

Issued May 8, 1915.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

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

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SOIL SURVEY OF LOGAN AND MINGO  
COUNTIES, WEST VIRGINIA.

BY

W. J. LATIMER.

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HUGH H. BENNETT, INSPECTOR, SOUTHERN DIVISION.

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



WASHINGTON:  
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1915.

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., September 25, 1914.*

SIR: Under the cooperative agreement with the West Virginia Geological Survey, I. C. White, State Geologist, a soil survey of Logan and Mingo Counties was carried to completion during the field season of 1913.

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 1913, as authorized by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

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

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### MAP.

Soil map, Logan and Mingo Counties sheet, West Virginia.



# SOIL SURVEY OF LOGAN AND MINGO COUNTIES, WEST VIRGINIA.

By W. J. LATIMER.

## DESCRIPTION OF THE AREA.

Logan and Mingo Counties, W. Va., are located in the southwestern part of the State. Together they comprise a total area of 871 square miles, or 557,440 acres. The area is bounded on the west by Tug Fork of Big Sandy River for about 65 miles along the Kentucky line and for about 5 miles along the Virginia line; on the southeast by McDowell and Wyoming Counties; on the northeast by Boone County; and on the north by Lincoln and Wayne Counties.

These counties lie wholly within the Appalachian Plateau region. The original surface of the plateau has been severely dissected and the surface is now anything but a plane. The streams have cut the country into deep, narrow V-shaped valleys and hog-backed ridges, leaving little or no level topographic features in the upland. The tops of the ridges lie in the same general level and represent the original plain surface. The general elevation above sea level of the hilltops varies from 1,250 to 1,750 feet in the western part of the area, and from 1,750 to 2,500 feet in the eastern part. The general elevation of hill or ridge tops above stream level is from 500 to 1,000 feet in the western part and 1,000 to 1,500 feet in the eastern part. Individual peaks, of course, rise higher. There is very little difference in elevation between the points at which the Guyandot River and the Tug Fork of Big Sandy River flow out of the area. Both places are about 600 feet above sea level and represent the lowest points in the area. The highest point is where Logan, Boone, and Wyoming Counties join, being 2,750 feet above sea level.

The area has two main drainage systems and two lesser ones. All of Logan County except a district in the northeastern part is drained into the Guyandot River through numerous but comparatively small tributaries. The district mentioned is tributary to Spruce Fork of

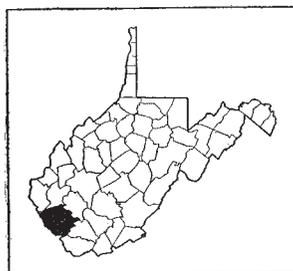


FIG. 1.—Sketch map showing location of the Logan and Mingo Counties area, West Virginia.

Little Coal River. The greater part of the drainage of Mingo County goes into Tug Fork of Big Sandy River through Pigeon Creek and other smaller laterals. A small portion of Mingo County in the southeast corner is drained into the Guyandot River, and the extreme northern portion by the Forks of Twelvepole Creek.

The topography of the county in general is exceedingly rough and broken, but in the western part the hillsides are less precipitous and the ridge tops more level than in the eastern part. The valleys are usually narrow and small developments of bottom land are found. The bottom-land development along Guyandot River is larger than along any other stream in the area. It is approximately one-half mile wide throughout the river's course in Mingo and Logan Counties. The river bottoms along Tug Fork are well developed in places, but half the land is on the Kentucky side and hence outside the present survey.

Probably 80 per cent of the area surveyed is still in forest. Although most of it is cut-over land, there is still standing a large forest of original growth in the eastern part of the area. The forest consists chiefly of different varieties of oak, chestnut, pine, spruce, poplar, walnut, hickory, ash, beech, sycamore, and birch.

Prior to about 1800 there were very few settlers in the territory which includes this area. They began to come in soon after that time, mostly from Virginia and North Carolina, and settled along the larger streams, such as Tug Fork and the Guyandot River. Logan County was formed in 1824, and the town of Logan was laid out in 1827. Mingo County was formed from Logan County in 1895.

Before the Civil War stock raising was the principal industry of the area. After the war lumbering became the chief occupation and source of revenue. The lumber was floated down the Big Sandy and Guyandot Rivers to market. Since the construction of the railroads, which took place mainly between 1892 and 1904, coal mining has become an important industry. They have also opened up valuable forest lands. The lumber output, though still considerable, is not so large as in former years.

Natural gas is found in abundance in proximity to the Warfield anticline. The principal developments are near Kermit in Mingo County and Chapmanville in Logan County. The gas is piped to Huntington and to local towns.

According to the census, the population of Logan County in 1910 was 14,476 and that of Mingo County 19,431, while in 1900 the figures were 6,955 and 11,359, respectively, showing an increase for the area of 15,593 during the decade.

Most of the residents of the area have come in from other counties and adjoining States, attracted by the development of lumbering

and mining. A large proportion of the present rural population consists of descendants of the original settlers. A comparatively large number of negroes are found in the towns along the Norfolk & Western Railroad, many of them being employed in the mines.

Williamson, the county seat of Mingo County, is the largest town in the area, having a population of 3,561 in 1910. It is the central distributing point for an extensive coal field. Matewan is the next town of importance in Mingo County, with a population of 588. Logan, the county seat of Logan County, had a population of 1,640 in 1910, being the second city of importance in the area. It is the center of a large and rapidly developing coal field. Devon, Chattaroy, Glenalum, Red Jacket, Thacker, Naugatuck, and Kermit are small towns in Mingo County, and Holden, Chapmanville, Man, Clothier, Manbar, Big Creek, and Ethel in Logan County.

The area is well supplied with transportation facilities. The Norfolk & Western Railroad extends through Mingo County, along the Tug Fork, giving an ample outlet for that part of the area to the east and west. The Guyandot Valley Branch of the Chesapeake & Ohio Railroad and its branch roads reach nearly all parts of Logan County. A branch of the Coal River Railroad extends to Sovereign, giving an outlet to the northeast corner of the county. Lumber is rafted down the rivers to the mills and market.

The public roads of the area are fairly good, considering the topography and the materials available for construction.

The local markets for produce are excellent, but are supplied largely from outside sources. The leading outside markets for the section are Huntington, Cincinnati, Columbus, Lynchburg, Richmond, and Norfolk.

#### CLIMATE.

The climate of the Logan-Mingo area is both agreeable and healthful. Extremely hot or cold spells are of rare occurrence and short duration, the average temperature for the winter months, December, January, and February, being 37.2° F. and that for the summer months, June, July, and August, being 73.9° F. The lowest recorded temperature is -9° F. in February and the highest 102° F. in July. The snowfall is usually light and remains on the ground but a short time.

The alternate freezing and thawing that occur in this section are of great benefit to the soil in improving its physical condition, especially where plowing is done in late fall or early winter, so that the furrow slices are exposed during the winter months.

The average dates of the last killing frost in spring and the first in fall are April 21 and October 24, respectively, giving a growing season

of 186 days. The date of the latest killing frost in spring is May 22, and of the earliest in fall October 11.

The annual precipitation of about 49 inches is more than ample for all crops produced in this section. The rainfall is fairly evenly distributed, being somewhat heavier during the spring and early summer, when most needed by the growing crops, and lightest in the fall during harvest time. There is sufficient precipitation in the fall, however, to germinate seeds that are planted during that season.

Occasionally droughts occur during the late summer, causing injury to some crops. Crops are also likely to suffer injury by late spring floods, but these seldom occur too late to allow replanting. The severe floods that ordinarily would do a great deal of damage usually occur before crops are planted, being caused by melting snow. Late summer floods are uncommon.

*Normal monthly, seasonal, and annual temperature and precipitation at Logan, Logan County.*

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	39.2	71	2	5.08	3.32	3.54	3.7
January.....	37.8	76	2	4.54	3.74	6.34	7.1
February.....	37.5	75	-9	4.42	8.70	3.35	8.0
Winter.....	38.2			14.04	15.76	13.23	18.8
March.....	52.7	91	4	5.73	6.10	5.12	5.0
April.....	56.8	92	25	5.01	7.30	4.24	1.6
May.....	6.76	96	33	3.92	0.90	4.71	0.0
Spring.....	59.0			14.66	14.30	14.07	6.6
June.....	71.7	100	46	5.62	4.01	7.76	0.0
July.....	75.3	102	50	4.86	5.33	7.89	0.0
August.....	73.3	96	44	3.94	2.38	7.55	0.0
Summer.....	73.4			14.42	11.72	23.20	0.0
September.....	68.6	94	38	2.69	0.93	3.97	0.0
October.....	58.9	90	21	2.97	1.81	4.68	0.3
November.....	47.2	81	11	3.11	3.15	5.70	2.6
Fall.....	58.2			8.77	5.89	14.35	2.9
Year.....	57.2	102	-9	51.89	47.67	64.85	28.3

*Normal monthly, seasonal, and annual temperature and precipitation at Williamson, Mingo County.*

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	38.2	73	5	4.07	4.00	8.22	2.2
January.....	35.6	75	-1	3.59	2.00	2.31	2.4
February.....	34.9	77	-8	3.32	3.73	1.30	4.9
Winter.....	36.2			10.98	9.73	11.83	9.5
March.....	49.3	89	6	4.94	3.47	3.97	3.8
April.....	54.4	89	21	4.17	2.53	5.30	0.6
May.....	66.8	95	35	4.22	3.59	8.65	0.0
Spring.....	56.8			13.33	9.59	17.92	4.4
June.....	72.1	95	41	5.72	3.95	7.72	0.0
July.....	75.9	98	53	3.53	3.25	4.15	0.0
August.....	75.2	97	50	4.00	3.18	5.33	0.0
Summer.....	74.4			13.25	10.38	17.20	0.0
September.....	69.9	95	39	3.22	3.22	7.64	0.0
October.....	58.1	90	22	2.16	4.00	0.55	T.
November.....	45.5	80	11	3.07	2.00	1.24	0.7
Fall.....	57.8			8.45	9.22	9.43	0.7
Year.....	56.3	98	-8	46.01	38.92	56.38	14.6

AGRICULTURE.

The early settlers in the area surveyed made clearings upon the bottoms of the larger streams and not until within recent years has any attempt been made to develop upland areas or the bottom lands along the smaller streams. Corn, wheat, tobacco, and vegetables constituted the principal crops grown during the early period of settlement.

The production of corn has steadily increased until at the present time it has the largest acreage of any crop planted. According to the 1910 census, there were 17,887 acres in corn, producing 345,172 bushels, the average yield being about 20 bushels per acre. On the hillsides corn is planted in rows running with the contours, cow-peas being very often sown between the rows; upon bottom land it is usually planted in check rows, two stalks being left to the hill. The leading varieties of corn planted are Reids Yellow Dent, Boone County White, and Hickory King.

The acreage devoted to wheat has decreased from 1,629 acres in 1880 to 51 acres in 1910. This decrease was caused by competition with the Central West. During the same period the acreage devoted to oats decreased from 1,398 to 355 acres. Rye has never been grown very extensively, although it is fairly well suited to the soil and climatic conditions.

Tobacco growing was introduced into the area by the settlers from Virginia, who were familiar with the methods of growing and handling the crop. Orinoco was the leading variety grown. Burley tobacco has been introduced into the western part of the area from Lincoln County within the last few years. The climate and soil are well suited to the production of tobacco, and there is every indication that the industry will thrive and that this crop will become the main money crop of this section, as it is of the counties to the west in this State and in Kentucky. The crop is grown in small fields, does best on new land, and nearly all the cultivation can be done successfully with the hoe. The wire tram, used so successfully in the adjacent counties, can be used to advantage in this area to transport the crop from the hillsides to the barns. Fertilizers are not used very extensively upon this crop. A fertilizer composed of phosphoric acid, nitrogen, and potash in the proportion of 8-2-5, applied broadcast at the rate of 500 to 800 pounds per acre, or at the rate of 150 to 200 pounds per acre when placed in hills, has given satisfactory results in the tobacco-growing district to the west, where the same soils are found.

Sweet potatoes are grown on a larger scale than is usually the case in West Virginia. This is attributed to the larger acreage of sandy bottom land. In most places the potatoes are planted in hills and not in rows. Very little fertilizer is used. In 1909, according to the census, 272 acres were planted to sweet potatoes, producing 27,126 bushels.

There were 1,196 acres devoted to Irish potatoes in 1909, producing 89,761 bushels.

Sorghum is grown to some extent upon the bottom lands and gives a fair quality of sirup. This crop was planted on 350 acres in 1909, the production of sirup being 20,496 gallons.

All the vegetables common to this section of the country are grown in the gardens more or less successfully, but there are very few farmers who grow vegetables on a commercial scale. Trucking should be profitable, owing to the markets afforded by the mining centers. Cabbage, beans, beets, onions, tomatoes, turnips, and sweet corn are the chief vegetables grown for market. Melons have proved a profitable crop upon the sandy bottom soils.

The production of hay is limited on account of the comparatively small acreage of level land suitable for the use of mowing machines.

Only 2,179 acres were devoted to hay and forage crops in 1909, producing 3,363 tons, or an average of a little over  $1\frac{1}{2}$  tons per acre. Timothy is the leading grass sown for hay, with millet second, of nearly equal importance. Millet is used largely as a catch crop when the hay crop is short.

Clover is grown to a very small extent. It does not seem to catch well. Cowpeas are grown more extensively than any other of the legumes. Soy beans and vetch are fairly well suited to the conditions of the area, but are not grown, so far as could be ascertained.

The soils of the area are not especially well adapted to grass, although a considerable acreage is in pasture. Bluegrass does not come in naturally, and makes only an indifferent stand when planted. Lespedeza is found growing luxuriantly in the cleared places and abandoned fields. Broom sedge seeds naturally in the abandoned fields of the bottom land, and often takes possession of the mowing lands if steps are not taken to prevent it. Many of the native grasses are found growing luxuriantly in the open woods, and furnish good grazing during the summer months.

There are many small orchards in the area which furnish fruit for home use. Commercial orcharding has not been developed, and it is doubtful if it could be made to pay on the uplands, except in a few places where the topography is level enough to permit the use of spraying machines, etc. The climate and soil are well suited to the production of fruits, including apples, peaches, plums, cherries, and grapes. Apples do better than any of the other fruits. The varieties of apples grown profitably in the general region are Thompson King, Grimes Golden, Maiden Blush, Pearmain, Ben Davis, Rome Beauty, Winesap, Early Harvest, and Yellow Transparent. Nearly all the small fruits do well. Raspberries and strawberries are found in most of the gardens and there is an abundance of native berries. The value of orchard products as given by the 1910 census was \$79,300.

A considerable number of cattle, sheep, and hogs are raised, but the industry has not reached the proportions it had attained prior to the Civil War. On the whole very little attention is given to the introduction of purebred stock. A few Herefords, Hereford grades, and Shorthorn grades were seen, but most of the cattle were native stock. There are a few Southdown, Shropshire, and Merino sheep, or rather crosses and grades of these, but most of the flocks are nondescripts. The hogs are mostly Chester White, Poland China, or grades or crosses of these breeds. A large number of native mountain hogs of the "razor back" variety were seen.

Very few horses are bred in the area, most of the supply being shipped from outside markets. A large number of mules are used in the mines and upon the farms, nearly all of which are supplied from outside sources.

According to the census, there were 193,058 acres in farms in 1910, of which 47,219 acres were improved, as compared with 218,466 acres in farms and 51,087 acres improved in 1900. The decrease is largely the result of the buying up of land by the coal companies. The value of the land and improvements in 1910 was \$5,376,647; of the implements and machinery, \$53,957; and of live stock, \$473,778. The average size of farms was 89 acres.

In Logan County, where the Morris Grant <sup>1</sup> was contested, most of the surface is owned by the residents and the timber and coal are in the hands of corporations. In Mingo County large areas of land are owned in fee simple by the corporations and leased to the farmers. The leases are usually for long terms and the rents very low. Where land is rented on shares the basis of division is half and half, but this varies to suit the conditions and the contracting parties. About one-half the farms in the area are operated by their owners.

Large bodies of land in Logan and Mingo Counties are held for speculation. About 1890 much of the land could be bought for 50 cents an acre. By 1895 the price had risen to \$10 an acre. At the present time the average price of farm land in the area is \$24.15 an acre.

Improved farm machinery, such as mowers, rakes, cultivators, disk plows, etc., are used only upon the bottoms or terraces along the larger streams. These are also about the only places where 2-horse plows are used. Over most of the area plowing is done with one horse and subsequent cultivations mainly with the hoe.

Commercial fertilizers are used to a very small extent, only 35 farms reporting their use, with a total expenditure of \$367, in 1909. Very little manure is used, as there is no large town to furnish a surplus supply and the roads are not in condition for hauling from the mine stables or lumber camps. Liming is not generally practiced. It is doubtful whether the benefits of liming upon the upland in general would warrant the expenditure necessary to pay the cost of purchase and transportation.

The greater part of the farm work is done by the farmers and their families, most of the efficient laborers having been attracted to the coal mines and lumber camps by the higher wages paid. The amount expended for labor upon the farms in 1909 was \$27,472, which is very small in comparison with the amount expended in other parts of the State upon the same acreage. A relatively small number of farms report labor hire. The average wage of farm laborers is about \$1 per day.

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<sup>1</sup> Under the settlement of the Morris Grant, which embraced about 500 square miles, most of which was in Logan County, the original settlers got the surface rights and the contestants the timber and mineral rights.

No general system of rotation is followed in the area. On hill land corn is generally planted upon new ground for several years in succession, the land being then put in pasture. When the sod begins to fail it is used for corn again. This is continued until the supply of organic matter in the soil has been exhausted and the root systems have given way, causing the hillsides to wash, when the land is left to grow up in forest. On the leveler places a more definite system is followed, including (1) corn without cowpeas, (2) corn with cowpeas, (3) oats or wheat, (4) timothy or redtop, and (5) mowing. If pasture is desired, bluegrass is sown with the timothy. This rotation is used by some of the best farmers.

SOILS.

The soils of Logan and Mingo Counties fall into three general groups, namely, residual or upland soils, terrace or old alluvial soils, and first bottom or recent alluvial soils. The residual types have been derived from shales and sandstones. The alluvial soils represent the wash from the upland deposited by currents of different velocities and changed through subjection to erosion and varying drainage conditions.

The following outline shows the soil groups and classification according to origin and process of formation:

*Classification of soil groups according to origin and process of formation.*

Group.	Material from which derived.	Name.
Upland or residual.....	Fine-grained sandstone, sandy shales, and shales.	Dekalb loam.
	Fine-grained sandstones and shales.....	Dekalb silt loam.
	Sandstones and gray shales.....	Dekalb stony silt loam.
	Hard coarse-grained sandstones.....	Rough stony land.
Terrace or alluvial.....	Dekalb material where shale predominates.	Holston silt loam.
		Holston silt loam, low phase.
	Dekalb material where sandstone predominates.	Tyler silt loam.
First bottom or recent alluvial.	Derived from material washed from Dekalb material, laid down under moderately swift current.	Holston fine sandy loam, Huntington fine sandy loam.
	Same laid down by rapidly moving current.	Riverwash.

The geologic formation outcropping in the area and entering into the composition of the upland soils and indirectly affecting the character of the alluvial soils are the Conemaugh, Allegheny, and Pottsville formations of Carboniferous age. These formations consist of alternating layers of sandstone and gray shale. Only the lower portion of the Conemaugh is found, this formation capping the hills.

This is predominantly shale, with the exception of the heavy sandstone (Mahoning) found at the base of the formation. These shales usually give rise to the Dekalb silt loam and Dekalb loam. The Mahoning sandstone and the group of sandstones below it, approximately 400 feet in thickness, belonging to the Allegheny formation, are sometimes called the Charleston sandstone formation.<sup>1</sup>

Sandstone strata predominate in this formation and give rise to the Dekalb stony silt loam, though here the type contains more rock and sand than it usually does. The lower part of the Allegheny consists of more shale than sandstone, giving rise to the Dekalb stony silt loam in its typical development. The stone from the overlying Charleston sandstone group is largely responsible for the great amount of stone encountered upon the surface of the lower slopes. However, there are sufficient sandstone formations outcropping upon the lower slopes to furnish some stone in the subsoil. Only the top member, the Pottsville, comes to the surface. This occurs in the region of the Warfield anticline.

This anticline passes through the area in a general northeast-southwest direction. Entering the area at Kermit in Mingo County, it passes near Swelled Hickory Gap, Dingess, and Pecks Mill, leaving the area near the head of Big Creek 5.5 miles northwest of Clothier. Along this line of disturbance, especially in the northwestern part of the area, the rocks of the Charleston sandstone are found high upon the hills, and large areas of the less stony phase of the Dekalb stony silt loam are here formed.

The Dekalb silt loam is developed to a comparatively small extent, occurring in two phases, the hilltop and the hillside phase. Both are fairly representative of the type as mapped in adjoining areas, except that the soil contains more rock fragments and has generally a rougher topography. The Dekalb loam is found in only a few isolated developments and is very closely related to the hilltop phase of the silt loam, but is slightly lighter and fluffier in structure. The soil is considerably darker in color than the average of this type. The subsoil, however, is normal in color and texture.

The Dekalb stony silt loam is fairly representative of the type in color, texture, and topography. Large areas of excessively stony and sandy soils were found, but these conditions occur wherever this soil has been mapped, only in smaller developments. The areas of stony sandy loam are somewhat larger than are usually encountered, but their irregularity in shape and occurrence made it impracticable to separate them. The Dekalb loam areas included, as in adjoining surveys, were too small to map. Taken as a whole, the Dekalb stony silt loam has a lower agricultural value than the same type in adjoining counties, except on the lower slopes, where the shale formations

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<sup>1</sup> See U. S. Geological Survey, Charleston and Huntington Folio.

predominate. Here the soil has about the same productive power as elsewhere in the State.

Rough stony land is developed to a comparatively small extent, being confined to the steeper topography and precipices along the valley walls of the larger streams.

The Holston silt loam occurs on a high terrace and low terrace. The low terrace development is mapped as a phase. The high terrace represents the remnant of an ancient river flood plain that has been nearly all removed by erosion. It contains more residual material than is common with this type. The low terrace phase is fairly representative of this soil as mapped in adjoining counties. It is well intact, having suffered very little from erosion. It is more recent in origin than the high terrace soils, having been formed while the river flowed at a very slightly higher elevation than at present. The Tyler silt loam occurs as low, poorly drained spots over the Holston silt loam, low phase. It is typical, but is found in very small areas. The Holston fine sandy loam is a terrace soil occurring at the same general level as the low terrace phase of the silt loam, but in a portion of the area where the wash from the upland is predominantly from sandstone. It contains more sand than the average of this soil, and in places approaches a loamy fine sand.

The first-bottom or overflow land is represented by the Huntington fine sandy loam and Riverwash. The Huntington fine sandy loam is found along nearly all the streams in the area. In large part its area is typical, but along the smaller streams it contains a greater quantity of sand, gravel, and rock fragments than usual. Areas of Riverwash are numerous on this type; in fact Riverwash is more prominently developed in this area than in any of the counties previously surveyed in the State. It occurs for the most part along the larger streams where the channels were unable to take care of the volume of water during excessive floods and the bottom land was washed away, leaving the barren spots of rock fragments, gravel, and sand.

The name and the actual and relative extent of each of the soils mapped are given in the following table:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb stony silt loam.....	495,424	88.9	Holston fine sandy loam.....	1,152	0.2
Huntington fine sandy loam.	37,120	6.6	Riverwash.....	896	.1
Holston silt loam.....	640	1.7	Dekalb loam.....	192	.1
Low phase.....	9,216		Tyler silt loam.....	128	.1
Rough stony land.....	8,448	1.5			
Dekalb silt loam.....	4,224	.8	Total.....	557,440	.....

## DEKALB SERIES.

The surface soil of the types in the Dekalb series is gray to brown and the subsoil commonly some shade of yellow. These soils are derived from the disintegration of sandstones and shales, from Silurian to Carboniferous in age. In Logan and Mingo Counties the soils are from Carboniferous rocks. The surface features consist of gently rolling tablelands, hills, and mountains.

## DEKALB SILT LOAM.

The Dekalb silt loam is a gray to grayish-yellow, friable silt loam, 8 to 10 inches deep, underlain by yellow to yellowish-brown, rather compact but friable heavy silt loam to silty clay loam, which becomes more compact with depth. Both soil and subsoil contain rock fragments, the proportion of such being larger than is usually the case with this type of soil. This coarse material is composed of partly weathered fragments of the parent rocks which comprise fine-grained sandstone and shale, usually interbedded. In many places bedrock is encountered within the 3-foot section, but over most of the type it lies 4 or 5 feet below the surface.

The Dekalb silt loam is developed to a relatively small extent in this area, most of it lying upon the hilltops around the head of Marrowbone Creek. Here the material is derived from weathering of shales and sandstones of the lower Conemaugh formation and is supported by the massive Mahoning sandstone. The topography of the areas on these hilltops is level to gently undulating and the soil can usually be plowed without reference to the contours. It is recognized locally as good agricultural land. In the southeastern part of Mingo County the type occurs largely as cove land, and the soil is darker and more loamy than usual, owing to a slightly higher organic-matter content. In the curves of the bends along the larger streams it occurs as gently sloping hillsides. The most extensive developments are found along Tug Fork.

Practically all of the Dekalb silt loam is cleared and either under cultivation at present or has been cultivated in the past. The principal crop is corn. Wheat, oats, tobacco, potatoes, and hay are also grown. Corn yields 20 to 30 bushels per acre, wheat 10 to 12 bushels, potatoes 150 to 200 bushels, and hay 1 ton.

Vegetables do well but are grown only for home consumption, except in a few places near the large towns or coal mines, but even then on a very small scale.

The type is well suited to the growing of fruit, especially apples, although little used for this purpose. The small apple orchards seen were in good condition, producing fruit of excellent color and quality. This soil is used successfully in adjacent areas for apples, peaches,

plums, and cherries. Strawberries, blackberries, and raspberries do well, but are grown to a very small extent.

Irish potatoes are one of the most profitable crops for this soil when properly handled, but as a rule very little fertilizer is used and the yields are correspondingly low.

Tobacco, which does well, is grown upon a small acreage. The yields are usually low, except on new ground or when commercial fertilizer is used. The leaf is usually of excellent quality and commands a good price.

Leguminous crops, with the exception of cowpeas, are not grown upon the type. Cowpeas are sometimes planted with corn. Timothy and redtop give good yields of hay, but very little hay is produced. The type is not considered an exceptionally good grazing soil, but it supports a fair bluegrass sod. About one steer to the acre can be maintained upon these pastures if properly seeded to bluegrass.

When the soil is kept under constant cultivation for a number of years the organic matter content is seriously depleted, leaving the soil in such condition that it hardens upon drying and crops suffer during dry spells.

The natural forest growth consists of oak, chestnut, poplar, and ash.

Land values on this type range from \$15 to \$50 an acre.

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

*Mechanical analyses of Dekalb 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>				
221213	¾ mile west of William-son.	Silt loam, 0-8 inches..	3.0	3.4	3.2	10.4	8.0	54.6	17.6
221214	Subsoil of 221213.....	Silt loam, 8-36 inches..	1.2	2.6	3.1	10.4	8.7	50.5	23.7

DEKALB LOAM.

The soil of the Dekalb loam is a brown to dark-brown mellow loam, underlain at about 6 to 15 inches by a yellow or yellowish-brown friable silt loam to silty clay loam. The soil and subsoil generally contain a considerable quantity of small sandstone fragments and in spots a relatively high percentage of sand. Bedrock is usually encountered just below the 3-foot section.

The Dekalb loam is not extensively developed, occurring in relatively small areas upon hilltops and benches in the eastern part of Logan County along the Boone County line. The topography is level

to gently rolling or sloping, affording excellent drainage in all but a few spots where small ponds or mudholes are found, locally called "bear wallows."

The important crops are corn, vegetables, oats, and cowpeas, in the order named. Corn yields 20 to 40 bushels and oats 30 to 40 bushels per acre. Irish potatoes, sweet potatoes, cabbage, tomatoes, onions, beans, beets, turnips, parsnips, carrots, and radishes produce good yields with the aid of small quantities of manure. Timothy and redbud give fair yields of hay. Bluegrass does only fairly well.

Apples, peaches, pears, plums, and cherries do well, although there are no large orchards on the type. Strawberries and brier berries do exceptionally well.

Oak, chestnut, ash, and locust form the predominant forest growth on this soil.

#### DEKALB STONY SILT LOAM.

The Dekalb stony silt loam as mapped in this area varies considerably. As typically developed the interstitial soil material is a grayish-brown or yellowish-brown friable silt loam, which passes gradually, at about 4 to 8 inches below the surface, into a yellow or light yellowish brown, friable, compact silty clay loam subsoil, which becomes heavier and more compact in the lower part of the soil section. Both soil and subsoil contain considerable quantities of stone varying in size from small fragments to large boulders. In this coarse material sandstone predominates, the rock ranging in texture from fine grained to conglomerate. In places large quantities of shale fragments are found. In many areas the bedrock is encountered within the 3-foot section, and in only a few places is it found at depths greater than 4 or 5 feet. Over the greater part of the type the subsoil below 2 feet is so filled with fragments that it is impossible to make a boring.

Small spots of Dekalb stony loam, found usually in coves or upon bench or shoulder situations, and areas of Rough stony land are also included with the type.

A group of sandstones known as the Charleston sandstone formation, the cap of which is marked by the Mahoning sandstone, outcrops in the area. The formation ranges from about 300 to 400 feet thick. The top member of this formation is the heavy cliff rock that supports the hilltops over all the area, with the exception of the portion along the Warfield anticline in Logan County, where the horizon of the sandstone rises above the tops of the hills. Where these sandstones outcrop the soil is more or less sandy and contains a larger quantity of rock than the remainder of the type. Areas of Dekalb stony sandy loam are found, but these are irregular in size and occurrence and could not be separated. The lower boundary of the stony

sandy areas is rather irregular. Owing to the action of gravity, it extends farther down the sides of the steeper slopes. The top of the Mahoning sandstone marks the upper boundary. These areas are of very little agricultural value and are usually left in forest.

The Dekalb stony silt loam is by far the most extensive soil in the area, representing 88.9 per cent of the two counties.

The topography is steep and broken and only around the base, in coves, upon shelf land, and upon slightly flattened hilltops is the surface at all level. The run-off is very rapid and consequently the drainage is excessive. Crops suffer from lack of moisture even in moderately dry seasons. The soil at the base of the hills is more or less talus in character and deeper than the average. In the coves, where considerable organic matter has accumulated, and upon benches and hilltops, where the topography is more level, fair crops are grown. In these places the moisture conditions are usually better than over most of the type.

Very little of the Dekalb stony silt loam is cleared or under cultivation. The crops planted are principally corn, oats, tobacco, cowpeas, hay, grass, potatoes, and vegetables. Corn is more extensively grown than any other crop, occupying over half the cultivated area. On new ground this crop will produce about 35 to 40 bushels per acre, but the general average for the type does not exceed 10 bushels per acre. On average land 20 bushels is considered a good yield.

Oats are grown to a very limited extent, owing to the difficulty of harvesting the crop, and rarely produce over 20 bushels per acre.

Tobacco is grown to some extent in the western part of the area, usually upon new ground, and yields from 800 to 1,000 pounds per acre of a good grade of Burley tobacco.

Timothy and redtop are grown to a small extent for hay. The yields are usually low and the steep topography makes harvesting difficult. Cowpeas are grown with corn to some extent, but are rarely grown alone as a forage crop. Clover does only fairly well and is grown to a very small extent. Bluegrass, wild grass, and lespedeza predominate in the pastures. Very little of the pasture land will support one steer per acre. The average will fall below two or three acres per steer, while on the wild range 10 acres or more is required for one steer.

Apples, peaches, pears, plums, cherries, and grapes do well in small orchards, but the surface of the type in general is too rough for successful commercial orcharding. Strawberries, blackberries, and raspberries are grown successfully in the garden.

Both Irish and sweet potatoes are planted in small acreages. The soil is not exceptionally well adapted to either crop, but makes fair yields in gardens where special attention is paid to fertilization and

cultivation. Nearly all the vegetables common to this section are grown to supply the home needs.

Commercial fertilizers are used to a very small extent, and as a rule only upon tobacco. Special tobacco fertilizers are generally used and applications rarely exceed 800 pounds per acre.

Plowing and subsequent cultivations are difficult, owing to the steepness of the surface and the large quantity of stone present. Much cultivation is done with the hoe. On this account only the more gently sloping areas, coves, shelf-land, hilltops, etc., should be planted to cultivated crops. The rest of the type can best be utilized for grazing or left in forest.

Erosion is very active, especially upon the steeper slopes and where the land has been under cultivation long enough for the roots left in the soil at the time of clearing to decay. Under cultivation the soil is removed rapidly, leaving a surface strewn with stone or entirely denuded of soil material. This condition was noticed in a great many places. The belt following the outcrop of the Charleston sandstone would best be left in forest.

The natural forest growth consists of oak, poplar, hickory, walnut, chestnut, pine, spruce pine, and beech. By far the greater part of the type is covered with forest. Land of the Dekalb stony silt loam is valued at \$5 to \$25 an acre, exclusive of timber and mineral rights.

#### HOLSTON SERIES.

The Holston series includes types with yellowish-brown to brown surface soils and yellow subsoils. It is developed on old alluvial terraces, sometimes standing 200 feet or more above the first bottoms of streams. The soils consist principally of material washed from sandstone and shale soils, and on this account are somewhat less productive than the Elk soils, which they closely resemble in process of formation, but which contain more limestone material. The Holston soils are generally underlain by sandstone or shale, and in places the lower subsoil seems to be partly residual from these rocks.

#### HOLSTON SILT LOAM.

The surface soil of the Holston silt loam as typically developed is a grayish-brown or dark yellowish brown mellow silt loam, 8 to 10 inches deep. This grades into a bright yellowish brown to yellow, slightly compact though friable, heavy silt loam to silty clay loam. On the surface and throughout the soil and subsoil gravel and bowlders occur.

The type occurs on terraces lying at an average elevation of 100 feet above stream level. The areas are found along the larger streams. It represents the remnant of an old alluvium deposit

that has suffered severely by erosion. The material has been washed very largely from soils derived from sandstone and shale, the Dekalb being the dominant soil in the basins of the streams upon which this soil is found. The thickness of the deposit at the present time varies from 5 to 25 feet. In places the underlying rock is exposed, and in other places residual material (Dekalb) is found near the surface, making it very difficult in places to distinguish this type from the Dekalb silt loam. The presence of waterworn stones or gravel has been taken to indicate that running water has been the main agent in the formation of the soil.

The Holston silt loam is most extensively developed adjacent to the hill land along Guyandot River from Pecks Mill to Big Creek. A large single area is also found near Matewan on Tug Fork. Scattered areas are found on Tug Fork, Guyandot River, Big Creek, and Island Creek. The topography is flat to undulating.

Corn, wheat, oats, tobacco, clover, timothy, and cowpeas are the leading crops. Corn, which is grown more extensively than any other crop, yields from 20 to 40 bushels per acre. Wheat yields from 10 to 12 bushels and oats about 20 bushels per acre, but neither of these crops is grown extensively. From 1 to 1½ tons of hay per acre is obtained. Clover does fairly well, but the soil is said to be better adapted to such leguminous crops as cowpeas. Potatoes produce 100 to 150 bushels and tobacco about 1,000 pounds per acre, the leaf being of good grade.

This soil is fairly well suited to fruit and is used for home orchards.

Practically all of the land has been cropped until there is very little organic matter left. By the addition of even small quantities of humus the yields can be increased and the mechanical condition of the soil improved. Cultivations are easily made, as the soil has a mellow structure.

The native forest growth on this type consists of oak, poplar, and beech. Nearly all of the type has been cleared.

The value of land of this type ranges from \$25 to \$50 an acre.

*Holston silt loam, low phase.*—The low phase of the Holston silt loam is a brown to yellowish-brown mellow silt loam, underlain at about 10 to 12 inches by a light yellowish brown, compact though friable heavy silt loam to silty clay loam, which often becomes lighter in color as depth increases. Near the bottom of the profile the material is usually a bright yellow.

Above Logan on the Guyandot River the low phase becomes lighter in texture until it finally merges into the fine sandy loam. This phase represents the greater part of the Holston silt loam mapped in this area. It occurs on low terraces that have been formed by the streams while flowing practically at their present level. Areas of this soil are found in the bends along Tug Fork throughout Mingo

County; along the Guyandot River from the mouth of Rich Creek to the Lincoln County line, and in scattered areas along the bottoms of some of the smaller streams.

The low phase is derived from the same class of material as the typical soil, i. e., Dekalb material. The topography is level, or nearly so. The areas lie from 30 to 60 feet above normal water level of the streams. These low terraces have suffered very little from erosion, though the run-off is sufficient as a rule to give excellent drainage.

Narrow swales are often found next to hills when the drainage is poor, but these are of very little importance.

The low phase of the Holston silt loam forms the larger part of the cultivated portion of the farms in the area. It is slightly more productive than the typical soil, though this may be partially due to the better cultural methods used in the river bottoms.

About the same crops are grown as on the typical soil. Corn occupies a larger acreage than any other crop grown. The yields are comparatively large, ranging from about 30 to 50 bushels per acre. Wheat yields 10 to 15 bushels and oats about 20 to 30 bushels per acre. Timothy and redtop are grown together and separately, yielding  $1\frac{1}{2}$  to 2 tons of hay per acre. Pea vine and crabgrass hay give heavy yields. Millet does well and is used as a catch crop to supplement other forage crops in years of shortage. Sorghum makes a good growth and a good grade of sirup, but does perhaps better on first bottom land. Grass forms a good sod, but the soil is little used for pastures. Potatoes yield 150 to 200 bushels per acre. This crop could be made profitable on a commercial scale if given proper attention. At present only a small acreage is planted. Tobacco is grown to a limited extent. A good grade of Burley leaf is produced, but the yields are not what they should be, 1,000 pounds representing the maximum. Growers in adjoining areas use from 400 to 600 pounds per acre of 8-2-5 fertilizer very successfully upon this soil. Sweet potatoes give good yields on this soil, but better on the sandy soils.

When the soil is plowed too wet clodding results, leaving the soil in a bad condition for crops and affecting its producing power for several seasons. This also makes additional harrowings and cultivations necessary. The organic-matter content of the soil should be maintained to improve its physical condition. Applications of 1 ton of burnt lime or 2 tons of crushed lime per acre would prove very beneficial.

This phase is too low for successful orcharding, but is well suited to strawberries and brambleberries.

The Holston silt loam, low phase, is practically all cleared of forest growth. The native trees are substantially those of the bottom land,

elm, sycamore, and beech, the phase differing in this respect from the typical soil.

Land of the low phase of the Holston silt loam is valued at \$75 to \$100 an acre.

Results of mechanical analyses of samples of soil and subsoil of typical Holston silt loam are given below:

*Mechanical analyses of Holston 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.	P. ct.				
221203	½ mile southeast of Manbar.	Silt loam, 0-8 inches.....	0.6	2.6	3.8	11.8	24.0	42.7	14.6					
221204	Subsoil of 221203.....	Heavy silt loam, 8-36 inches.	.1	2.0	3.9	10.4	13.2	39.1	31.3					
221207	1¼ miles west of Chapmanville.	Silt loam, 0-12 inches....	.0	.2	.5	15.2	24.2	43.3	16.4					
221208	Subsoil of 221207.....	Silt loam, 12-36 inches..	.0	.2	.2	12.6	20.6	45.9	20.6					
221211	1 mile west of Williamson.	Silt loam, 0-10 inches....	.1	.4	1.0	18.0	22.4	41.3	16.9					
221212	Subsoil of 221211.....	Silt loam, 10-36 inches..	.0	.1	.8	16.4	25.2	38.1	19.5					

HOLSTON FINE SANDY LOAM.

The typical Holston fine sandy loam has a brown light fine sandy loam soil, fairly loose and open in structure, grading at about 8 to 10 inches into a slightly compact, yellowish-brown to yellow, friable, medium heavy fine sandy loam subsoil. In many places the subsoil is only slightly heavier in texture than the surface soil, the entire 3-foot section consisting of a fine sandy loam. The soil is usually lighter in texture or more sandy next to the streams and heavier next to the hills, but the main body of the type is fairly uniform in texture. The type contains a small quantity of waterworn stones, usually sandstone.

This type lies on terraces along the larger streams. The areas are about 40 to 60 feet above stream level and not subject to overflow. The most extensive bodies occur along the Guyandot River. This material has been washed very largely from Dekalb soils, where sandstone gives the greater part of the material.

The topography is level to undulating, having a tendency toward low ridges or swells running in the direction of stream courses. The drainage is excessive and crops suffer for want of moisture in dry seasons.

Plowing and cultivation are easily carried on under a comparatively wide range of moisture conditions. The soil in general is deficient in organic matter. It only requires a few years of close

cropping to seriously diminish the organic matter in a type of this character.

Very little manure or fertilizer is used and the yields are correspondingly low.

The principal crops are corn, wheat, oats, rye, timothy, redtop, cowpeas, sorghum, millet, Irish and sweet potatoes, melons, and vegetables. Corn yields from 20 to 40 bushels, wheat 10 to 15 bushels, oats 20 to 30 bushels, Irish potatoes 100 to 150 bushels, sweet potatoes 200 to 250 bushels, and hay 1 ton to 1½ tons per acre. The yield of peavine hay is considerably more than this. Sorghum yields well. Melons bring good returns, but are not extensively grown. Vegetables are grown largely for home consumption, but in a few places an effort is made to supply the mining towns. The soil is well adapted to this use.

Tobacco can be grown successfully with the use of large quantities of high-grade fertilizers. The yields as a rule are not so heavy as upon the first bottoms or upon heavier soils, but the grade of leaf is usually excellent.

This type is well adapted to the production of strawberries and other small fruits. Many home orchards in fairly good condition were seen during the survey. The type is too low for profitable commercial orcharding.

The original forest growth, which consists largely of sycamore, poplar, elm, beech, and birch, has been removed from most of the land.

The price of land of the Holston fine sandy loam ranges from \$50 to \$150 an acre, the higher price being caused by "right of way" privileges.

In the following table the results of mechanical analyses of samples of the soil and subsoil of the Holston fine sandy loam are given:

*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.
221205	Hutchinson.....	Fine sandy loam, 0-8 inches.	0.1	5.0	17.9	33.5	18.0	14.7	5.9
221206	Subsoil of 221205.....	Fine sandy loam, 8-36 inches.	.1	2.1	9.7	36.9	22.4	19.1	10.0

TYLER SERIES.

The surface soils of the Tyler series are gray to grayish brown. The subsoils are yellowish to mottled yellow and gray, and of rather compact and slightly plastic structure. The series is developed on

second terraces of streams in that part of the Appalachian region where sandstone and shale soils largely predominate over limestone soils. The drainage is in general inadequate.

#### TYLER SILT LOAM.

The soil of the Tyler silt loam is a mottled gray and drab silt loam of a compact, friable structure. This is underlain at about 10 inches by a mottled gray, drab, and yellow compact heavy silty clay loam. Below about 24 to 30 inches the mottling becomes more pronounced, the drab and yellow colors being more conspicuous, and brownish mottlings being common. Besides the color change the subsoil becomes heavier and more compact with depth, the lower part being a rather impervious clay. Both soil and subsoil when dry are friable, but become sticky and plastic when wet.

In the present survey the type is developed to a very small extent, occurring as swales or low, poorly drained areas, usually next to the hills, upon terraces along Tug Fork, Guyandot River, and Pigeon Creek. It is closely associated with the Holston silt loam, and really represents the poorly drained areas upon this soil.

The topography is usually level or nearly so. The soil remains cold and wet most of the year and is exceptionally hard to handle, clodding badly when plowed in a wet condition and becoming very hard when dry. It is known locally as "crawfish" land.

This soil needs thorough drainage and liming and the addition of large quantities of organic matter either in the form of manure or of green crops turned under, in order to improve its physical condition and correct the acidity.

The Tyler silt loam is nearly all cleared, the greater part of it being in pasture. A small acreage of corn and timothy are grown, but otherwise it is little used for crops. It furnishes excellent grazing and is capable of supporting several steers per acre. Corn produces about 15 to 30 bushels and timothy about  $1\frac{1}{2}$  to 2 tons per acre.

If properly drained this type of soil would be adapted to a very much wider range of crops than it is at present. Practically all of those suited to the low phase of the Holston silt loam could be grown upon it. Fertilizers high in phosphoric acid seem to give best results upon this soil in adjoining areas.

Rushes and broom sedge are found to a considerable extent upon this soil, the former in places where the drainage is extremely poor and the latter where it is better established. The natural forest growth, which consisted chiefly of beech, sycamore, and willow, has been practically all removed. Land of this type is valued at about \$75 to \$100 an acre.

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

*Mechanical analyses of Tyler 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.
221209	1 mile west of Chapmanville.	Silt loam, 0-10 inches . . .	0.4	0.7	0.6	10.4	20.1	49.6	18.0
221210	Subsoil of 221209. . . . .	Silt loam, 10-36 inches . .	.0	.2	.3	12.0	19.6	47.0	21.2

#### HUNTINGTON SERIES.

The Huntington series includes types with light-brown to brown soils and yellow to light-brown subsoils. Frequently there is little change in the color or the 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 subject to overflow. They consist of materials washed from limestone, sandstone, and shale soils. They are the best drained first-bottom soils of the region.

#### HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam is a dark-brown or yellowish-brown fine sandy loam 8 to 10 inches deep, grading rather abruptly into yellowish-brown light fine sandy loam, which becomes lighter in color and texture with depth. Along the banks of streams the texture is lighter, approximating a loamy fine sand. The main body of the type, however, is fairly uniform in texture. Along the larger streams beds of sandstone, shale, and gravel are found in places at 4 to 6 feet below the surface.

The stream beds are usually broad and filled with gravel and sand. The bottoms along the larger streams are usually high and above normal overflow, but are inundated during the higher floods. Along smaller streams the bottoms are lower and subject to frequent overflows. The surface of the latter is consequently more or less washed. In places beds of gravel and sand are exposed. Gravel beds are common throughout the soil section along the smaller streams. An exception to the general rule is to be found along Big Creek and the smaller streams that form its tributaries. Here the bottoms are fairly intact and as a rule the subsoil is slightly heavier than the surface material, giving a slightly better soil than the remainder of the type.

The Huntington fine sandy loam is found as first-bottom or overflow land along practically all the streams in the area. It is derived largely from wash from Dekalb stony silt loam. The topography is level to slightly undulating, the ridges having a tendency to be sandy and the intervening swales slightly heavy, very often with poor drainage. The drainage over most of the type is excessive, but the nearness of the surface to water level prevents serious trouble from drought.

The soil is not naturally strong, but produces fair yields of most of the crops grown in this section. The crops are the same as on the silt loam areas. Wheat produces 10 to 12 bushels, hay 1 ton, and tobacco 800 to 1,000 pounds per acre. Corn produces 40 to 60 bushels, cow-peas 2½ to 3 tons, and sweet potatoes 200 to 300 bushels per acre. Irish potatoes do not grow quite so well as upon the silt loam, yielding as a rule from 100 to 150 bushels and rarely over 200 bushels per acre. Sorghum makes a good growth and gives a fine quality of sirup. Melons are a profitable crop where convenient to markets. Vegetables do well and are grown in abundance in local gardens, but very few farmers grow them on a commercial scale. The soil is well suited to early truck crops and to light regular season truck crops.

The light texture and mellow structure of the soil make cultivation easy. Little trouble is experienced from plowing in a wet condition.

This soil is in need of fertilization and the addition of organic matter. It is not an acid soil and therefore does not require liming.

The original forest growth on the Huntington fine sandy loam consisted largely of sycamore, elm, beech, birch, and willow. The land is valued at about \$50 to \$150 an acre.

Below are given the results of mechanical analyses of samples of the soil and subsoil of the Huntington fine sandy loam:

*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.	P. ct.				
221201	Varney.....	Fine sandy loam, 0-8 inches.	0.5	4.0	11.1	30.0	17.9	26.1	10.5					
221202	Subsoil of 221201.....	Fine sandy loam, 8-36 inches.	.2	5.0	18.8	34.4	16.4	17.4	8.0					

MISCELLANEOUS MATERIAL.

ROUGH STONY LAND.

Rough stony land embraces areas upon which the stone fragments are so numerous as to preclude cultivation. The soil material between the fragments and outcrop is Dekalb silt loam, loam, or sandy loam.

The stones are mostly derived from the hard, massive, coarse-grained sandstone strata and range from small fragments to masses as large as a house.

The type is found along the valley walls of the larger streams, usually on the outer side of bends. Most of it occurs along Tug Fork of Big Sandy River, Guyandot River, and Buffalo Creek. The topography is steep to precipitous and the run-off very rapid.

The Rough stony land is of little or no agricultural value. Some small areas where the stone is not too thick to prevent the growth of grass are suitable for grazing sheep and goats, but most of the land is too steep even for grazing.

The greater part of the type is in forest, to which it is best adapted. The native tree growth consists chiefly of pine, spruce, chestnut, and chestnut oak.

#### RIVERWASH.

Riverwash as mapped in Logan and Mingo Counties represents bottom land that has been stripped of soil material by high water, leaving beds of gravel and sand, and also broadened stream beds upon which deposits of coarse gravel and sand have been laid down. The material consists of sandstone and shale fragments, more or less waterworn, rounded quartz pebbles, and sand.

Small spots of Huntington fine sandy loam are found in this type, usually along the outer edges of the bottoms, but these were too small and too irregular in occurrence to map.

The type, whether deposited or eroded, is the result of a voluminous and rapidly moving current. This is caused by the steep fall of the drainage basins, which causes a very rapid run-off. Upon some of the larger streams, where the current is not swift enough to do much damage, this condition has been caused by "splash dams" used in floating logs down the streams.

The type is developed along Guyandot River above Logan, and upon Buffalo and Pigeon Creeks. Other smaller creeks contain small areas. In many places this type is found as slightly broadened stream channels in the Huntington fine sandy loam.

Aside from the small spots of Huntington soil mapped with this type, it is of little or no agricultural value. The natural forest has disappeared from most of these barren areas, but a few trees are still found, consisting of sycamore, elm, beech, birch, and willow.

#### SUMMARY.

Logan and Mingo Counties are situated in the southwestern part of West Virginia, and have a combined area of 871 square miles, or 557,440 acres.

These counties lie wholly within the Appalachian Plateau and have the characteristic rough and broken topography of this region, with very narrow stream valleys having little smooth bottom land in them.

These counties have developed very rapidly within the last 20 years, increasing in population 85.1 per cent from 1900 to 1910. Williamson, Logan, and Matewan are the most important towns.

About 80 per cent of the area is in forest, mostly cut-over land.

Lumbering and coal mining are the leading industries.

The area is well supplied with transportation facilities, railroads traversing both counties. Local markets offer opportunity for disposing of most of the farm produce. Huntington is the nearest market for securing supplies.

The climate of the area is agreeable and healthful. The temperature rarely goes below zero or above 100° F., the average annual temperature being 56.75° F. The annual precipitation of about 49 inches is well distributed throughout the year. The snowfall is light. There is little damage to crops from floods.

Agriculture is not very well developed. The principal crops are corn, tobacco, oats, hay, sorghum, Irish and sweet potatoes, and vegetables. Fruit is grown to a very small extent. Most of the land is too steep for successful commercial orcharding. Cattle, sheep, and hogs are raised to some extent, but not as much attention is given to the production of live stock as in former years.

The soils of the area are derived either directly or indirectly from the shales and sandstones of the lower Conemaugh, Allegheny, and Pottsville formations of the Carboniferous era. Nine soil types were encountered, including 4 upland, 3 terrace, and 2 bottom-land soils. These have been grouped in 4 series and 2 miscellaneous types.

The Dekalb stony silt loam is the most extensive soil, occupying 88.9 per cent of the area. The surface of this type is usually steep and broken, and very susceptible to erosion when cleared. By far the greater part of it is in forest. Corn is the principal crop. A large acreage of the cleared land is in pasture, to which it is best suited. Much of the steeper portions of the type should remain in forest.

The Dekalb silt loam is of small extent. It gives the best results with tobacco, potatoes, and fruit.

The Dekalb loam is found in small isolated areas. It is a good soil for use in the production of fruit, potatoes, tobacco, and vegetables.

Rough stony land is confined to the steep slopes and precipices of the river valley walls, and is of no agricultural value.

The Holston silt loam contains slightly more residual material than is usually encountered in this type. The low phase is like this soil

as found in adjoining areas. It is a slightly better agricultural soil than the higher lying portions. The crops grown are corn, oats, tobacco, potatoes, grass, and cowpeas.

The Holston fine sandy loam is slightly sandier in the subsoil than is usual for this type. It is best suited to corn, melons, sweet potatoes, cowpeas, and light truck crops.

The Tyler silt loam occupies poorly drained areas in the Holston silt loam, low phase. It is in need of drainage and lime, and in its present condition is best suited to grass.

The Huntington fine sandy loam is the first bottom soil throughout Logan and Mingo Counties. Corn, cowpeas, melons, sweet potatoes, and sorghum are grown successfully on it.

Riverwash is developed more extensively than in other areas so far mapped in this State. It is a nonagricultural type.



[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved March 14, 1904.

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



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