

Issued March 28, 1916.

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

IN COOPERATION WITH THE WEST VIRGINIA GEOLOGICAL SURVEY;
I. C. WHITE, STATE GEOLOGIST.

SOIL SURVEY OF RALEIGH COUNTY,
WEST VIRGINIA.

BY

W. J. LATIMER.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1914.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1916.

BUREAU OF SOILS.

MILTON WHITNEY, *Chief of Bureau.*
ALBERT G. RICE, *Chief Clerk.*

SOIL SURVEY.

CURTIS F. MARBUT, *In Charge.*
G. W. BAUMANN, *Executive Assistant.*

COMMITTEE ON THE CORRELATION AND CLASSIFICATION OF SOILS.

CURTIS F. MARBUT, *Chairman.*
HUGH H. BENNETT, *Inspector, Southern Division.*
W. EDWARD HEARN, *Inspector, Southern Division.*
THOMAS D. RICE, *Inspector, Northern Division.*
W. E. McLENDON, *Inspector, Northern Division.*
MACY H. LAPHAM, *Inspector, Western Division.*
J. W. McKERICHER, *Secretary.*

Issued March 28, 1916.

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

IN COOPERATION WITH THE WEST VIRGINIA GEOLOGICAL SURVEY;
I. C. WHITE, STATE GEOLOGIST.

SOIL SURVEY OF RALEIGH COUNTY,
WEST VIRGINIA.

BY

W. J. LATIMER.

HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1914.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1916.

LETTER OF TRANSMITTAL.

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

SIR: Under the cooperative agreement with the West Virginia Geological Survey, I. C. White, State Geologist, a soil survey of Raleigh County was carried to completion during the field season of 1914.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1914, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

CONTENTS.

	Page.
SOIL SURVEY OF RALEIGH COUNTY, WEST VIRGINIA. By W. J. LATIMER. . . .	5
Description of the area.	5
Climate.	7
Agriculture.	9
Soils.	13
Dekalb series.	16
Dekalb fine sandy loam.	16
Dekalb loam.	17
Dekalb silt loam.	18
Dekalb silty clay loam.	20
Dekalb stony loam.	21
Dekalb stony silt loam.	22
Upshur series.	23
Upshur clay loam.	23
Upshur stony clay loam.	25
Holston series.	25
Holston fine sandy loam.	25
Holston silt loam.	26
Huntington series.	27
Huntington silt loam.	28
Huntington fine sandy loam.	29
Holly series.	30
Holly silt loam.	30
Miscellaneous material.	31
Rough stony land.	31
Summary.	31

ILLUSTRATIONS.

FIGURE.

	Page.
FIG. 1. Sketch map showing location of the Raleigh County area, West Virginia.	5

MAP.

Soil map, Raleigh County sheet, West Virginia.

SOIL SURVEY OF RALEIGH COUNTY, WEST VIRGINIA.

By W. J. LATIMER.

DESCRIPTION OF THE AREA.

Raleigh County is located in the southern part of the State of West Virginia. It is bounded on the north by Boone, Kanawha, and Fayette Counties; on the east by Fayette and Summers; on the south by Summers, Mercer, and Wyoming; and on the west by Wyoming and Boone Counties. It has a total area of 611 square miles, or 391,040 acres.

The county lies wholly within the Allegheny Plateau, the elevation of the upland surface ranging from 3,566 feet on Huff Knob of Flattop Mountain, in the southern part of the county, to about 2,000 feet in the northeastern part. The greater part of the surface is extremely rough, owing to the completeness and depth of dissection which has taken place. In general, the northwestern part of the county is thoroughly dissected. All the watershed ridges have been reduced to "hogbacks" and the valleys are narrow, with steep slopes. The depth to which the valleys have been cut reaches a maximum of nearly 1,500 feet. The southwestern part of the country differs from the northwestern only in the lesser depth of the dissection, which in this case is about 1,000 feet. The dissection, however, is as complete as in the northwestern part.

Along the eastern side of the county lies a narrow belt of extremely rough land, adjoining the valley of New River. It consists mainly of a river-bluff zone scarcely wider than the bluff itself, extending up the larger tributaries in equally narrow strips on each side of the stream. This zone is bounded sharply at the top of the bluff by a rolling to somewhat mountainous plateau. There is an area in the central-western part of the county and a north-south belt across the eastern part just west of the New River bluff zone of much smoother topography, though the areas of flat or undulating plateau are extremely small.

The plateau areas consist of a strongly rolling upland with broad, open, round-bottomed valleys and coves, with relatively low, round-

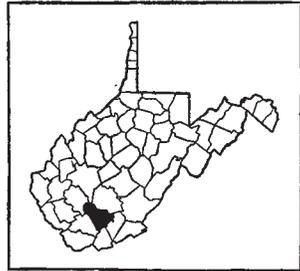


FIG. 1. — Sketch map showing location of the Raleigh County area, West Virginia.

ish ridges between. The streams here have not cut deep, narrow valleys, partly because these areas lie well up toward their headwaters and partly because the areas are underlain at no great depth by a resistant sandstone bed which acts as a local base level for the stream at the point in its course where it finally reaches the rock. Upstream from this point the stream will determine its grade with reference to the elevation of the sandstone bed at this point. This holds these upper stream courses within the outcrop zone of a shale bed in which they open the broad, rounded valleys and coves referred to. They do not seem to be inherited from a base level in a former cycle of erosion, but seem rather to be features determined by the local geologic conditions. In the southern part of the county these valleys lie at an elevation of about 3,000 feet. Northward they lie at successively lower elevations regardless of the size of the stream, and at the northern boundary they are about 2,000 feet above sea level. This seems to be due to the dip of the sandstone bed which permits their development. Locally they are called "glades." Between them there are low mountain ridges with gradual slopes and rounded but rather narrow tops. In general the glades are about the only areas that are cultivated.

The drainage of the county is performed by the streams of four different basins or systems. The northwestern part of the county is drained by Marsh and Clear Forks into Coal River; the southern part is drained by Winding Gulf, Stone Coal, and Tommy Creeks, and Devils Fork, all entering Guyandot River; the eastern part is drained by Piney and Glade Creeks emptying into New River, and a small strip in the north-central part of the county by Paint Creek.

The first settlements were made in the territory included in this county about 1790 by hunters and trappers. Settlement spread very slowly. The settlers came mainly from Virginia, with a few from North Carolina and Maryland. Most of the present rural population consists of descendants of the original settlers; the population of the mining towns consists mainly of Hungarians, Italians, and negroes. The industrial development has brought a large number from adjoining counties and States.

Raleigh County was formed from a part of Fayette County in 1850, with Beckley as the county seat, this town being incorporated the same year.

The extension of the Chesapeake & Ohio Railroad along New River was completed in 1872, but it was not until the branch lines along Piney Creek were constructed in 1900 that the industrial development of the county began. The industries of the county were further encouraged by the construction of the Virginian Railroad in 1907. The Cabin Creek branch of the Chesapeake & Ohio gives an outlet to the extreme northwestern part of the county, while the Winding Gulf

branch of the Virginian Railroad opens an important coal field in the southern part. A large part of the county, however, is without transportation facilities. The public-road system is good, considering the generally unfavorable topography.

Coal mining and lumbering are important industries in the county. Coal was first mined at Royal, near Prince, about 1873, being carried across New River in buckets to the Chesapeake & Ohio Railroad. Lumbering became important about 20 years ago. Up to about 12 years ago, when extensive milling operations were started, most of the timber was rafted down Coal River. About 50 per cent of the merchantable timber has been removed.

The greater part of the population of the county is engaged in farming. The total population of the county, according to the 1910 census, is 25,633, of which 22,056 are native whites, 2,052 negroes, and 1,525 foreign-born whites.

Beckley, the county seat, with a population of 2,161, as reported in the 1910 census, is the largest town in the county and the trading center of the farming districts and coal fields. It is situated on a plateau 2,440 feet above sea level. Raleigh, Mabscott, Lester, Eccles, Surveyor, Slab Fork, Tams, Stotesbury, Winding Gulf, Sophia, Pemberton, and Lanark are small mining towns.

The principal outside markets are Charleston, Huntington, Cincinnati, Richmond, Baltimore, Norfolk, Lynchburg, Roanoke, and Bluefield. The towns of the county furnish a ready market for agricultural products.

CLIMATE.

The climate of Raleigh County is mild and healthful. The average temperature for the winter months—December, January, and February—is 31.6° F. The temperature rarely falls much below zero, although it reaches that point often during midwinter. The snowfall is about the same as in other mountain counties of eastern West Virginia. The snow remains upon the ground for only comparatively short periods. Long-continued blizzards are unknown.

The temperature throughout the summer months of June, July, and August is comparatively low, averaging 69.9° F. It rarely exceeds 100° F. Periods of hot weather are of short duration. The nights are usually cool.

The mean annual precipitation of 34.17 inches is fairly well distributed throughout the year, the heaviest rainfall occurring from January to June, when it is needed by the growing crops, and the lightest in the late summer and fall, when the crops are being harvested. During the years of heaviest precipitation the rainfall is ample throughout all seasons, but during the driest years crops suffer from drought. Corn, hay, and pasturage are affected the most, as these crops mature during the months of light precipitation.

The heaviest floods occur in early spring before planting time or before it is too late to replant. Late floods are unusual, but do considerable damage to growing crops. Only a relatively small percentage of the farms, however, are located upon land subject to overflow.

The average date of the last killing frost in the spring is May 6 and of the earliest in the fall October 4. This gives a normal growing season of approximately five months, with pasture about seven months. The date of the earliest killing frost recorded in the fall is September 6 and of the latest in spring May 28.

The table below, compiled from the records of the Weather Bureau station at Beckley, gives the normal monthly, seasonal, and annual temperature and precipitation at that point, which is 2,440 feet above sea level and is fairly representative of climatic conditions throughout the county. In stream valleys the temperature is probably slightly higher. The climatic data for Raleigh County are incomplete, and a table compiled from the records of the Weather Bureau station at Powellton, Fayette County, W. Va., is given for comparison. Fayette is an adjoining county, in which conditions are very similar to those in Raleigh County.

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

Month.	Temperature, mean.	Precipitation.			Month.	Temperature, mean.	Precipitation.		
		Mean.	Total amount for the driest year.	Total amount for the wettest year.			Mean.	Total amount for the driest year.	Total amount for the wettest year.
	° F.	Inches.	Inches.	Inches.		° F.	Inches.	Inches.	Inches.
December.....	33.4	2.96	3.07	4.51	June.....	67.5	3.64	1.87	6.82
January.....	31.9	3.33	0.83	7.01	July.....	72.0	2.58	1.26	4.75
February.....	29.6	3.16	5.70	1.05	August.....	70.1	2.71	0.51	4.86
Winter....	31.6	9.45	9.60	12.57	Summer...	69.9	8.93	3.64	16.43
March.....	43.0	3.73	0.82	3.32	September.....	63.0	1.70	1.92	2.65
April.....	48.3	2.93	1.06	5.44	October.....	54.0	2.20	2.15	3.38
May.....	59.7	2.84	2.57	3.13	November.....	42.3	2.39	0.57	5.93
Spring.....	50.3	9.50	4.45	11.89	Fall.....	53.1	6.29	4.64	11.96
					Year.....	51.2	34.17	22.33	52.85

Normal monthly, seasonal, and annual temperature and precipitation at Powellton, Fayette County, W. Va.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total, driest year.	Total, wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	34	70	- 5	3.6	0.9	3.0	4.8
January.....	34	74	- 5	4.1	1.8	4.4	6.1
February.....	33	68	-20	3.1	5.2	2.1	9.5
Winter.....	34			10.8	7.9	9.5	20.4
March.....	46	83	1	5.2	4.9	5.2	7.0
April.....	53	93	20	3.2	5.2	2.7	1.7
May.....	64	93	31	4.7	2.9	3.8	T.
Spring.....	55			13.1	13.0	11.7	8.7
June.....	70	96	42	5.3	5.2	2.8	0.0
July.....	73	98	46	3.5	4.6	7.6	0.0
August.....	72	99	42	2.8	1.9	9.6	0.0
Summer.....	72			12.6	11.7	20.0	0.0
September.....	66	99	33	2.4	1.3	1.8	0.0
October.....	53	92	16	1.4	1.1	3.6	T.
November.....	44	74	10	3.0	1.7	3.4	1.5
Fall.....	54			6.8	4.1	8.8	1.5
Year.....	53	99	-20	43.3	36.7	50.0	30.6

AGRICULTURE.

The early settlers of Raleigh County paid very little attention to agriculture. Owing to the natural conditions, including the large streams and dense forests, game was relatively abundant and farming was difficult, even for the growing of home supplies. As long as game continued to be plentiful hunting was the chief occupation of the few inhabitants. Farming was begun, however, at an early date on the river-bottom lands and on the slopes and benches of the adjoining uplands. The early agriculture consisted of the growing of grain and vegetables for home use and winter feed for cattle. The cattle grazed on the open range but were fed during the winter. Markets for grain and vegetables were entirely out of reach before the railways were built, so that live stock constituted the only source of income. This condition obtains to-day to a great extent, though the growing of supplies for the mining population has received considerable attention during the last 10 or 15 years.

In addition to cattle raising, sheep raising, mainly for wool, received considerable attention in the early days and continued as an

important industry over the entire county until the advent of the miners. The industry was made unprofitable in the eastern part of the county largely by the presence of dogs. It is still rather important in the western part, but is based on the sale of the animals for mutton rather than on the sale of wool. According to the United States census, there were 8,886 sheep in the county in 1879, 10,115 in 1889, 10,099 in 1899, and 11,444 in 1909.

Hog raising has never been an important industry. The soil is not easily cultivated, and the yields of corn are not large, and only enough hogs are raised to supply the local demand. In the 1880 census 15,467 hogs are reported in the county; in 1890, 5,848; in 1900, 8,440; and in 1910, 8,073. Since the number of farms has averaged about 1,300, the number of hogs has averaged about 6 per farm.

The dairy industry has never been developed. The number of milch cows has increased slightly, but at no greater rate than the increase in the acreage of improved land. The number has stood between 3,000 and 4,000 for the last 30 years, an average of a little more than 2 cows per farm.

There is a small cattle-raising industry which has remained about stationary for the last 30 years. The number of cattle, other than dairy cows, reported was 3,697 in the 1880 census, 5,240 in 1890, 5,702 in 1900, and 4,975 in 1910.

Some horses are raised, but not enough to supply the local demand, and horses are imported from Ohio, Indiana, and Kentucky, and also from the Limestone Valley of Virginia and West Virginia. Purebred French Percheons have been introduced, as well as racing stock from New York and Virginia. The Percherons are popular as draft animals. Very few mules are raised, those used being imported largely from Missouri. Most of these are used by lumber and coal companies.

Some poultry is kept on every farm, but little attention is paid to this branch of farming. A few hives of bees are kept on many farms. In some sections "bee trees" are still depended upon for honey.

The following table, compiled from the census reports, gives the number and value of live stock, poultry, and bee hives in the county in 1910:

Kind of animal.	Number.	Value.	Kind of animal.	Number.	Value.
Cattle.....	8,834	\$196,352	Sheep.....	11,444	\$35,184
Horses.....	1,848	192,535	Poultry.....	48,020	20,785
Mules.....	508	58,509	Bee hives.....	2,597	8,846
Swine.....	8,073	32,928			

There have been no important changes in the history of the crops grown in the county. There has been a marked decrease in the wheat

acreage since 1890 and an increase in the acreages of corn, potatoes, buckwheat, and hay. The extension of potato production is due largely to the increase in the mining population. Flax, which was grown to a small extent several years ago, has been abandoned.

The principal crops grown in the county, named in the order of their importance with respect to value of product, are hay, corn, potatoes, buckwheat, and oats. All these crops, except a part of the potatoes and the buckwheat, are grown mainly as subsistence crops for the use of the family and as feed for live stock. Some of the hay and a considerable part of the potato crop are sold. Buckwheat is the principal money crop. The 1910 census reports a production of 23,207 bushels.

The total corn production of 165,311 bushels amounted to an average of only about 103 bushels per farm. Very little of the corn is sold. The census reports a production of 14,244 bushels of oats, and most of this is used locally. There was a production of 8,645 tons of hay, or an average of a little more than 5 tons per farm. Most of this is fed on the farm.

The character of the soil has had very little influence on the kind of agriculture practiced. The agriculture of the county is carried on mainly on the Holston soils, the alluvial soils, and the heavier and less stony upland soils. The topography has a considerable influence on farming, only the smooth lands being cultivated.

The climate and soils of Raleigh County are well suited to fruit growing. The level ridge tops and gently sloping hillsides furnish many good locations for extensive orcharding. Apples are probably best adapted to local conditions and are grown on a larger scale than any other fruit. The most common varieties grown are the Rome Beauty, Grimes Golden, York Imperial, Yellow Transparent, Early Harvest, Maiden Blush, and Fallawater. These varieties give a good range of apples from early to late maturing.

Peach trees are short-lived as a rule, and care in the selection of a site for the orchard is necessary to insure success. Cherries do exceptionally well, but only a few are grown. These are mainly of a sweet variety, which has a low market value. Wild huckleberries and blackberries are found in abundance. Cultivated berries, such as raspberries, dewberries, and blackberries, would thrive, but it is doubtful if they would be profitable owing to the abundance of wild berries. Strawberries do exceptionally well and are grown successfully in small patches as a truck crop. Grapes do fairly well, but are rather uncertain, owing to the liability of injury by late spring frosts. In 1910, according to the census, there were 73,390 apple trees, 3,745 peach trees, and 1,097 grapevines in the county.

Commercial fertilizers are used to a very small extent. In 1910 only 27.5 per cent of the farms reported the use of fertilizer, at an

average cost of only \$12 per farm, and the amount used has not increased very much since that time. Bone meal, ammoniated phosphate, and high-grade mixtures for vegetables are the chief kinds in use. The bone meal and ammoniated phosphate are used for corn and buckwheat, at the rate of 200 to 400 pounds per acre. Vegetables and potatoes generally receive applications of about 100 to 250 pounds of fertilizer per acre. Many farmers do not use any fertilizer, but depend upon the stable manure available, which is seldom sufficient to cover all the cultivated land. Liming is practiced to a small extent.

Systematic crop rotations are not in general use. Most of the farmers follow a method of farming which involves a more or less haphazard change of crops. Some follow corn with small grain and then seed the land to grass, mowing the grass until it runs out and then pasturing the field. If the brush does not become too thick the old grassland is put back in cultivated crops, otherwise it is frequently allowed to remain in brush. As most of the soils are low in organic matter and of only moderate inherent productiveness, the growing of the legumes, such as cowpeas, vetch, and clover, is essential to the best rotations, since these add organic matter and nitrogen. Crops like buckwheat and rye, however, can be used to good advantage as a means of supplying green manure. A small number of farmers practice some definite form of rotation.

Some revenue is derived from collecting and selling medicinal herbs and plants, including ginseng, goldenseal (yellowroot), bloodroot, blacksnake root, wild ginger, spikewood, and May apple, which are found in the mountainous districts. Ginseng is the most valuable of these plants and is very scarce.

The census of 1910 reports a total of 139,134 acres in farms in Raleigh County, of which 65,228 acres are classed as improved land. There are 1,598 farms, of an average size of 87.1 acres, reported, and 78.6 per cent of these are reported as operated by the owners, practically all the remainder being operated by tenants. Most of the rented land is leased from the coal companies for cash, the usual rental being \$1 per acre per year. Where the farms are worked on a share basis the terms vary widely, but usually the owner of the land receives one-half the crops. Nearly all of the farm labor, except during rush seasons, is performed by the farmers and their families. From \$1.50 to \$2 a day is the price usually paid for efficient farm labor. Laborers are difficult to obtain, as they prefer to work in coal mines, lumber camps, and on public works, where the wages are higher or the period of employment more nearly continuous.

The average value of farm land in the Coal River district is about \$10 an acre, and in the remainder of the county about \$20. The best

farm lands are valued at \$50 to \$100 an acre. Forested land is valued at about \$50 and coal land at about \$100 an acre, these estimates being based upon several recent transfers of large tracts. The coal land, however, generally has a much higher value.

SOILS.

Raleigh County comprises 14 distinct soil types, including Rough stony land, 9 upland or residual soils, 2 stream-terrace or second-bottom soils, and 3 stream-bottom soils occupying overflowed land.

The rocks from which these soils are derived range in age from the lower Conemaugh, the highest, to the Mauch Chunk red shale, the lowest formation. These beds consist of shales and sandstones, with the exception of a few layers of limestone and red calcareous shale outcropping in the New River Gorge. Their outcrop belt is only a few hundred yards wide and occurs on a steep slope too rough, in general, for cultivation. The agricultural soils of the area, therefore, are derived from shales and sandstones. These rocks dip northwestward at a low angle, so that the highest formation, the Allegheny series, occurs in the northwestern part of the county and only on the highest ridges, where it underlies the Dekalb loam. Beneath this formation and the Homewood sandstone lies a series of shales and soft sandstones (Kanawha group) from which the Dekalb stony silt loam, the Dekalb silt loam, the Dekalb silty clay loam, and the Dekalb fine sandy loam are derived. The stony loam occurs only on the steeper slopes. The silty clay loam occurs on the outcrops of beds of shale where interbedded sandstone layers do not occur and where sandstone blocks have not worked downward onto the clay from higher beds. The fine sandy loam is derived from the sandstone beds and lenses of fine grain, which occur in this series of rocks. The silt loam occurs on the gentler slopes where the underlying shales have been weathered to a considerable depth.

This series of rocks is about 1,000 feet thick and outcrops in a belt covering the western half of the county. It contains two beds of resistant sandstones, at least one of which is of considerable importance in the local agriculture. West of Marshes Post Office it forms, because of its resistance to erosion by Marsh Fork, a temporary base level which has enabled the stream and its tributaries above this point to open out broad, basinlike valleys locally called "glades." The same process has caused the formation of the "glades" at Bolt and above Dameron on both branches of Sandlick Creek. The soil of these basins is mapped as the Holly silt loam.

Beneath the Kanawha formation lie the Nuttall and Raleigh sandstones. They are massive, resistant sandstones and outcrop in the eastern part of the county. As a source of soil material they are like

the Allegheny and Homewood sandstones. They are much more important, however, in their influence on the agriculture of the county than the latter, since their resistance to erosion has caused the formation of a number of plateaus in this part of the county separated from one another by the deep gorges of the streams flowing into New River. The soils of these plateaus are mainly derived from remnants of the shales of the Kanawha formation and are identified as loams and silt loams of the Dekalb series. In the gorges separating the plateau remnants the Raleigh and Nuttall sandstone outcrops are mapped as Rough stony land.

Like the resistant sandstone beds in the Kanawha formation, these sandstones also cause the formation of "glades" along streams flowing out of the shales over the sandstone beds especially well developed on Little Whitestick, Whitestick, and Soak Creeks, these glades lying in the eastern part of the Kanawha shales and along streams flowing eastward. Below the Raleigh sandstone lie beds of argillaceous shales, which outcrop in an irregular belt across the southeastern part of the county, forming relatively smooth land occupied by a heavy soil mapped as the Dekalb silty clay loam.

Beneath these shales lie sandstones and other shales, the upper part holding, however, a massive resistant bed of sandstone which in its turn forms a temporary base level for the upper branches of Glade, Beaver, and Little Beaver Creeks, and Bluff Fork. One of the largest glades in the county has been developed along Glade Creek above and below Ghent as a result of this action. Other "glades" have been developed on the other streams mentioned. This sandstone, east of the Glade Creek gorge, supports a series of small plateaus extending eastward in diminishing area to the bluffs overlooking the New River gorge, just as the Raleigh sandstone supports the somewhat higher plateau remnants west of Glade Creek gorge. The shales of the lower part of this formation outcrop usually on steep slopes capped by the overlying sandstone and therefore form stony loams of the Dekalb series, while on a number of rather smooth-topped ridges in the extreme northeastern part of the county the lower argillaceous beds of the formation give rise to the Dekalb silty clay loam.

Underlying these lower sandstones and shales and outcropping only in the gorge of New River and the gorges of some of its tributaries is the Mauch Chunk red shale formation, consisting of red and gray shales, sandstones, and a few thin beds of limestone.

On gentle slopes these give rise to the Upshur clay loam, while on the steep slopes they form the Upshur stony clay loam.

The terrace, or second-bottom soils, the Holston fine sandy loam and silt loam, occupy the old stream bottoms and were deposited when the streams flowed at a higher level than at the present time. The material from which these soils are derived is alluvial and was

washed from the gray shales and sandstones which compose the majority of the outcrops over the drainage basins of the streams along which they occur. They are developed to a very limited extent in Raleigh County. Their variation in texture depends on the velocity of current which deposited the material, the fine sandy loam being deposited by a more rapidly moving current than the silt loam.

The first-bottom soils are alluvial in origin occupying the present flood plain of the streams. The material is derived from the sandstone and shales outcropping in the drainage basins of the streams. As with the terrace soils, the variation in texture of the first-bottom soils is due largely to the velocity of the current under which the soils were deposited. The first-bottom soils include the Huntington fine sandy loam and silt loam, and the Holly silt loam. The Holly silt loam is found upon the "glades" where the bottoms are broad and low and the streams have reached a local base level. Accumulation of organic matter and deoxidation have played an important part in forming this soil type.

The following table gives the origin of the various soil types:

Group.	Origin.	Soil types.
Upland, or residual soils.	Indian-red shale, with some thin limestone.	Upshur clay loam.
	Indian-red shale, with some thin limestone and sandstone.	Upshur stony clay loam.
	Gray shale and sandstone, shale predominating.	Dekalb silt loam.
	Gray shale.....	Dekalb stony silt loam.
	Sandstone.....	Dekalb silty clay loam.
	Sandstone and gray shale.....	Dekalb fine sandy loam.
	Sandstone, with little shale.....	Dekalb loam.
Stream-terrace, or second-bottom soils.	Chiefly sandstone.....	Dekalb stony loam.
	Wash from upland soils derived chiefly from shale.	Rough stony land.
	Wash from upland soils derived chiefly from sandstone.	Holston silt loam.
Stream-bottom soils, or overflowed land.	Wash from upland soils derived chiefly from shale.	Holston fine sandy loam.
	Wash from upland soils derived chiefly from sandstone.	Huntington silt loam.
	Wash from upland soils derived chiefly from shale. Poorly drained.	Huntington fine sandy loam.
		Holly silt loam.

Those soils having the same range of color and structure in the soil and subsoil, a similar origin, and the same type of drainage and topography are grouped into series. The series includes various types of soil, depending on the texture of the material, such as sand, loam, silt loam, clay loam, and stony loam. In the following chapters brief descriptions of the soil series and detailed descriptions of the various soil types encountered in Raleigh County are given.

The table below gives the name and actual and relative extent of each soil type mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb silt loam.....	111,232	28.4	Upshur stony clay loam.....	6,144	1.6
Dekalb stony silt loam.....	94,848	24.3	Upshur clay loam.....	3,584	.9
Dekalb silty clay loam.....	70,208	18.0	Dekalb fine sandy loam.....	2,880	.7
Dekalb stony loam.....	35,840	9.2	Huntington silt loam.....	1,344	.3
Rough stony land.....	32,256	8.2	Holston fine sandy loam.....	832	.2
Huntington fine sandy loam...	13,056	3.3	Holston silt loam.....	64	.1
Holly silt loam.....	10,048	2.6			
Dekalb loam.....	8,704	2.2	Total.....	391,040

DEKALB SERIES.

The surface soils of the Dekalb series are gray to brown and the subsoils yellow or yellowish brown. The soils are derived from gray shales and sandstones from Silurian to Carboniferous in age. In this county they are wholly from the latter formations. The topography varies from gently rolling to steep and rugged. The drainage is usually excessive. In this county the fine sandy loam, loam, silt loam, silty clay loam, stony loam, and stony silt loam are recognized.

DEKALB FINE SANDY LOAM.

The soil of the Dekalb fine sandy loam is a grayish-brown fine sandy loam which quickly grades into yellowish-brown fine sandy loam, fairly loose and open in structure. The subsoil, beginning at a depth of about 8 to 10 inches, is a yellow heavy fine sandy loam, of a compact, friable character.

The topography is level to gently undulating, the soil occurring on rounded ridge tops and gently sloping hillsides. The drainage is good. The type occurs in small areas in the central part of the county, generally in association with outcrops of fine-grained sandstone.

The greater part of the type is cleared and under cultivation or in pasture. The character of the soil makes cultivation easy, and the topographic conditions are very favorable to the use of improved farm machinery.

The principal crops are corn, oats, buckwheat, garden vegetables, Irish and sweet potatoes, and hay, consisting of timothy, redtop, and cowpea. Corn and oats are probably the leading crops. Only relatively small areas are mowed, as the soil does not produce exceptionally good grass. Clover is grown to a very small extent, as it does not do well on this soil. The type is well suited to cowpeas,

and vetch is an excellent crop for hay and for building up the soil. Rye or oats can be grown with vetch.

Corn yields from 20 to 40 bushels per acre, oats 20 to 30 bushels, buckwheat 10 to 20 bushels, wheat 10 to 12 bushels, potatoes 100 to 200 bushels, sweet potatoes 150 to 250 bushels, and hay something less than 1 ton.

Apples, peaches, pears, plums, and cherries are grown successfully. Apples apparently do better than the other fruits, although there are no extensive orchards on the type. The soil is well suited to small fruits, such as brier berries and strawberries.

The native forest growth consists mainly of chestnut, chestnut oak, oak, pine, and poplar.

The present value of this land is about \$25 to \$50 an acre.

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

Mechanical analyses of Dekalb fine sandy loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221401	1 mile west of Beckley.	Fine sandy loam, 0 to 8 inches.	0.1	0.5	0.3	39.4	17.3	32.8	9.6
221402	Subsoil of 221401....	Heavy fine sandy loam, 8 to 36 inches.	.0	.1	.2	39.8	17.5	30.6	11.7

DEKALB LOAM.

The soil of the Dekalb loam to a depth of about 8 or 10 inches is a brown mellow loam, grading into a yellowish-brown loam or silt loam which extends to a depth of about 15 to 18 inches where the subsoil becomes heavier and more compact, consisting of silty clay loam. In places small fragments of partly decomposed sandstone and shale are scattered over the surface and disseminated throughout the soil section.

Most of the type is underlain by a heavy, massive sandstone stratum, which is encountered within the 3-foot section in many places. In the western part of the county it is underlain by the Allegheny and Homeward sandstones, and in the eastern part by the Nuttall and Raleigh sandstones. Crops do not suffer on this type in dry seasons as much as on other upland soils which are more compact in structure. The dark color of the surface soil is due to the accumulation of organic matter.

The Dekalb loam is not extensively developed. It is found in a few small, scattered areas on the high mountain tops in the western part of the county and on the broad flats supported by the Raleigh sandstone between Piney and Glade Creeks. The topography is level to slightly undulating. The drainage is fairly good. "Bear wallows" are occasionally found over the type where the under-drainage is retarded by the sandstone.

Most of the type is cleared and under cultivation. Corn, wheat, buckwheat, oats, hay (timothy, redtop, millet, clover, and cowpea), and vegetables are the principal crops grown. Corn probably occupies the largest acreage, with buckwheat and hay following closely. Very little of the type is in pasture, although grass does very well. Practically all the crops grown make good yields. Potatoes, cabbage, beans, beets, and turnips are more extensively grown than any other vegetables. Corn yields about 20 to 50 bushels per acre, wheat 12 to 15 bushels, buckwheat 15 to 25 bushels, oats 25 to 40 bushels, potatoes 100 to 250 bushels, and hay about 1 ton.

There are several good orchards on this soil. It produces good yields of apples and cherries of excellent quality. It comprises many favorable sites for commercial orchards.

The native forest growth consists mainly of oak, chestnut, chestnut oak, spruce, pine, white pine, and poplar. Land of this type is valued at about \$20 to \$50 an acre.

DEKALB SILT LOAM.

The Dekalb silt loam consists of a grayish silt loam, which passes at a depth of a few inches into yellowish-gray or yellowish-brown medium silt loam, underlain at about 8 to 10 inches by yellowish-brown, heavy silt loam to clay loam. The parent rock is seldom found within the 3-foot section, weathering having extended to depths of 4 to 6 feet in most places. As the result of this the rock content is very low, being confined to a few scattered fragments of partially weathered sandstone and shale.

The topography is fairly level to rolling and drainage is good throughout the type. The Dekalb silt loam is extensively developed over the central and northern parts of the county, occupying flattish mountain tops and ridge crests and gently sloping hillsides.

Corn, wheat, buckwheat, oats, potatoes, hay (timothy, redtop, millet, clover, and cowpea), and vegetables are the principal crops grown. Corn yields about 20 to 45 bushels per acre, and is planted on a larger acreage than other crops. Wheat yields 10 to 15 bushels per acre, but is grown only to a small extent. Buckwheat yields 10 to 20 bushels per acre. It is grown almost as extensively as oats. Oats yield 20 to 30 bushels per acre and rank next to corn in point of acreage. Potatoes yield 100 to 250 bushels per acre, and hay

(timothy) about 1 ton. The acreage in grass, as compared with other crops, is rather high, but that used for mowing each season is not very large. The yields are a little higher than are usually obtained upon this type in other sections, owing largely to more attention being given to farming the type in this county. Tobacco is grown to a very small extent, although it is produced quite extensively on this soil in counties to the west. Apples do particularly well, and there are a few orchards of commercial size which produce fruit of excellent quality and color. Other fruits, such as pears, plums, cherries, and peaches, do fairly well. The peach does not seem especially well adapted to the conditions in this section, at least the trees, as a rule, are short-lived and little has been accomplished with them on this soil. Cherries seem to rank next to apples in point of importance and adaptability.

Most of this soil has been under cultivation since the country was cleared and many hard-used fields have had the organic-matter content of the soil materially reduced. Very little effort has been made to improve this deficiency, and crop yields under such condition are comparatively low. The amount of commercial fertilizer used is small, and the best farmers depend upon applications of stable manure and the turning under of vegetation to maintain productiveness.

The soil is fairly easy to cultivate, requiring but moderately heavy tools and teams for efficient tillage, at least where the supply of humus has not been permitted to run so low as to cause the soil to bake and clod. Under such conditions the expense of effecting good tilth is always increased. The surface configuration is such that improved machinery can be used over most of the land, thus reducing the cost of crop production below that on the steeper mountain land. The soil is easily improved, as it responds readily to good treatment, including applications of fertilizers and manures. It is a desirable soil for general farming.

Most of the land has been cleared of its original forest, which consisted chiefly of chestnut, chestnut oak and other oaks, poplar, beech, and hickory. Of the cleared portion probably one-third is in pasture. Although it does not support a heavy growth of bluegrass, it will produce at least fair pasturage of this grass and other grasses, and much of the type could, under present conditions, be used most economically for pastures. The soil is better adapted to such leguminous crops as vetch and cowpeas than it is to clover. The lime content is very low, and liming has generally been followed by good results. Red clover does best where lime is used. Probably 2,000 pounds of burned lime per acre, or twice this amount of ground limestone, would be a good application, judging by results on the same soil in many parts of the Appalachian region. The value of this land varies from about \$20 to \$60 an acre.

Mechanical analyses of samples of the soil and subsoil of the Dekalb silt loam gave the following results:

Mechanical analyses of Dekalb silt loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221403	1½ miles west of Beckley.	Silt loam, 0 to 6 inches.....	0.4	0.6	0.6	7.6	12.5	59.2	18.8
221404	Subsoil of 221403....	Heavy silt loam, 6 to 36 inches.	.4	.6	.4	6.3	9.4	58.7	23.7

DEKALB SILTY CLAY LOAM.

The soil and subsoil of the Dekalb silty clay loam are fairly uniform throughout the type. The soil is a grayish-brown to pale yellowish brown silt loam, which grades at a depth of a few inches into a yellowish, compact but friable, silty clay loam. Cultivation to a depth of about 6 to 8 inches brings to the surface enough of the more clayey material to produce a soil of silty clay loam texture. The soil is fairly free from rock fragments. A few fragments of shale are scattered over the surface and disseminated throughout the soil section. Weathering has extended to a depth of about 3 to 5 feet.

The topography is nearly level to gently rolling, and drainage is good.

The type in general is well suited to agriculture, and most of it is cleared and under cultivation. It is distributed through the eastern half of the county, where it occurs in irregular strips on hilltops or slopes as the outcrop of the shale may occur.

The principal crops grown are wheat, oats, buckwheat, corn, potatoes, vegetables, and timothy, clover, cowpea, and millet hay. Corn and hay are the leading crops. Corn yields about 20 to 40 bushels per acre, buckwheat about 15 to 20 bushels, oats 20 to 30 bushels, wheat 12 to 20 bushels, potatoes 100 to 150 bushels, and hay 1 ton to 1½ tons.

In general the soil is deficient in organic matter. This should be supplied where practicable by applying stable manure, or by growing and occasionally plowing under legumes or other crops, such as rye or buckwheat, for green manuring. Lime or ground limestone in moderately liberal applications—about the same probably as are used on the Dekalb silt loam—is beneficial. Bluegrass takes hold fairly well, and a considerable acreage is in bluegrass pasture.

Those fruits which succeed in this section seem to do best on this soil. The apple orchards are in a healthy condition. Brier crops, such as blackberries and raspberries, do exceptionally well. Blackberries of excellent quality grow wild in abundance.

In cultivating this soil care should be taken not to plow while in a wet condition, for as a result the soil puddles, and when dry, clods are turned up by plowing which require considerable labor to reduce to a favorable condition for seeding.

The type is a moderately strong soil naturally, and good yields are obtained by proper treatment; that is, by maintaining a good supply of humus, by thorough and seasonable plowing, and by practicing other essentials of good farming.

The native forest growth consists of oak, hickory, walnut, beech, poplar, and some chestnut and pine. This land is valued at about \$25 to \$50 an acre.

Results of mechanical analyses of samples of the soil and subsoil of the Dekalb silty clay loam follow:

Mechanical analyses of Dekalb silty clay loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221407	1 mile west of Cranberry.	Silt loam, 0 to 6 inches.....	0.8	1.4	0.7	2.5	5.0	66.6	22.7
221408	Subsoil of 221407....	Silty clay loam, 6 to 36 inches.	.5	1.1	.6	.9	2.3	46.0	48.4

DEKALB STONY LOAM.

The fine material of the Dekalb stony loam consists of brown to dark yellowish brown mellow loam which grades at about 6 to 8 inches into yellowish-brown to yellow, slightly compact loam to silt loam. The stony material consists almost entirely of sandstone fragments and varies considerably in quantity from place to place, but usually there is enough to interfere seriously with cultivation. Bed-rock occurs within the 3-foot section in places.

The topography of most of the type is moderately sloping. In places the surface is quite steep, and in other places it is almost level. The drainage is good to rather excessive. The type is developed in the eastern and west-central parts of the county.

The soil is not very valuable from an agricultural standpoint. A part of it is used for grazing, though most of it is in open range. Very little of the type is cultivated. Patches of corn are grown here and there. Some fields have been cleared of the rocks. This soil

has about the same agricultural possibilities as the Dekalb stony silt loam, except that its topographic features are better suited to orcharding. The smoother topography is a factor which makes this a much more valuable soil. The steeper areas should be allowed to remain in forest; the remainder can be grazed, and the more nearly level portions cultivated or used for orcharding. The latter is preferable, owing to the difficulty of plowing and the impracticability of using the best farm machinery on much of the type.

The forest growth consists of spruce pine, white pine, pitch or mountain pine, sometimes called black pine, beech, oak, poplar, and chestnut.

DEKALB STONY SILT LOAM.

The fine material of the Dekalb stony silt loam consists of grayish-brown to yellowish-brown silt loam, which grades at about 6 to 8 inches into yellowish-brown heavy silt loam to silty clay loam. Scattered over the surface and disseminated throughout the soil section are varying quantities of sandstone and shale fragments. Bedrock is encountered within 3 feet of the surface in some areas. In general the type contains somewhat more sand than the Dekalb silt loam, and is more friable. Areas of Rough stony land, Dekalb sandy loam, loam, and silty clay loam are scattered over the areas of this type, but are so irregular in occurrence that their separation is impracticable.

The type is extensively developed in the western half of the county, with scattered areas in other sections. The topography is mainly steep and broken, and the run-off is very rapid.

Most of the type is forested with a heavy growth of poplar, chestnut, white oak, red oak, chestnut oak, beech, and pine. Much of this is original forest, although there are large areas of cut-over land.

In general the surface is too steep for cultivated crops or orchards. Much of the land can be used for pasture, but after the vegetation is cleared from open areas, erosion is likely to become active, washing the surface soil from the steep hillsides. Where this land is put in grass, every effort should be made to keep up a good sod. A large part of the type is too steep to be cleared. Much of the land affords good grazing and is used as an open range. The range could be improved by clearing away the underbrush to permit the bluegrass and native grasses to make a better growth.

Small areas are cultivated, mainly to corn, which yields about 10 to 30 bushels per acre. Most of the land is productive when first cleared, especially in the coves, where the soil is deeper. Yields of about 45 to 50 bushels per acre are sometimes obtained on these spots. Some of this type could be used for tobacco, as this is a crop with which hand cultivation can be largely used. This soil is used suc-

cessfully in other parts of the State for tobacco. Such crops as wheat, buckwheat, oats, and hay can not be successfully handled over the greater part of this type, on account of the difficulty of harvesting. Small patches of nearly all the crops common to the county are grown upon this soil. Vegetables do well and are grown on a small scale and sold in mining towns. Small home orchards of apples are common, and the quality of the fruit is good.

The type can best be utilized for grazing cattle, sheep, and hogs. Occasional smooth areas on benches, in coves, and in more nearly level places can be used for tilled crops.

The value of this land varies from about \$5 to \$20 an acre, not including coal and timber rights. Most of the land is held by the coal and lumber companies and is not in farms.

UPSHUR SERIES.

The soils of the Upshur series have reddish-brown to red or Indian-red surface soils and red to Indian-red subsoils. They are derived from red sandstone and red to Indian-red shales. The shales are very often calcareous. These soils occupy rolling to mountainous country. The drainage is well established. Two soil types of this series are represented in Raleigh County, the clay loam and stony clay loam.

UPSHUR CLAY LOAM.

The soil of the Upshur clay loam where typically developed is a dark reddish brown or dark Indian-red clay loam about 6 to 8 inches deep. This grades imperceptibly into a subsoil of compact, heavy Indian-red clay. The material is friable when moderately moist and plastic when wet. A very pronounced characteristic of the soil is its tendency to bake and crack upon drying rapidly. Both soil and subsoil contain small quantities of sandstone and red shale fragments which are more or less decomposed. In many places where the type has been under cultivation for some time and erosion has been active the soil is very thin and the subsoil very compact.

This type is developed to a small extent along the edge or upper slopes of New River gorge, in the eastern part of the county.

The topography is rolling to steep, much of the soil occurring on steep hillsides. In the more rolling areas and on the steep hillsides erosion has been very active, and many of the old fields are badly gullied.

This type was the first hill land to be cleared and farmed in this section of the country, and naturally much of it is impoverished, giving poor yields. Such land can be built up and made to produce good yields by growing leguminous crops, turning under cover crops, and liming.

Such legumes as clover and vetch thrive on this soil. The other legumes, as cowpeas and soy beans, will grow, but they do not seem to be so well adapted to the conditions as red clover, crimson clover, and lespedeza.

Fertilizers are not used, and experience indicates that there is some doubt as to whether their use would pay except, perhaps, in the case of phosphatic material. Lime seems to be beneficial.

The Upshur clay loam is the strongest upland soil in the county. Bluegrass does well, growing wild over much of the virgin land. It is necessary to seed the grass on the impoverished cultivated land to obtain a stand.

The forest, which consisted originally of a heavy growth of hardwood, chiefly oak, hickory, maple, and walnut, has been cleared from most of this land. A large area of the cleared land is in pasture. The remainder is used for corn, oats, wheat, buckwheat, and timothy and clover hay. Of these crops corn occupies the largest acreage. Corn yields about 25 to 45 bushels per acre, buckwheat 10 to 20 bushels, wheat 12 to 15 bushels, oats 15 to 30 bushels, and hay about one-half ton to 1½ tons. On the better portions of the type 1 acre will support a steer, but in the poorer places several acres are required.

For its proper cultivation this soil requires strong implements and heavy teams. If plowed in a wet condition, it bakes with subsequent dry weather and clods when plowed again. The soil remains cold and wet late in the spring, and this retards plowing. Late fall plowing permits beneficial alternate freezing and thawing of the upturned soil in the winter.

Owing to its steep topography and consequent susceptibility to erosion, it is advisable to put only the more gently sloping areas of this type in cultivated crops. Some slopes too steep for safe cultivation can be successfully used for bluegrass pasture. The type is now valued at about \$25 to \$40 an acre.

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

Mechanical analyses of Upshur clay loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay
221409	½ mile east of Abraham.	Clay loam, 0 to 8 inches.....	P. ct. 0.7	P. ct. 2.2	P. ct. 1.2	P. ct. 4.4	P. ct. 11.5	P. ct. 57.2	P. ct. 22.7
221410	Subsoil of 221409....	Heavy clay, 8 to 36 inches...	.1	.5	.5	2.4	11.0	50.3	35.4

UPSHUR STONY CLAY LOAM.

The soil of the Upshur stony clay loam is a chocolate-brown to dark Indian-red stony clay loam about 6 to 8 inches deep, overlying Indian-red clay of a rather stiff to plastic structure. The subsoil contains some stone fragments, but is less stony than the soil. The stones consist largely of sandstone boulders coming down from the higher Pottsville formation. A few thin strata of sandstone, gray shale, and limestone are present in the strata giving rise to the soil, but these influence the type to a very slight extent. The stone content varies with the topography, the steeper areas containing the most stone. In some places only a few scattered fragments are found, while in others the surface is almost covered with sandstone boulders.

This soil is developed to some extent along the New River gorge, and the Glade Creek gorge in the eastern part of the county. The topography is usually steep and in a few places sloping.

Very little of the land is utilized for farming, most of the cleared areas being in pasture, with an occasional patch of corn. Corn does well, but is very hard to cultivate on account of the stones. The type can best be used for grazing and forestry. Much of it could be successfully used for grazing sheep and goats.

The native forest is composed largely of oak, poplar, hickory, walnut, and beech. The trees are usually large, and the underbrush and ferns are dense.

HOLSTON SERIES.

The types of the Holston series have yellowish-brown to brown surface soils and yellow subsoils. They are developed on old alluvial terraces representing the level of the old flood plains of the streams along which they occur. The material is derived from gray shale and sandstone which outcrops in the drainage basin. Sometimes small quantities of residual material are encountered in the subsoil.

HOLSTON FINE SANDY LOAM.

The Holston fine sandy loam is a brown, mellow fine sandy loam, underlain at about 10 inches by a yellowish-brown to yellow, friable, heavy fine sandy loam, which becomes slightly compact in the deep subsoil.

This soil occurs on stream terraces (second bottoms) along the lower part of Marsh and Clear Forks. The material varies in thickness from several feet to about 20 to 30 feet and represents alluvium deposited when the streams were flowing at higher levels.

Most of this soil lies above normal overflow, with a topography that varies from level to gently undulating. This gives good surface

drainage, and the porous character of the substratum gives good underdrainage.

The principal crops grown are corn, oats, rye, sorghum, and hay (cowpea and millet). Irish and sweet potatoes and other vegetables are grown in small patches. Corn covers a larger acreage than any other cultivated crop. Very little of the type is in improved, fenced pasture, but much of it is used as an open range. Corn yields about 20 to 30 bushels, oats about 20 to 25 bushels, Irish potatoes 100 to 150 bushels, sweet potatoes 200 to 250 bushels, and hay about 1 ton per acre. Brier berries and strawberries would probably make good yields, but are not grown. Melons are grown to a small extent for market. Vegetables are grown in gardens, but seldom for market. Summer apples seem to do very well, although the trees usually show lack of care. The soil is easily cultivated and responds readily to fertilizers, stable manure, or green manure. It is deficient in organic matter. Liberal additions of fertilizers or manure are necessary for good yields of vegetables. Better results are obtained with such leguminous crops as cowpeas, vetch, and soy beans for hay than with the grasses. It is doubtful if liming generally would pay. Light applications might prove profitable where green vegetation is plowed under in large amounts. Burley tobacco of a good grade can be grown if properly fertilized. About 600 to 800 pounds of tobacco or "truckers'" fertilizer has been used successfully upon tobacco in other counties in the State upon the same soil type.

The natural forest growth consists of sycamore, poplar, beech, and birch. This land is valued at about \$50 to \$75 an acre where no right of way is involved.

Results of mechanical analyses of samples of the soil and subsoil of this type follow:

Mechanical analyses of Holston fine sandy loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221411	4 miles south of Jarrolds Valley.	Fine sandy loam, 0 to 10 inches.	0.2	6.2	10.0	34.6	18.7	20.0	10.2
221412	Subsoil of 221411....	Fine sandy loam, 10 to 36 inches.	.1	2.9	3.4	20.9	25.0	30.3	17.5

HOLSTON SILT LOAM.

The soil of the Holston silt loam is a brown, mellow silt loam which grades at about 10 inches into a light yellowish brown or

yellow, compact, friable silt loam, changing to a silty clay loam in the lower part of the 3-foot section.

The type is inextensive, being confined to one area along New River. It occurs as a stream terrace (second bottom) lying above overflow, and the material was deposited by the stream while flowing at a higher level than at present. The deposits vary in depth from a few feet to about 20 feet.

The topography is level to gently undulating. The drainage is good.

This type is clearer and is either under cultivation or is used for mowings. The crops grown are corn, wheat, oats, buckwheat, sorghum, hay (millet, timothy, and cowpea), sweet and Irish potatoes, and vegetables. Corn and hay are the most important crops. Probably half of the type is in pasture. Corn yields about 30 to 60 bushels per acre, oats 20 to 30 bushels, wheat 10 to 15 bushels, buckwheat 15 to 18 bushels, potatoes 150 to 200 bushels, and hay 1 ton to 1½ tons. Vegetables succeed, but are grown for home consumption only. There are many small orchards in which a few apples are grown for home use. Most of the apples are of summer varieties. Tobacco is not grown, although it is produced successfully upon this soil in adjoining areas. Sorghum makes good yields and produces an excellent grade of sirup. Pumpkins and squashes grow to a large size.

Little fertilizer, lime, or stable manure is used and cover crops are seldom turned under. The soil appears to be deficient in organic matter. Cowpeas are about the only legume grown.

In other areas the use of commercial fertilizers in small quantities on this type has proved beneficial. For truck crops the application of 200 to 400 pounds per acre of a high-grade "truckers'" fertilizer analyzing 8-5-5 or 8-5-7 is used with profit. For corn about 200 to 250 pounds of some form of phosphate is used. Tobacco is given an application of 400 to 600 pounds of an 8-2-5 mixture and potatoes 250 to 500 pounds of an 8-4-6 mixture. Lime is beneficial where clover will not make a stand. Where the soil is well supplied with humus 1 ton of lime or 2 tons of ground limestone would probably be about the proper acreage application, according to experience on similar soil elsewhere. Clodding results from wet plowing. The native forest growth is mainly sycamore, elm, and beech.

This land is valued at about \$50 to \$75 an acre.

HUNTINGTON SERIES.

The Huntington series includes light-brown to brown soils and yellow to light-brown subsoils. Frequently there is little change in color or character of materials throughout the 3-foot section. These

soils are found upon the first-bottom or overflowed land along streams in the Appalachian Mountain and Limestone Valley regions. They consist of material derived from limestone, sandstone, and shale soils. In this county they are derived from gray shales and sandstones, very little limestone entering into their composition.

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam is a brown to dark-brown mellow silt loam about 10 or 12 inches deep. Over much of the type there is little change from soil to subsoil, but usually the latter is slightly lighter in color and a little heavier and more compact, especially in the lower part. It consists generally of silt loam of a light-brown color. In places the color is yellowish brown, but such areas are not extensive.

The type is found along the headwaters of Clear Fork and along those of Sandlick Creek, occurring as first-bottom overflow land.

The topography is fairly level, with a few swells and swales running with the direction of the streams. These give ample drainage to most of the type. The swales are usually poorly drained and resemble the Holly series.

This soil is one of the most valuable soil types in the county. It produces excellent yields of corn, sorghum, hay, and vegetables. Corn yields from 40 to 80 bushels per acre, and timothy and redtop hay $1\frac{1}{2}$ to 2 tons. Wheat, oats, and buckwheat are not grown because they have a strong tendency to lodge. Vegetables produce good yields. Cabbage, beans, onions, and tomatoes do best. Sorghum makes heavy yields, but the sirup is not of the best quality. Pumpkins and squashes grow to a large size. Probably half the type is in pasture. It furnishes excellent grazing even during fairly dry seasons.

Clover and several other legumes, such as cowpeas, vetch, and soy beans, do well in the better drained areas. Irish and sweet potatoes do well upon the higher, better drained portions of the type.

The deposits of organic matter and soil material left by the frequent inundations make it unnecessary to use fertilizer or manure, or to turn under cover crops to maintain the productiveness. In many places corn has been grown for a number of years without any decrease in yields.

Plowing and subsequent cultivations are easily performed with comparatively light implements and teams. Clods formed from unseasonable plowing are easily crushed or disintegrated by rains and overflows.

The natural forest growth is composed principally of sycamore, elm, beech, birch, and willow. This land is valued at about \$75 to \$100 an acre.

HUNTINGTON FINE SANDY LOAM.

The soil of the Huntington fine sandy loam is light-brown, loose fine sandy loam, somewhat yellowish in the subsurface section. The subsoil, beginning at about 10 inches, is a little lighter in color and slightly heavier and more compact than the soil. Spots of sand occur along the banks of streams, and there are some included swales of Holly silt loam and fine sandy loam, but these areas are too small to map separately.

The Huntington fine sandy loam occurs in the first bottoms along many of the streams. It is subject to overflow, although a large part of it is overflowed only about once in five or six years.

The channels of the streams through much of this type are broad and deep enough to carry the water of most of the floods, and overflows are thus prevented. This, however, makes erosion active along the stream banks, as a result of which there are many very broad channels.

The topography is level to undulating. In places swells, or faint ridges and hummocks alternate with shallow swales. The drainage is good to rather excessive where the loose sand is deep. The depth of the alluvium in this type varies from a few feet to about 10 or 15 feet.

The soil is easily cultivated, requiring a light draft of work stock, light tools, and very little harrowing to provide a good tilth. The supply of organic matter in the soil is apparently reduced rather rapidly under cultivation. This can be replenished by the addition of manure and by growing and turning under the legumes and other crops. Commercial fertilizers are necessary for best yields where barnyard manure is not available.

The crops grown are corn, oats, rye, hay (millet and cowpea), sorghum, and vegetables. Brier berries and strawberries succeed, but are not extensively grown. While the soil is well suited to vegetables, they are not grown for market to any important extent. Some melons are grown.

Corn yields about 30 to 40 bushels, oats 25 to 30 bushels, Irish potatoes 100 to 150 bushels, sweet potatoes 200 to 250 bushels, and hay about 1 ton per acre. The soil produces good grass, and about half the type is in pasture or hay land. Rye yields well and makes good hay where sown with vetch. Sorghum usually makes heavy yields.

The natural forest growth consists mainly of sycamore, beech, birch, elm, and willow. The value of land of this type is about \$50 to \$75 an acre.

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

Mechanical analyses of Huntington fine sandy loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221413	Near Raleigh.....	Sandy loam, 0 to 10 inches..	0.0	1.0	3.6	40.4	28.0	14.7	12.1
221414	Subsoil of 221413....	Fine sandy loam, 10 to 36 inches.	.0	.6	2.6	43.8	31.0	15.3	6.9

HOLLY SERIES.

The members of the Holly series have gray soils and mottled gray, yellow, and brown subsoils. They occur on first-bottom land and are subject to frequent overflow. The material is alluvial and derived from sandstone and shale formations of the Appalachian Mountains and from the soils of the Limestone Valley region. In this area it is derived entirely from gray shale and sandstone. The drainage is very poor.

HOLLY SILT LOAM.

The soil of the Holly silt loam to a depth of about 10 or 12 inches is a gray or dark-gray silt loam, with mottlings of yellow in the sub-surface section. The subsoil is a mottled gray or drab and yellow, compact silty clay loam which is plastic when wet.

The surface is level and the drainage is poor, both on account of inadequate surface slope and the imperviousness of the subsoil. The land is known locally as "glade land" or "crawfish land." Crawfish holes are present in large numbers.

The type occurs in the stream bottoms. When cleared and drained it furnishes excellent pasture and hay, producing good yields even in dry seasons. Where the drainage is inadequate on account of clogged ditches or the absence of ditches, bullrush is a common growth. Where well drained the type produces fairly good yields of corn, oats, hay, consisting of timothy, redtop, and wild grass, and sorghum. Certain vegetables, such as cabbage, onions, and celery, succeed upon this soil in other sections of the State. Probably two-thirds of the type is in pasture, and most of the remainder is in meadow, leaving only a small percentage for cultivated crops. Corn yields 30 to 50 bushels per acre and oats 30 to 40 bushels. Sorghum and millet make good yields. The type is too poorly drained for fruit. Legumes in general do not do especially well.

This type requires thorough drainage and liming. Bone meal, ground phosphate rock (floats) or crushed limestone is beneficial.

The natural forest growth consists of sycamore, birch, beech, elm, and willow, with an undergrowth consisting largely of alder. Land of this type is valued at about \$50 to \$100 an acre.

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

Mechanical analyses of Holly silt loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>				
221405	½ mile northeast of Trap Hill.	Silt loam, 0 to 12 inches.....	0.1	1.3	1.5	12.8	15.7	48.7	19.4
221406	Subsoil of 221405....	Silt loam to silty clay loam, 12 to 36 inches.	.3	2.4	2.0	12.6	13.8	46.4	22.5

MISCELLANEOUS MATERIAL.

ROUGH STONY LAND.

The areas mapped as Rough stony land consist mainly of steep land so thickly covered with stone or including so many outcrops of rock that it can not be used for agricultural purposes. The soil material is largely Dekalb silt loam, fine sandy loam, and sandy loam.

The most extensive areas of Rough stony land occur along the gorges and steep valley walls of the streams in the eastern part of the county, mainly along New River, Piney Creek, and Glade Creek. This land is of very little agricultural value and should be allowed to remain in forest. It can be used to a small extent for grazing, but much of it is too steep even for this. Where the underbrush is cleared away the native grasses spread over areas in which the rock content is not too great. It is doubtful whether the returns would pay for the trouble of clearing this land.

The forest growth consists of oak, hemlock, pine, chestnut, and birch.

SUMMARY.

Raleigh County is in the southern part of West Virginia. It contains 611 square miles, or 391,040 acres. The county lies entirely

within the Appalachian Plateau region. The western third of the county is severely dissected, and the country is mountainous with deep, narrow valleys. In a belt extending through the central part of the county the hills are more rounded, the valley walls more sloping, and the stream bottoms widen out into "glades." In the eastern section these hills merge into a plateau, cut by deep, narrow gorges, which become deeper and wider as the New River gorge is approached.

The county was first settled about 1800. The early settlers occupied the country along the New River. The population increased gradually, and agriculture became the leading occupation early in the history of the county. Although much attention has been given to lumbering and coal mining during the last 30 years, farming has received increasing attention and is still the most important industry.

The early agriculture of the county consisted mainly of stock raising and the growing of corn, wheat, and vegetables for home use. Following the building of the railroads and subsequent industrial developments, wheat production declined, and the acreage in oats increased. Sheep raising was abandoned, and hog raising became more popular. At the present time cattle raising and general farming is the dominant form of agriculture. The leading crops are corn, oats, hay, buckwheat, sorghum, and potatoes. There are a number of good apple orchards in the county. Vegetables are grown mainly for home use. Some improved labor-saving machinery is used. Liming is practiced, and fertilizers are used to a limited extent. No systematic crop rotation is practiced. A considerable acreage is in pasture.

A large part of the stock is kept on the open range. Some attention is given to the introduction of improved breeds of live stock.

The population of the county is given in the 1910 census as 25,633.

Beckley is the county seat and the largest and most important town. Its population is reported as 2,161 in 1910. A number of large cities are within easy reach by railroad, furnishing good markets. The coal-mining towns constitute good local markets for vegetables, fruit, and dairy products.

Farm labor is scarce. Most of the farm work is done by the farmers and their families. Very little land is rented, a large percentage being operated by the owners. Land values, excluding coal and timber rights, are not very high.

The climate of Raleigh County is mild and well suited to farming. The average temperature for the year is about 52° F. The precipitation is well distributed and averages about 38 inches annually.

The 14 soil types mapped in the county fall into 3 classes: (1) Upland or residual soils, formed by the weathering in place of gray

shales and sandstone and red shale and thin-bedded limestone; (2) terrace or old-alluvial soils, which occupy the former flood plains of the streams, and (3) the first-bottom or present flood-plain soils. The terrace and first-bottom soils are derived from the sandstone and shales which outcrop in the drainage basins of the streams along which the deposits occur.

The Dekalb soils have gray to yellowish-brown soils and yellow to yellowish-brown subsoils. They are derived from gray shale and sandstone.

The Dekalb fine sandy loam has a rolling to fairly level ridge-top topography. It is not a strong soil, but is suited to the legumes, melons, and vegetables.

The Dekalb loam occupies flat to gently rolling ridge tops and is well suited to vegetables and general farm crops.

The Dekalb silt loam in general has a smooth to rolling topography and is well suited to general farming, stock raising, and fruit growing.

The Dekalb silty clay loam has a gently sloping to rolling relief. It is a fairly strong soil, well suited to orcharding, general farming, and stock raising. It is fairly well suited to grass.

The Dekalb stony loam and stony silt loam both have steep and rugged topographic features. They are not very well adapted to tilled crops, and are best utilized for pasture and forestry.

The Upshur soils have reddish-brown to red soils and red to Indian-red subsoils. They are derived from red shales and some interbedded gray shales, sandstone, and limestone.

The Upshur clay loam has a rounded to sloping topography. It is a fairly stony soil and is best suited to grain and grasses. In this county it has suffered somewhat from erosion.

The Upshur stony clay loam occupies steep to precipitous hillsides, with the exception of a few patches which can be cultivated. It is best utilized for pasture.

The Holston series is represented by two soil types in this county, the fine sandy loam and silt loam. Both are of very small extent. They have brown to yellowish-brown soils and yellow to yellowish-brown subsoils, and occur on the second bottoms or old flood plains of streams. They are well suited to general farm crops and vegetables.

The soils of the Huntington series have brown to yellowish-brown soils and yellow to yellowish-brown subsoils. They occur on the present flood plains of the streams.

The Huntington fine sandy loam, while not so productive as the silt loam, is suited to a wide range of general farm crops and vegetables.

The Huntington silt loam is a strong soil, producing excellent crops of corn, grass, and vegetables without the use of commercial fertilizer.

The Holly silt loam is the only representative of the Holly series in this county. It has a gray to dark-gray surface soil and a mottled gray, yellow and brown subsoil. It is known locally as "glade land," and in its natural state is best suited to grass. If drained and limed, good crops of corn, oats, and vegetables can be grown.

The Rough stony land has a comparatively small extent. It is of little agricultural value.



[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.]

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. 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.