish-brown silty clay loam which passes below into yellowish-brown clay. While the material is almost wholly residual from nearly pure limestone, much of it has been removed down slope from its original position and in places colluvial accumulation from higher lying formations has covered the original soil. Fragments of chert and limestone are not uncommon, but they are rarely sufficiently abundant to make a gravelly soil.

Ordinarily the soil grows deeper toward the foot of the slopes. The material in places has a silt loam texture, but the separation of such areas is not practicable on account of the intricate association of the two soils. There are places where the texture of the soil is clay loam and the color is reddish brown rather than brown, as in the case of the typical soil.

This soil characteristically occurs as rather narrow strips along lower slopes, adjacent to stream bottoms, and on shoulders of the higher slopes. It also occurs in moderately large areas occupying gently rolling slopes with no flats. It is a valuable agricultural soil, being well drained and mainly topographically suited to tillage. As the soil mass is open and friable, it readily absorbs and retains moisture. Most of the type is found along the Cumberland River and its larger tributaries.

Practically all the Hagerstown loam has been under cultivation, but some areas have been abandoned owing to severe erosion, following poor management. At present about 50 per cent of the type is tilled, the remainder being largely in pasture. The principal crops grown are wheat and corn, the yields of which are generally good, wheat ranging from 12 to 25 bushels per acre and corn from 35 to 50 bushels. Oats, cowpeas, and sorghum are grown. The

better farmers realize that the yields can readily be increased by deep plowing and the growing of legumes, such as cowpeas and clover, at intervals to supply organic matter and nitrogen. Timothy and orchard grass, as well as many varieties of other cultivated grasses, thrive on this soil. A little tobacco is grown on it in several localities.

The Hagerstown loam is a strong, productive soil, capable of producing, with good management, fair yields of all the staple crops adapted to this region. The usual crop rotation consists of a grain crop followed by clover and grass. This soil is valuable largely because of its adaptation to bluegrass. It belongs to the group of soils which has made the Central Basin of Tennessee famous for its live-stock industries. Although this soil is derived from a nearly pure limestone, some areas are apparently deficient in lime. This condition is caused by leaching. Applications of lime are beneficial in such cases. "Land plaster" is also used to advantage.

The present value of land of the type ranges from $40 to $75 an acre, according to locality, slope, and condition of the soil. The best land is withheld from sale.

HAGERSTOWN STONY LOAM.

The Hagerstown stony loam consists of a brown silt loam or loam, underlain at about 6 or 8 inches by reddish-yellow or yellowish-red to dull-red crumbly clay. Fragments and outcrops of limestone are common.

The type occurs on lower slopes and in bends or shoulders of the valley walls. The principal areas are found along stream slopes in the northwestern part of the county. It is generally too steep and stony for cultivation, being best suited for pastures. Bluegrass affords good grazing. The cultivable areas are suited to the same crops as the Hagerstown gravelly loam.

HAGERSTOWN GRAVELLY LOAM.

The surface soil of the Hagerstown gravelly loam is a brown silt loam to loam, while the subsoil, beginning at any point from about 5 to 10 inches, is a yellowish-red to red or yellowish-brown silty clay loam to clay. Large and small angular fragments of chert and limestone are present on the surface and throughout the soil section in sufficient quantities to impart a decidedly gravelly character. The stones are mostly smaller than 4 inches in diameter, but there are some included areas, not mapped on account of their small size or irregular distribution, where they are sufficiently large to make a stony loam. While the rock fragments interfere somewhat with cultivation, they are of advantage in checking erosion.

Included with this type are some patches of Hagerstown clay loam too small to map.

The Hagerstown gravelly loam is an extensive type, occurring on the slopes of the deeply dissected portion of the county. Its usual position is on benches along the slopes between the Clarksville or Westmoreland soils, on the upper side, and other members of the Hagerstown series, particularly the Hagerstown stony clay.

The soil consists largely of residual limestone material, derived from the Ordovician limestone, and colluvial wash from cherty limestone of the Waverly formation and shale (Chattanooga and Maury shales) lying on the higher slopes.

This is the most important upland soil in the county and is used principally for corn, the yields of which range from about 35 to 75 bushels per acre. Wheat, oats, clover, and bluegrass are grown with splendid results. This soil is not suited to small grain on account of its position and gravelly nature, which are unfavorable to the use of harvesting machinery. The soil is naturally mellow and conserves moisture well. Little effort is necessary to maintain the productiveness of the soil on the smoother slopes. It is said that some fields which have been cultivated for 50 to 75 years without fertilization, and mostly to the same crop, are still producing good yields. This is in part due to the continual washing down of the material from above. The steeper slopes should be used as pasture or forest lands.

Parts of the formation from which this soil is derived are believed to have a varying content of phosphate of lime, and the productiveness of the land may be due in part to this component. Phosphatic nodules are known to exist in the shale formations mentioned above.

The Hagerstown gravelly loam originally supported a vigorous forest growth, but nearly all is now under cultivation. The tree growth consists mainly of maple, ash, walnut, hickory, cedar, elm, sycamore, poplar, hackberry, beech, and several varieties of oak.

This is a highly prized soil, and good farm land is valued at about $60 to $100 an acre, depending on local conditions.

HAGERSTOWN CLAY LOAM.

The Hagerstown clay loam consists of reddish-brown, friable clay loam, underlain at about 4 to 6 inches by yellowish-red to red clay. The immediate surface, in the timbered areas, is usually a brownish, mellow loam having a high content of organic matter. Fragments of limestone and chert are of common occurrence, and there are some limestone outcrops, but not enough to interfere seriously with cultivation. The material is derived from limestone.

The Hagerstown clay loam generally occurs on steeper and higher slopes than those occupied by the Hagerstown loam. Only a few small areas were mapped, but there are many patches which, on account of their small size, were included with other types, princi-

pally the Hagerstown gravelly loam. The largest areas are found north of Gainesboro, just north of the Cumberland River and north of the Free State School.

This is a strong soil, but portions of it are too steep for successful cultivation. It gives good yields of corn, wheat, clover, bluegrass, and cowpeas.

HAGERSTOWN STONY CLAY.

The soil of the Hagerstown stony clay consists of a brown to yellow clay loam or clay, about 8 inches deep, underlain by yellowish to red clay, which is moderately crumbly when dry and plastic and sticky when wet. Bedrock seldom lies deeper than 10 to 20 inches. Large quantities of limestone and chert fragments are found in both soil and subsoil, while outcrops of hard limestone are of frequent occurrence. Along the gentler, usually the lower, slopes are included patches of clay loam and stony loam. The limestone outcrops are the edges of strata which are often exposed in steplike regularity from near the borders of streams or their flood plains up to the "bench" or shoulders of the slopes.

The type has a wide distribution throughout the county, and occupies sloping to hilly areas, consisting of ridges and valley slopes. Its normal position is between the Hagerstown gravelly loam and the Huntington soils or the Hagerstown loam. The soil owes its origin to the weathering of limestone and shaly limestone, influenced in some places by colluvial sandstone and shale material. Most of the Hagerstown stony clay is too stony and steep for safe cultivation. It is naturally very productive, and its low agricultural value is due to its unfavorable topographic position, the outcrops of solid rock, and the presence of numerous large and small rock fragments on the surface and within the soil mass. Probably 60 to 75 per cent of the type is covered by a layer of soil capable of supporting bluegrass, white clover, lespedeza, and several wild grasses. In places it is suitable for apple growing or even for gardening, under hand-implement cultivation. Some of this land, now valuable only for pasturage, was formerly cultivated, its present condition having resulted from washing. In places large areas, consisting mainly of recently cleared land, are being cultivated, principally to corn. At present the greatest value of the type is for pasturage and forestry. Cedars thrive on this soil.

This land is usually sold in connection with the Hagerstown gravelly loam and other adjoining soils. Its market value is less than that of the gravelly loam type.

WESTMORELAND SERIES.

The Westmoreland series is marked by the grayish-brown to yellowish-brown color and mellow structure of the surface soils and the yellowish-brown to yellow color and friable structure of the subsoils.

The soils are derived from shales and sandstones with interbedded limestones and calcareous shales. Although the shales and sandstones predominate, there is sufficient limestone present to make these soils much more productive than if formed exclusively of sandstone and shale materials. Usually the parent rocks are so interstratified that the resultant soils are rather heterogeneous in character. In some places the different rocks give rise separately to definite soil types, as the Dekalb or Brooke, but the areas of these are usually so small that mapping is impracticable. The topography ranges from gently sloping to quite rolling or steep, many areas being so steep that plowing can not be safely carried on. The drainage is mainly good. The soils generally retain moisture sufficiently well to meet the requirements of crops even in dry periods.

WESTMORELAND GRAVELLY LOAM.

The soil of the Westmoreland gravelly loam is mostly a grayish-brown to brown silt loam to silty loam, underlain at varying depths by yellowish-brown, moderately friable silty clay loam. Small chips and large platy fragments of black shale (Chattanooga shale) and olive-colored shale (Maury shale) are plentiful over the surface and throughout the soil profile. There are also present fragments of chert and limestone which have been carried from above.

The Westmoreland gravelly loam occurs as a narrow band along slopes, usually between the Hagerstown gravelly loam and the Clarksville gravelly loam or stony loam, its position being marked by outcrops of the Chattanooga shale. This bed of shale is so thin that there is not sufficient width of the derivative soil on the steeper slopes to admit of mapping on the scale used. Where the slope is more gentle and where a considerable depth of material derived largely from the Chattanooga shale has accumulated, both in place and as colluvial wash, for some distance below the shale beds narrow strips of sufficient width to map are found.

The most extensive areas of this type occur in the vicinity of Clenny and northwest of this place. The total area mapped is not great.

On account of their small size many narrow strips throughout the county were included with other types, principally the Clarksville stony loam.

Most of this land is too steep for practical cultivation, but a portion is farmed with fair to good results, corn being the principal crop.

DECATUR SERIES.

The soils of the Decatur series are characteristically reddish brown to deep red in color and the subsoils intensely red or blood red. They are derived mainly from chert-free limestone, although some

areas show traces of chert. These soils are developed as nearly level to gently rolling valley lands, although they occur to some extent in the uplands.

DECATUR SILT LOAM.

The soil of the Decatur silt loam consists of a red or reddish-brown silty loam, 6 to 12 inches deep. The subsoil is reddish-brown or red silt loam, grading into a deep-red silty clay, usually carrying numerous chert fragments. The material is residual from cherty limestones belonging to the upper strata of the Waverly formation.

This type lies in scattered tracts. It is found chiefly on eroded slopes and slight ridges and knolls in areas of the Clarksville silt loam and the Clarksville gravelly loam. A good many spots have been included with these types on account of their small size. The most important areas occur in the southeastern part of the county, near the Putnam County line.

Practically all of the areas of Decatur silt loam mapped are under cultivation. The original forest growth was about the same as that on the Clarksville silt loam. Corn and small grains are the chief crops. These yield moderately well where properly handled. With deep plowing and rotations which include legumes, such as clover and cowpeas, this soil is very successfully used in other parts of Tennessee and in other States for the production of corn, tobacco, small grains, truck, and forage crops. It is deficient in organic matter and is in need of lime. Phosphate fertilizers would probably prove beneficial also.

The small areas of Decatur silt loam have about the same agricultural value as the Clarksville silt loam, but the larger areas are considered much more productive than the latter type. The Decatur is probably better for grass, and in Overton County, Tenn., it is used more extensively for hay and pasture than is the Clarksville silt loam. The same methods are needed on this type as on the Clarksville silt loam, and this type is adapted to the same special crops.

HUNTINGTON SERIES.

The Huntington soils are light brown to brown and the subsoils yellow to light brown. Frequently there is little change in the color or character of the material from the surface downward. The soils are developed in the Limestone and Appalachian Mountain regions in the first bottoms of streams. They consist of material derived from limestone, sandstone, and shale.

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam is a brown, mellow silt loam, underlain at a depth of about 10 to 12 inches by light-brown or light yellowish brown, friable silt loam to silty clay loam having a more

compact structure than the surface soil. Some areas do not show much change in color or texture within the 3-foot section. As the banks of the streams are approached the soil frequently grades into loam, fine sandy loam, or gravelly loam. Along the smaller streams it is in places difficult to determine whether the soil should be mapped as silt loam or as gravelly loam. In some places sandy strata occur at various depths through the soil section. In the broader bottoms occasional strips of Huntington silty clay loam too small to map have been included with the type.

The Huntington silt loam is an alluvial soil which occurs in the overflowed first bottoms of streams, and represents stream-deposited material, derived entirely or chiefly from limestone soils. It is found along all the larger streams of the county. Although subject to overflow, inundations are rare during the growing season, and most of the type is successfully farmed.

The surface is characteristically flat and nearly level, and the drainage between periods of overflow is well established.

Corn, which is the principal crop grown, ranges from 40 to 75 bushels per acre. The larger yields are generally obtained from the lower areas where the Cumberland River overflows frequently deposit sediment. These rich low areas are locally called "backwater land." No fertilizer is required; in fact, the soil is so productive that good yields have been maintained for long periods without apparent deterioration of the soil. Many tracts of the Huntington silt loam are capable of growing alfalfa, with protection from inundation.

This soil produces good hay crops where seeded to grass, and affords good pasturage. Wheat does not do well. It sometimes grows too rank and fails to head, and the crop is likely to be injured by spring floods. Oats do fairly well in dry seasons, but the upland soils give better returns in seasons of normal rainfall. Cowpeas, sorghum, and certain other crops thrive on this type, but most of the land is used for corn.

Land values range from about $65 to over $100 an acre, the best land being reserved from sale.

HUNTINGTON SILTY CLAY LOAM.

The Huntington silty clay loam consists of a brown to dark-brown silty clay loam, underlain at about 10 to 20 inches by a somewhat lighter brown silty clay loam to silty clay, often mottled with gray and rusty brown. The area on the outer edge of the Cumberland River bottoms just north of Gainesboro Ferry is a brown silty clay loam mottled with rusty brown, and underlain by a mottled gray or drab and rusty brown, rather plastic silty clay loam to silty clay.

This type occurs in narrow strips, usually in slight depressions or swales in the broader first bottoms of streams. The principal areas occur in the first bottoms of the Cumberland River near Gainesboro Ferry, near Salt Lick Island, and south of Corinth School.

The Huntington silty clay loam is a productive soil, but does not yield on the average so heavily as the Huntington silt loam, particularly on account of its poorer drainage and greater tendency to clod and cake.

In its natural condition the soil is best adapted to such crops as grass and lespedeza. For its most profitable utilization such land requires liming and artificial drainage. Where drained and cultivated it is devoted to corn, the yields ranging from 40 to over 60 bushels per acre. Most of the type is idle or in pasture. When drained it is adapted to about the same crops as the Huntington silt loam.

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

Mechanical analyses of Huntington silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
401521	Soil	0.2	0.4	0.6	4.6	11.2	63.7	19.7
401522	Subsoil	.0	.6	.6	5.4	15.8	56.6	21.1

HUNTINGTON FINE SANDY LOAM.

The soil of the Huntington fine sandy loam varies from light-brown loamy fine sand underlain by light-brown fine sandy loam or loam to brown heavy fine sandy loam or loam underlain by somewhat lighter colored material of about the same texture. This is a good agricultural soil, but is less productive and durable than the Huntington silt loam. It is easier to cultivate, however, and where well supplied with organic matter, as in the case of the darker colored areas, the yields of corn approach those obtained from the silt loam, as high as 75 bushels being reported. Sorghum, cowpeas, watermelons, and sweet potatoes are grown in small patches.

This type usually occupies slight swells or natural levees fronting the larger streams. Most of it occurs in the first bottoms of the Cumberland River, near the stream bed, the wide areas being found on the concave sides of the river bends. Small areas also occur on Roaring River.

HUNTINGTON LOAM.

The soil of the Huntington loam is a brown, mellow loam to silty loam, usually from 10 to 12 inches deep, and is underlain by light or dark-brown loam, silty loam, or clay loam.

The type is inextensive and occurs in narrow strips along the outer, higher edges of the bottoms, where it grades imperceptibly into the Hagerstown loam on the one side and the Huntington silt loam on the other side.

While the typical soil represents first-bottom alluvium, there is in places some colluvial wash from the adjacent slopes.

The soil is easy to cultivate and productive, giving good yields of corn, sorghum, cowpeas, and grass. Corn, which is the only crop grown to any extent, yields about as well as on the Huntington silt loam.

HUNTINGTON GRAVELLY LOAM.

The soil of the Huntington gravelly loam consists of about 10 inches of brown loam or silty loam, containing sufficient gravel, mostly rounded and subangular chert, to effect a rather open structure. Below this, to a depth of about 3 feet, occurs a similarly textured, lighter colored material, which contains larger quantities of gravel. The type is variable in color, texture, and gravel content. In the lower depths a bed of gravel and broken rocks is encountered, frequently cemented together.

This type has a wide distribution through the county, and is chiefly developed in the narrow bottoms of the smaller streams, especially along their upper courses. Smaller bodies occur in the broader bottoms near the stream channels and near the foot of the uplands, being influenced in the latter situations by colluvial material. The soil consists of material washed from adjoining slopes combined with alluvial deposits. Some of the bottoms along the smaller streams were too small to show on the map. Many of the smaller streams are carrying down and depositing large quantities of gravel in the Huntington silt loam areas, causing a decided deterioration in value.

This type is used mainly for growing corn. On some of the more gravelly areas crops are inclined to suffer during periods of protracted drought. The yield of corn during the season of 1913 was reduced considerably on account of insufficient moisture on this type, while on the other Huntington soils nearly average crops were reported. Where the subsoil is not so gravelly and loose, however, excellent yields of corn are produced. Forage crops, such as cowpeas and sorghum, produce large yields.

A part of the type, with protection from inundation, is capable of successful alfalfa production.

Elk Series.

The Elk series includes light-brown to brown soils and pale-yellow to yellow subsoils. It is developed on second terraces lying largely above overflow. The material is entirely alluvial and is derived from the soils of limestone, sandstone, and shale formations. These soils contain a larger amount of limestone material than do the Holston soils. Gravelly material is frequently encountered in the substratum. In places the surface is so flat that water stands after wet seasons.

ELK SILT LOAM.

The soil of the Elk silt loam is a grayish to light-brown silt loam 6 to 12 inches deep. The subsoil is a compact silt loam, of lighter color than the surface soil, occasionally faintly mottled with yellowish and grayish colors, especially in the lower sections, where a silty clay predominates. A few rounded gravel and cobbles are associated with the material.

The type occupies the second bottoms or terraces of the larger streams, principally the Cumberland River, the material having been washed principally from limestone soils and deposited by the streams when they flowed at higher levels. It lies 35 to 60 feet above the normal level of the Cumberland River. The material in places is doubtless largely colluvial.

This is a well-drained soil and under proper management gives good returns. It rarely suffers from drought, as its texture and structure are conducive to the retention of moisture for plant growth. The soil is easily cultivated. It is used mainly for corn, though wheat is also grown. In most cases the yields are only fair, owing to the fact that much of the land has been too severely cropped, too little attention being given the maintenance of organic matter. Originally it was a very productive soil. It is believed that this type will grow alfalfa successfully if properly handled, but experiments have not been carried sufficiently far to prove its adaptation to this crop.

In the following table the results of mechanical analyses of samples of the soil and subsoil of the Elk silt loam are given:

Mechanical analyses of Elk silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
401505	Soil	0.1	1.0	2.2	16.7	14.3	49.6	16.0
401506	Subsoil	.2	1.0	2.0	15.6	13.4	44.2	23.6

Miscellaneous Material.

ROUGH STONY LAND.

Rough stony land includes areas in an advanced stage of erosion, and steep slopes where rock outcrop is abundant. Probably less than 25 per cent of this land area is covered by a soil mantle, much of it being bare limestone ledges. The little fine soil material present resembles that of the Hagerstown series. The land is valueless except for its scant pasturage and the growth of cedar, which is suitable for pencil wood and fence posts. Areas of this land are confined to that part of the county lying below the areas of Clarksville soils, i. e., the precipitous slopes and steep stony areas leading down from the highlands.

Some of this land might properly be classed as Rock outcrop, but this subdivision is not practicable on a map of the scale used.

RIVERWASH.

Riverwash comprises the broad, shallow, filled-in stream beds, consisting principally of a loose mass of rounded, subangular, and angular chert and limestone gravel and coarse sand. This material has been spread out over certain areas of good bottom land. Riverwash has no agricultural value. It was mapped only along Roaring River and Jennings Creek, other areas being too small to show.

SUMMARY.

Jackson County is located in the north-central part of Tennessee, near the Kentucky line. Its area is 315 square miles, or 201,600 acres. The population is about 15,000.

The county lies in the limestone section and includes the highlands of the uneroded Highland Rim section, a larger area of slope land between this and the stream bottoms, and a large extent of valuable stream-bottom lands. Much steep, gullied land lies along the sloping areas.

There are no railroads in the county, but the Cumberland River affords transportation facilities.

The climate is mild and the growing season almost seven months long.

Agriculture is the leading industry. Corn is by far the most important crop, with wheat next. The small grains, legumes, garden vegetables, and small fruits are grown. Tobacco is grown for market. Hogs are the chief live-stock export.

Scientific handling of the soils, rather than fertilization, is needed, though applications of organic matter and phosphatic compounds are beneficial. Erosion is a serious soil problem.

The upland soils are residual from limestone.

The Clarksville soils are derived from siliceous limestone. The silt loam occupies the high and level situations. Some of it needs drainage. The gravelly loam and stony loam lie on the slopes below the silt loam. These soils are used mostly for corn and small grain. In other States they produce also strawberries, cantaloupes, tobacco, and fruits.

The Hagerstown soils occupy the slopes below the Clarksville loams. The gravelly loam and loam are mostly under cultivation. They produce good yields of corn, small grains, and forage crops. The Hagerstown gravelly loam is remarkably productive, but susceptible to erosion. The stony loam and stony clay are valuable chiefly as pastures. The clay loam is a good soil, but is inextensive.

The Huntington soils comprise the overflowed bottom lands. They are here composed of alluvial material washed chiefly from limestone and are very productive. They are practically all under cultivation, almost entirely to corn. Crops are seldom injured by overflow.

The Westmoreland gravelly loam is a variable soil type, of small extent, and in part tillable. The Decatur silt loam is an upland soil, mostly in cultivation, with fair yields.

Some important strips of second-bottom or "river-bench" land along the Cumberland River are remnants of an old flood plain built up by the river when at a higher level. This old alluvium, the Elk silt loam, when carefully handled, yields well. Much of it has deteriorated under careless methods of cultivation, but can be rejuvenated and maintained in a productive state at reasonable cost.

Rough stony land comprises areas too steep for cultivation, and Riverwash is a nonagricultural type, of small extent, found along stream beds.

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[PUBLIC RESOLUTION—No. 9.]

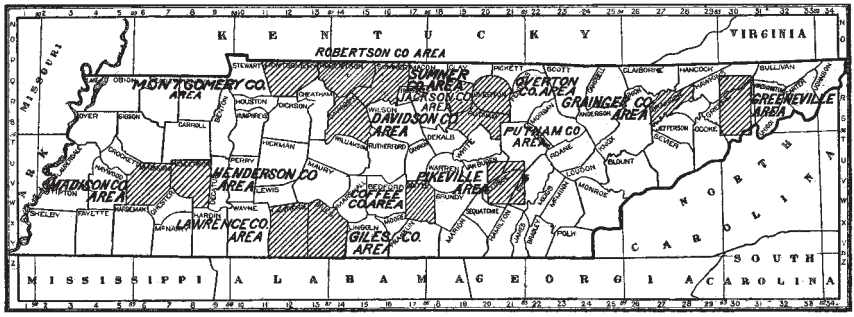
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred-and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

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

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

Approved, March 14, 1904.

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



Areas surveyed in Tennessee.

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