



Issued December 31, 1912.

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 THE HUNTINGTON AREA,  
WEST VIRGINIA.

BY W. J. LATIMER.

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HUGH H. BENNETT, INSPECTOR IN CHARGE SOUTHERN DIVISION.

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[Advance Sheets—Field Operations of the Bureau of Soils, 1911.]



WASHINGTON:  
GOVERNMENT PRINTING OFFICE,  
1912.

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## LETTER OF TRANSMITTAL.

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U. S. DEPARTMENT OF AGRICULTURE,  
BUREAU OF SOILS,  
*Washington, D. C., May 16, 1912.*

SIR: In continuation of the work being carried on in the State of West Virginia under a cooperative agreement with the State Geological Survey, a survey of the Huntington area was completed during the field season of 1911. This survey includes Cabell, Lincoln, and Wayne Counties.

The accompanying report and map embody the results of this survey, and I have the honor to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils for 1911, as authorized by law.

Respectfully,

MILTON WHITNEY,  
*Chief of Bureau.*

Hon. JAMES WILSON,  
*Secretary of Agriculture.*

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# SOIL SURVEY OF THE HUNTINGTON AREA, WEST VIRGINIA.

By W. J. LATIMER.

## DESCRIPTION OF THE AREA.

The Huntington survey covers a large area in the southwestern part of West Virginia, bordering the Ohio and Big Sandy Rivers. It includes Cabell, Lincoln, and Wayne Counties and has an area of 1,255 square miles, or 803,200 acres. It is bounded on the north by the Ohio River and Mason County, on the east by Putnam, Kanawha,

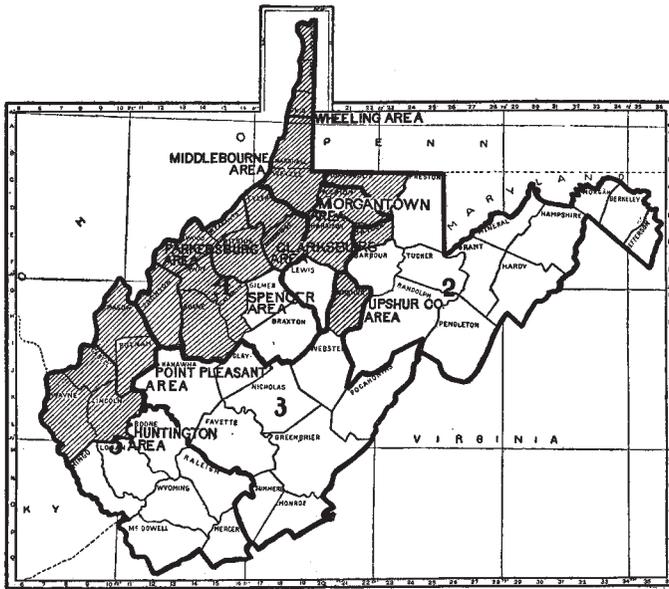


FIG. 1.—Sketch map showing areas surveyed in West Virginia.

and Boone Counties, on the south by Logan and Mingo Counties, and on the west by the Big Sandy River.

Physiographically the area lies wholly within the Appalachian Plateau. Very little of the original surface is left, having been dissected by numerous streams that have reduced the ridges to narrow hogbacks. The valleys are usually narrow and the walls

steep. The tops of the hills or ridges when viewed from a distance present a generally level appearance. The general elevation over the northern two-thirds of the area is from 1,000 to 1,200 feet, and in the southern part it ranges from 1,200 to 1,800 feet. The lowest point in the area is at the junction of the Ohio and Big Sandy Rivers, where the elevation is about 490 feet above sea level. Many of the hills in the extreme southern part of the area rise above 1,800 feet.

In general, the hilltops of the country lying back from the Ohio River are from 250 to 350 feet above stream level, and along the southern boundary of the area from 350 to 500 feet above stream level. Between these points the rise is very gradual until the southern part of the area is reached.

The topography of the area is generally rough, though the hills in the northern and central parts of the area are more rounded and the hillsides less precipitous. The valleys of the larger streams vary from one-half to 1 mile in width. Over most of the area the bottom lands are very narrow. Many more or less eroded ancient stream terraces are found, which modify the topography to some extent. Teays Valley,<sup>1</sup> the bed of the ancient Kanawha River, is the most prominent of these old deposits. (See Pl. I, figs. 1 and 2.) It extends from St. Albans to Huntington and forms a very marked feature of the area.

The greater part of the area is drained by two stream systems, the divide consisting of a ridge that begins at Huntington and runs in a general north and south direction, forming the Lincoln and Wayne County line. To the east of this line, with the exception of a narrow strip on the east side of the area that drains through local streams into Little Coal River and a restricted section of country along the northern boundary that is drained into the Ohio River, the drainage is carried off by the Guyandot River and its main tributary, Mud River. To the west of this line the drainage, with the exception of a narrow strip extending along the southwest border of the area, drained by small lateral streams into the Big Sandy River, is through Twelvepole Creek. The drainage of the entire area ultimately finds its way into the Ohio River.

Prior to 1800 very few settlements were made in the area, but from that time until 1830 large numbers of settlers entered from Virginia and the Carolinas. Others came down the Ohio from Maryland and Pennsylvania, but these were comparatively few in number.

The building of the James River and Guyandot turnpike, which was completed in 1830, gave a great impetus to the growth of the area. About this time navigation was opened on the Ohio River and lumbering operations in the interior of the area gave employment to large numbers. The building of the Chesapeake & Ohio Railroad in

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<sup>1</sup> See U. S. Geol. Survey, Charleston and Huntington folios.

1872 served to open up trade with the eastern markets, and the shipping of stock and lumber became important. The Ohio River Railroad, now a part of the Baltimore & Ohio system, was completed in 1891 and gave quicker transportation to northern points. The Norfolk & Western Railroad, built in 1892, and the Big Sandy River extension in 1906, the Guyandot Valley Railroad, built in 1902-3, and the Little Coal River Railroad, built in 1906-7, both branches of the Chesapeake & Ohio, were all promoted in the interest of the coal and lumber industries.

Upon the opening of the railroads to the west and the subsequent development of that country, many people left the area and moved west. Large numbers have come into the area since the oil, gas, and coal deposits have been exploited. Most of them have come from the adjoining States of Ohio, Kentucky, and Pennsylvania.

Large numbers of slaves were owned in Teays Valley and along the Ohio and Big Sandy River bottoms, but very few negroes are found in the area to-day, except in the larger towns, and many of these have come from adjoining Southern States.

The majority of the farming population of the area are descendants of the original settlers.

Cabell County was formed from Kanawha County in 1809, Wayne from Cabell in 1842, and Lincoln from parts of Cabell, Putnam, Kanawha, and Boone Counties in 1867.

Coal was first mined at Branchland in 1854 and later at Hubbards-town, but these operations were brought to a close with the beginning of the Civil War. The later developments have come with the building of the railroads and the introduction of eastern capital.

Oil and gas were discovered in paying quantities near Milton about 1901 or 1902. Since that time the development has been rapid. One of the largest producing oil fields in the State is located near Griffithsville. Gas is found in large quantities, but the development is scattered.

The timber industry has dwindled considerably from its former proportions, although large areas of original forest are still found in the southern part of the area, and much desirable timber is still available in the cut-over areas of this section and also in the woodlots in other parts of the area from which the original growth has long since disappeared.

Huntington, the principal town of the area, was founded upon the completion of the Chesapeake & Ohio Railroad to the Ohio River and, according to the census of 1910, has a population of 31,161. It is well supplied with transportation facilities, both rail and water. The manufacturing enterprises are many and varied, covering the range of nearly all classes of goods used in this section of the country. Fuel is cheap, and natural gas can be had at a low price.

Kenova, the second city in the area, is a thriving manufacturing center located at the confluence of the Ohio and Big Sandy Rivers. It has excellent railroad facilities and is connected with Huntington by a trolley line. Ceredo is a small town between Huntington and Kenova. Wayne, the county seat of Wayne County, and Hamlin, the county seat of Lincoln County, are small but thriving towns. The latter is near the Griffithsville oil fields. Both towns are located in a good agricultural country. Barboursville and Milton are situated on the Chesapeake & Ohio Railroad and are the distributing points of good farming sections, the latter being an important tobacco market. Branchland is a small town on the Guyandot Valley Railroad, built by the gas and coal industry. Fort Gay is a small town on the Norfolk & Western, opposite Louisa, Ky., on the Big Sandy River. McCorkle is a distributing point for the oil fields, located on the Little Coal River Railroad.

The area is well supplied with transportation facilities. The Chesapeake & Ohio Railroad, double tracked, gives direct connection with points east, west, and north; the Baltimore & Ohio (Ohio River Division) with the northern points; and the Norfolk & Western with the South. The smaller branch roads cover nearly all parts of the area, facilitating the distribution of supplies and the collection of products. The Ohio River during most of the year is open to navigation and will be available during the entire year after the completion of the system of locks and dams now in course of construction. The smaller streams, while navigable only for small craft, are used for rafting timber.

The public-road system in Cabell County is good, considering the character of the county traversed and the road material at hand. Some of the roads in the other portions of the area are good, but over the greater part they are not in very good condition.

The local markets for produce are good and at the present time are supplied largely from outside sources. Huntington is the best local market, but the oil fields and coal mines also furnish good markets. Pittsburgh, Baltimore, and Cincinnati are the principal outside markets for selling the products of the farm and factory and also for buying supplies.

#### CLIMATE.

The climate of the Huntington area is agreeable and salubrious throughout the entire year. The winters are cold but not severe and are what is usually termed in the North "open winters." The mean temperature for the winter months is 33° F. and the absolute minimum recorded is -26° F. Temperatures below 0° F. are rare. The cold spells are usually of short duration, and long periods of mild weather usually intervene. The summers are hot, but not oppressive,

the temperature rarely going over 100° F., the maximum record being 102° F. The hot spells extend over very short periods, and as the nights are usually cool there is very little suffering from heat. Excellent climatic conditions usually prevail during the spring and fall months.

The average date of the last killing frost in spring is April 17 and of the first in fall September 18. This gives an active growing season of approximately six months. The pasturage season lasts about eight months.

The annual precipitation of about 40 inches is fairly well distributed throughout the year, the distribution occurring so that it is of the most benefit to growing crops. The heaviest precipitation comes in the spring during the active growing season, and usually the rainfall is light during the harvest season. Heavy floods usually occur during early spring when winter is breaking and the snow is melting. Especially is this true along the Ohio River. Smaller floods occur during late spring and early summer, usually along the smaller streams. Fall floods are rare, and little loss is incurred from this source. The earlier heavy floods usually come before the growing season starts. The most severe damage is caused by the late spring floods. The snowfall is light during most winters and remains upon the ground but a short time. During some years the fall months, September, October, and November, are very dry and pastures suffer for want of moisture. As all the crops mature before that time, dry falls are not a very serious matter to the farmers, and a moderately dry fall is a decided advantage.

The climatic conditions of the area are well suited to general farming, stock raising, dairying, commercial orcharding, and truck growing. Tobacco grows well and matures even at the highest elevations within the area.

The following table gives the normal monthly, seasonal, and annual temperature and precipitation as recorded by the Weather Bureau station at Point Pleasant:

*Normal monthly, seasonal, and annual temperature and precipitation at Point Pleasant.*

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.....	35	70	- 5	3.1	4.4	2.6	1.6
January.....	33	73	-14	3.6	1.5	8.0	4.9
February.....	32	75	-26	3.6	1.3	1.9	5.0
Winter.....	33			10.3	7.2	12.5	11.5

*Normal monthly, seasonal, and annual temperature and precipitation at Point Pleasant—*  
Continued.

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.
March.....	45	84	4	3.7	2.4	5.8	5.0
April.....	55	95	23	3.0	6.9	1.5	0.5
May.....	66	98	31	3.5	5.8	3.5	0.0
Spring.....	56			10.2	15.1	10.8	5.5
June.....	73	102	44	4.8	7.3	2.4	0.0
July.....	77	102	47	3.7	0.7	2.8	0.0
August.....	75	99	50	3.2	1.6	6.4	0.0
Summer.....	75			11.7	9.6	11.6	0.0
September.....	70	100	37	2.2	2.3	2.1	0.0
October.....	58	90	19	1.9	0.2	3.2	0.0
November.....	45	81	14	3.2	2.6	2.7	0.5
Fall.....	58			7.3	5.1	8.0	0.5
Year.....	56	102	-26	39.5	37.0	42.9	17.5

#### AGRICULTURE.

The first real agricultural development of the area came with the tide of immigration during the early part of the last century. These settlers found homes along the Ohio River, tributary stream bottoms, in Teays Valley, and the adjacent hill land. They cleared large areas, burning the timber as the quickest method of removing it from the land. The principal crops grown were corn, wheat, tobacco, potatoes, and vegetables.

Much of the supplies produced during the early days was sold to transient homeseekers going farther west. In Teays Valley this soon developed into a profitable business, as the valley formed a natural route for travel to and from the East. Many large taverns were established and many acres kept under cultivation to feed the travelers and stock that passed through the valley. This business was brought to a sudden close with the completion of the Chesapeake & Ohio Railroad. Along the Ohio River wheat, potatoes, and apples were shipped in large quantities by flatboat to New Orleans.

Other portions of the area developed more slowly than did the Ohio River Valley and Teays Valley. The southern section is still sparsely settled, and over a large part of the area very little attention has been paid to agriculture. Lumbering claimed the attention of a considerable proportion of the population until a few years ago.

About the time of the decline of the lumber industry, oil and gas were found and the coal deposits began to be exploited. These industries give employment to many persons previously in the lumber camps.

The principal crops produced in the area at the present time are tobacco, corn, wheat, potatoes, and hay.

Tobacco has been grown in this area since it was first settled and has gradually gained in production until at the present time it represents the main money crop. The Civil War curtailed the production, and when the war tax was imposed in the early sixties it ceased to be grown on a commercial scale. With the removal of the tax the industry revived and continued to increase until the low prices of the early nineties discouraged the growers and very little planting was done. About 1900 conditions improved, and within the last few years the output has increased very rapidly. The present production is estimated to be about 10,000,000 pounds.<sup>1</sup>

The Bright Burley, the present variety grown, was introduced in Teays Valley about 20 years ago. Before that time the Ochre variety was chiefly grown. This tobacco was fire-cured and the commercial article was heavy and black. Practically all the tobacco grown in the area at the present time is air-cured, and some of it is more or less sun-cured before it is placed upon the racks in the barn. Most of the tobacco produced is very high grade. The color is bright, and it has splendid wrapping qualities. Most of the crop is used for plug wrapper and high-grade cigarette and pipe tobacco.

The quality varies considerably with the soil type, the condition of the land, and also with the kind of manure and fertilizers used. The sandy soils produce light tobacco of inferior quality and the heavy soil types produce heavy tobacco, usually of good quality. The terrace soils produce the best grades, but fall below the first-bottom lands in yield.

The curing and field method of handling the growing crop have much to do with the quality. The method of cultivation of tobacco on the hill land differs considerably from that practiced upon the bottoms and more level land. Here practically all the cultivation is by machinery, while upon the hill land it is done with the hoe. This makes a marked difference in the cost of production.

The following is the generally accepted method of growing tobacco as practiced by many of the best growers: Break the land with a turn plow at first favorable time in April, harrow with smoothing harrow, disk, and harrow again with smoothing harrow. Put in fertilizer with the wheat drill or drop in the hill. When placed in the hill 150 or 200 pounds per acre of 8-2-5 fertilizer is used and when put in with the drill 500 to 600 pounds of the same grade of fertilizer is required.

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<sup>1</sup> The 1910 estimate made by Huntington Tobacco Warehouse.

When heavy applications are made wheat is generally planted the following fall. The plants are transferred from the seed beds to the field from the middle of May to the middle of June in rows 4 feet apart, plants 18 to 24 inches in row, according to quantity of fertilizer applied. A 5-tooth cultivator is used and four or five cultivations given, according to growth of plant or season, starting as close to the plant as possible and making each subsequent cultivation vary in distance from plant as root system and size of plant will permit. Weeding close to plants is usually done with a hoe. Topping varies with the season, from 9 to 16 leaves being left. At the first topping 16 leaves are left, at the second 12, and at the last 9 leaves. Crops planted the middle of May under ordinary seasonal conditions should mature about the middle of September. Cutting is started when the leaves become spotted and begin to stiffen. Most of the planters transfer each day's cutting to the barn, while others leave the tobacco in the field for several days if weather conditions are favorable. A few days of sun curing produces a better leaf, but there is too much risk from rains and placing each day's cutting in the barn is considered the safest plan.

The tobacco is not subject to attack by disease or insects to any considerable extent. Paris green is used in sprays or dry for tobacco worms. Tobacco following sod suffers most from insect pests. In the southern part of the area tobacco is planted largely upon new land.

Corn has been produced in steadily increasing quantities since the first settlement of the area. At present it occupies a larger acreage than any other crop, being the most widely distributed crop grown in the area. It is grown principally upon the bottom lands and fertilizer is used to a very limited extent. Manure is used when it can be obtained in sufficient quantities. Corn cutters and binders are used occasionally, though most of the crop is cut and shocked by hand.

Wheat is grown to a very limited extent at the present time and is confined to the terrace soils and fairly level ridge tops. Upon the terrace soils most of the crop is drilled in. Bone meal, about 200 to 300 pounds, ammoniated phosphate, 250 pounds, or acid phosphate, 250 pounds per acre, is used. If grass is to follow wheat bone meal is generally used, as it becomes available very slowly.

Oats, rye, and barley are grown in small quantities, mostly along the Ohio River terraces and in Teays Valley, and are used in rotations.

Under the conditions existing in this area wheat could not be produced to compete with the western product, and oats, rye, and barley were grown as substitutes. With the present high prices wheat is grown more extensively than during the last two decades and the other cereal crops have decreased proportionately.

Irish potatoes are grown in limited quantities in all parts of the area, but in commercial quantities only upon the terrace soils and in Teays Valley. The crop is sold locally. Spraying is usually done with Bordeaux mixture, Paris green, or arsenate of lead.<sup>1</sup> Where manure can not be secured or a crop turned under the preceding season heavy applications of truckers' fertilizer of an 8-5-7 formula are usually made.

Sweet potatoes are grown to some extent upon the sandy bottom land and terrace soils and give good yields. The potatoes are dry and mealy and well suited to the requirements of the local market.

There is not a great deal of hay produced in the area. Timothy, clover, and crabgrass are the principal crops grown for this purpose, timothy being most extensively sown. Considerable forage is secured by growing cowpeas, which do well under the local soil and climatic conditions. Bluegrass comes in naturally upon the Meigs soil and a considerable area of this type is in sod. The natural growth of bluegrass can not be depended upon for a stand. The following method is usually adopted to secure a good sod of bluegrass upon the hill land: The first two years after clearing either corn or tobacco is planted and timothy, clover, and bluegrass sown upon the stubble of the last crop. If pasture only is desired the timothy is eliminated and the clover used as a nurse crop for the bluegrass.

Sorghum is grown to some extent upon the bottom land and peanuts and sweet potatoes in a small way mostly upon the sandy soil types. Watermelons and cantaloupes are grown on the sandy areas of the river bottoms and terraces. Broom corn and buckwheat are produced in very small quantities. A few small patches of alfalfa were found leading a rather precarious existence and as yet no great success has attended the growing of this crop.<sup>2</sup>

Although the soils of the area, especially the terrace soils, are well adapted to growing truck, such, for instance, as potatoes, tomatoes, beans, cabbage, and beets, there is very little of these crops produced, the Huntington market being supplied with vegetables from the larger bottoms on the Ohio side of the river. Potatoes are grown more extensively than any of the other truck crops. Sweet corn is grown to some extent in the Ohio River bottoms and on the bordering terraces.

The table following gives the acreage and yield of the leading crops produced in the area by counties, taken from the United States census of 1910.

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<sup>1</sup> See Farmers' Bulletin No. 320, Potato Spraying, and No. 407, Treatment of Seed for Scab.

<sup>2</sup> See Farmers' Bulletin No. 339, which discusses the growing of alfalfa.

	Cabell.		Lincoln.		Wayne.		Total	
	Acreage.	Yield.	Acreage.	Yield.	Acreage.	Yield.	Acreage.	Yield.
Wheat.....	12,370	110,380	8,176	52,380	8,532	53,770	29,078	216,530
Corn.....	17,980	392,130	21,915	549,210	34,637	762,640	74,532	1,703,980
Oats.....	827	10,780	1,724	18,180	1,805	17,490	4,356	46,450
Irish potatoes.....	553	32,829	376	22,987	808	46,833	1,737	102,649
Sweet potatoes.....	139	7,889	143	9,545	311	18,998	593	36,432
Hay <sup>1</sup> .....	3,839	3,284	1,994	1,552	3,078	2,651	8,911	7,487
Tobacco.....	897	570,500	1,255	770,040	228	163,390	2,279	1,503,920
Sorghum.....	256	17,690	407	21,165	361	22,079	1,024	80,734

<sup>1</sup> Millet, Hungarian grass, clover, and other tame grasses.

Although fruit has been grown in small quantities since the first settlement of the area, it has been only within the last few years that commercial orchards have been planted. The industry has not yet reached the proportions that it has on the corresponding soils on the Ohio side of the river. Apples and peaches form the bulk of the fruit grown. The Ben Davis is the best paying apple produced in this section. It is a prolific bearer and ships well, though in other qualities it is admittedly inferior. The Rome beauty and York Imperial are the best varieties of apples produced in the area. The Elberta peach seems well adapted to this part of the country and the majority of the trees in commercial orchards are of this variety. Other fruits, such as cherries, plums, and pears, are found to do well upon the upland soils, but are planted only in home orchards. Spraying is practiced in some sections.

Live stock has been kept in some parts of the area since the country was first settled, although the industry has never reached the importance that it has in adjoining counties to the north, where it represents one of the leading industries. Cattle and sheep were raised in commercial quantities during the early forties. Before the days of the railroads the stock was driven overland to Richmond and Baltimore. There are in all probability more cattle in the area to-day than at any time in its history, but the number of sheep has decreased since 1890, owing to the low price of wool. Cattle and hogs have taken the place of sheep upon the farm and under present conditions are more profitable. The cattle kept have largely been grade stock. Most of those in the area at the present time have more or less Shorthorn blood, a breed that was introduced just after the Civil War. Hereford cattle were introduced near Wayne about five years ago and have not as yet had time to come into general use. The success of the Herefords as a beef cattle in other sections of this State points to the rapid adoption of this breed in this section. Of sheep the Southdown, Shropshire, and Delaines seem to be the breeds best suited to this section. They were introduced some years ago, but

have become mixed with native grades and in most cases have lost their identity. Many good dairy herds are found in the area, consisting largely of grade Jersey and Holstein blood. In Teays Valley some attention is given to the breeding of horses. In nearly all parts of the area a few horses are raised, but most of those used even upon the farms are brought from other States. Hogs are kept in small numbers on nearly all farms. The Chester White seems to predominate in the country adjacent to the Ohio River, while in the rougher sections of the area hogs of nondescript breed are most common. Farm management along the Ohio River and in Teays Valley differs greatly from that practiced on the hill land, and the farm practice in the southern part of the area differs from that found in the northern two-thirds or over the section where the Meigs soils prevail.

Upon the valley farms, that is, the first and second bottom lands, improved implements, such as cultivators, sulky plows, disk harrows, grain and fertilizer drills, and spraying apparatus for potatoes, fruit, and tobacco are used extensively, while upon the hill land the work is done by more primitive methods. In the hill country rapid strides are being made in transportation facilities. Gravity trams are being used extensively for transporting tobacco and other crops from the steep hillsides to the barns in the valley below, the cable being transferred to any part of the hillside from which the crop is being gathered. This novel means of moving the crops eliminates the use of teams and wagons, which formed an expensive item in moving the crops from the high hills. While tobacco forms the nucleus of the crops produced on nearly every farm in the area, the other crops grown differ greatly.

Farming along the Ohio River and in Teays Valley is more diversified than in other parts of the area. Rotations are used and methods of building up the soil are practiced to some extent. Upon the hill land in the northern part of the area tobacco, with a few other cultivated crops, such as corn, wheat, and potatoes, is grown. Most of the land is under bluegrass sod, and considerable live stock is kept. In the rougher sections of the area there are very few cattle. Corn, tobacco, and a few vegetables constitute the main crops grown. New land is cleared for tobacco and this takes the place of rotations.

The adaptation of certain soils to certain crops is recognized in some sections. Corn is usually planted extensively upon the bottom land soils. The Meigs soils are known to be well suited to bluegrass and to fruit. Potatoes are grown extensively upon the Wheeling soils and melons on the sandier terraces and bottom-land types. Wheat is grown mostly upon the red ridge tops. Many crops are grown on all soils without regard to their natural adaptation or whether some other crop might give better returns. Tobacco is pro-

duced with more or less success upon every soil type in the area. On some the yield is heavy and the grade only medium and on others both yield and grade are poor. Peanuts and sweet potatoes are well suited to the sandy bottom lands and are grown almost exclusively upon these types. There are many soil types in the area that are well adapted to the growing of crops that are not produced at present or are grown to a very limited extent.

The rotations practiced vary considerably with the location and principal use of the land. Upon the terrace soils of the Ohio River a rotation in common use is (1) corn with cowpeas, soy beans, or crimson clover; (2) corn (in some cases tobacco), wheat following tobacco, with (3) timothy and clover. If the rotation is to be repeated the clover is sown without the timothy and the clover turned under. In this case cowpeas are usually sown even in the first year of the repeated rotation. Rotations are usually not followed upon the overflow land. Upon the light sandy bottom land and terrace soils a rotation of cowpeas with watermelons is found advantageous, the cowpeas furnishing the nitrogen for the melons. This rotation, however, is not in general practice, but is recommended to all melon growers. Rotations for getting land in condition for mowing are as follows: On hill land, corn with red clover and timothy; on crests of ridges or hilltops, corn, wheat, with timothy and red clover. If pasture is desired bluegrass seed is sown instead of timothy. Where tobacco is the principal crop desired it is grown for two years and the third year wheat and clover, turning under the clover the second year and repeating. Sod or hay can be obtained by sowing in the one case bluegrass or in the other timothy with the wheat.

The fertilizers and rates of application most commonly used in the area are: For tobacco, 400 to 600 pounds per acre of an 8-2-5 mixture of phosphoric acid, nitrate of soda, and kainit; for wheat, 150 to 300 pounds per acre of bone meal, 16 per cent acid phosphate, or ammoniated phosphate and nitrate of soda in the ratio of 14-2. Very little nitrate of soda or potash is used alone. Stable manure is used when it can be secured. Leguminous crops are grown to furnish nitrogen by a few farmers. Crushed limestone and ground phosphate rock (floats) are applied to some extent. A trucker's fertilizer of 8-5-7 formula is used to a limited extent for truck and garden crops. The home mixing of fertilizers would be found a great advantage.<sup>1</sup>

The labor available for farm work is usually efficient but scarce. Much of the labor from the farms has been attracted to the oil, gas, and coal fields. The wages paid labor upon the farms ranges from 75 cents to \$1 a day. The wages for the same class of labor in other industrial lines is about \$1.25 to \$2 a day, but the work, if not harder, is more dangerous than farm work. Land leases are based largely

<sup>1</sup> See Farmers' Bulletin 222, Home Mixed Fertilizers.

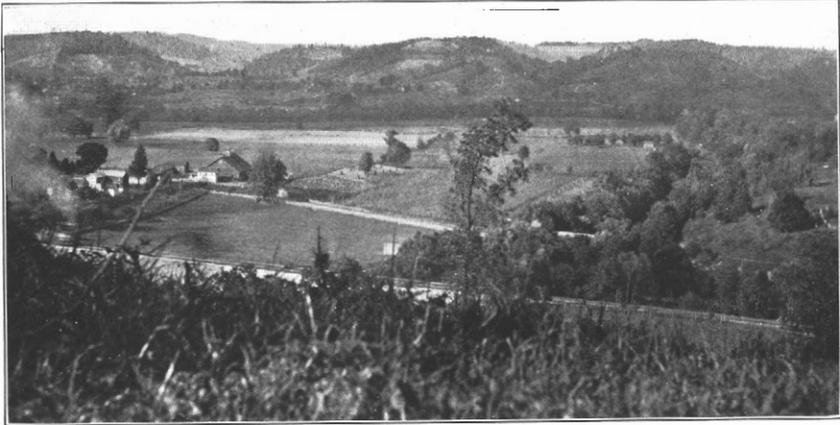


FIG. 1.—TEAYS VALLEY, NEAR MILTON.  
[Meigs clay loam in background uplands on north side of valley.]

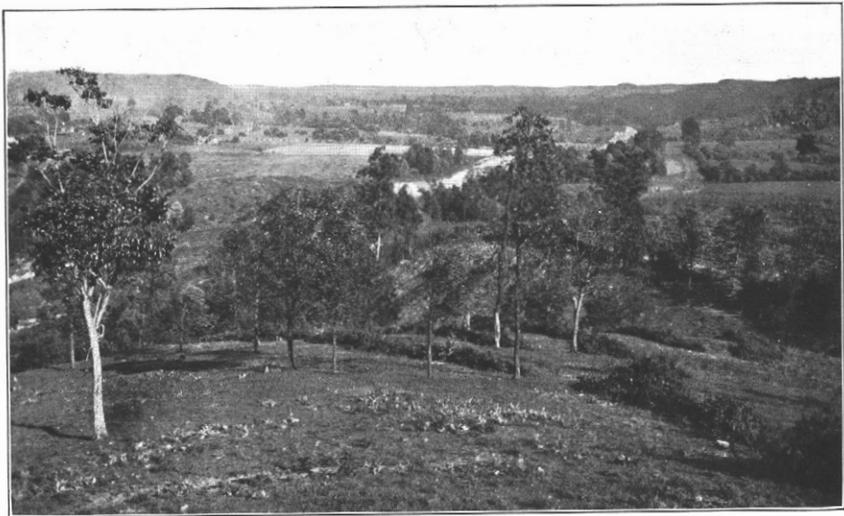


FIG. 2.—A CHARACTERISTIC VIEW OF TEAYS VALLEY, LOOKING EAST FROM POINT NEAR MILTON.

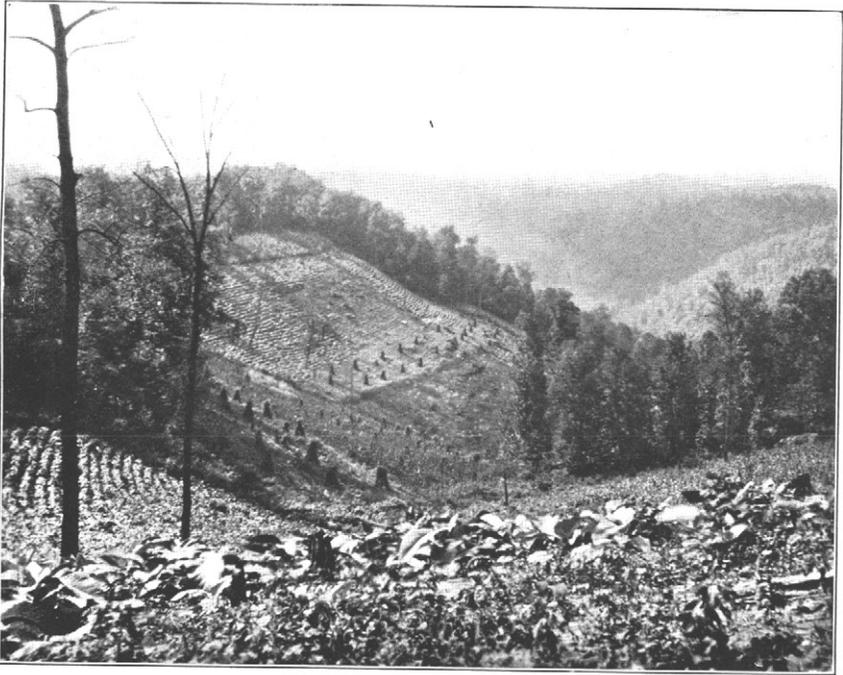


FIG. 1.—CHARACTERISTIC TOPOGRAPHY OF THE DEKALB STONY SILT LOAM, AND TOBACCO AND CORN ON THE SMOOTHER, LESS STONY SLOPES NEAR RECTOR, ON BIG UGLY CREEK.

[The tobacco field in the foreground is at an approximate elevation of 1,200 feet above sea level or about 400 feet above the stream bottom in the background.]

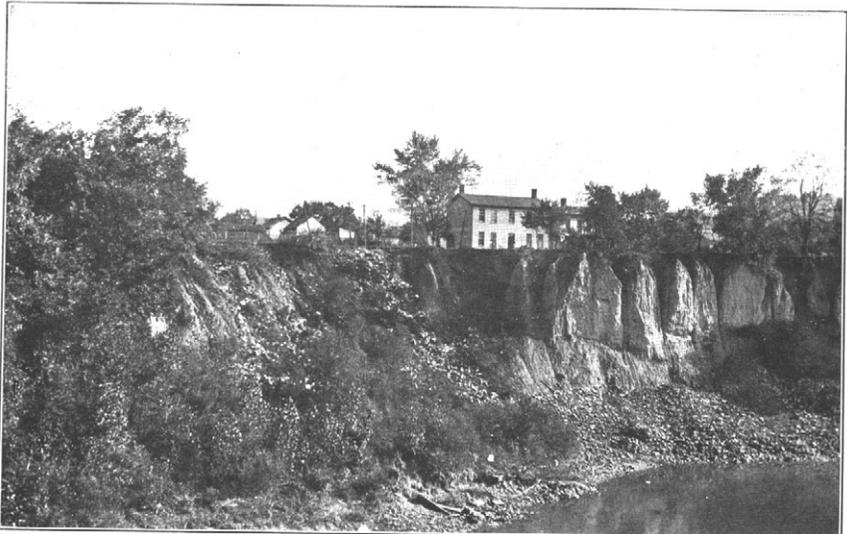


FIG. 2.—A SECTION OF TYLER SILT LOAM AS SHOWN IN STREAM BANK AT BARBOURSVILLE, W. VA.

upon the character of the land and crops to be grown. Tobacco is usually a stipulated crop. Where the owner furnishes the land and work stock and the tenant the labor, seed, and fertilizer, the owner receives one-fourth of the crop upon hill land and one-third of the crop upon bottom land. Rents, where no special crop is stipulated, are usually one-half of the crop when the owner furnishes teams, tools, and land and the tenant furnishes seed and labor. On bottom land the owner gets half the crop (corn and hay) and furnishes the land only. These are only general statements. Rentals are usually adjusted to suit conditions and vary with the contracting parties.

The land in the northern two-thirds of the area is divided into small holdings, but in the southern part of the area the holdings are more extensive and a large proportion of the land is owned by non-residents. The average size of farms for the area is 83 acres, the figures by counties being: Cabell, 78 acres; Lincoln, 76.5 acres; Wayne, 94.6 acres. The proportion of farms operated by owners is: Cabell County, 62.2 per cent; Lincoln County, 62.6 per cent; Wayne County, 53.6 per cent. In the area as a whole it is 59.8 per cent.

The following table gives the value of farm lands, implements, etc.:

*Value of farm lands, implements, etc., in the Huntington area, West Virginia.*

Item.	Year.	Cabell County.	Lincoln County.	Wayne County.	Huntington area.
Total acres in farms.....	1880	135,693	142,916	241,170	519,779
	1890	131,126	161,489	225,941	518,556
	1900	148,387	184,665	301,662	634,654
	1910	149,512	191,862	240,753	582,127
Acres improved.....	1880	47,577	36,493	75,745	159,815
	1890	62,090	50,195	90,837	203,122
	1900	80,852	68,687	125,241	274,780
	1910	84,290	88,823	129,365	302,478
Value of land and improvements other than buildings.	1880	\$1,658,333	\$762,759	\$1,942,916	\$4,364,008
	1890	1,832,420	870,780	2,226,750	4,929,950
	1900	1,421,020	929,690	1,602,840	3,953,550
	1910	2,396,144	2,349,304	2,199,727	6,945,175
Value of buildings.....	1900	419,940	315,610	517,620	1,253,170
	1910	868,480	800,483	788,004	2,456,967
Value of implements and machinery.....	1880	36,547	17,652	35,727	89,926
	1890	48,800	28,220	43,940	120,960
	1900	67,080	49,400	67,470	203,950
	1910	95,127	89,545	88,101	272,77
Value of live stock.....	1880	173,036	178,830	335,276	687,142
	1890	273,720	264,290	459,200	997,210
	1900	367,010	401,688	633,028	1,401,726
	1910	609,374	684,997	847,728	2,142,099

<sup>1</sup> Includes buildings.

*Value of farm lands, implements, etc., in the Huntington area, West Virginia.—Continued.*

Item.	Year.	Cabell County.	Lincoln County.	Wayne County.	Huntington area.
Value of products not fed to live stock.....	1880	253,451	224,685	401,373	879,509
	1890	412,360	352,600	446,110	1,211,070
	1900	649,696	630,020	962,687	2,242,403
Value of orchard products.....	1880	10,962	11,985	17,953	40,900
	1890				
	1900	33,422	20,334	30,918	84,674
Value of forest products.....	1880	31,074	21,722	57,540	110,336
	1900	58,572	53,634	141,297	253,503
Expenditures for fertilizers.....	1890	511	418	76	1,005
	1900	4,400	1,240	330	5,970
	1910	6,916	4,724	495	12,135
Expended for labor.....	1900	36,920	14,540	28,790	80,250
	1910	56,699	48,430	49,637	154,766

<sup>1</sup> Includes products fed to live stock.

There are many suggestions that can be offered for the improvement of the agricultural conditions, but only the most important ones and those that affect more closely the building up of the soils and the growing of some well-adapted crops can be touched upon in this report.

Fertilizers should be used more generally with tobacco upon the terrace and upland soils. Lime should be applied freely to acid soils or soils where red clover will not thrive. Low-lying, poorly drained land, where it is near enough to market to warrant the production of truck crops, should be drained. The increased production would more than pay for the installation of a drainage system. Upon the hill land more stock should be kept, orchards extended, and less land kept in intertilled crops. The more level spots should be picked out for intensive agriculture.

Upon the well-drained terrace soils alfalfa should succeed if the soil is well limed (1 to 2 tons burnt lime or 2 to 4 tons of crushed limestone per acre), the ground inoculated, and the seed bed thoroughly prepared. Cowpeas and soy beans should be used more freely, as they not only improve the physical condition of the soil, but add nitrogen. Winter vetch<sup>1</sup> is grown to a very limited extent and is well adapted to this area. It should be used as a winter cover crop and can be planted with either oats or rye or alone. This crop is especially recommended as a cover crop for tobacco land. It protects the land from washing and also materially increases the yields of tobacco. Peanuts<sup>2</sup> would be found profitable upon the sandy soils. They can be utilized for hogs, and the expense of gathering the crop avoided.

<sup>1</sup> See Farmers' Bulletin 360 for information concerning crop.

<sup>2</sup> See Farmers' Bulletin No. 431.

Irish potatoes <sup>1</sup> are well adapted to the terrace soils of the area and are a paying crop whether put upon the local market or sold elsewhere. Truck crops should be grown in sufficient quantities to supply the Huntington market.

Special attention should be paid to the condition of sod land. Where spots begin to die or weeds come up it should be renovated by resodding or by adding manure, lime, or nitrate of soda or fertilizer high in phosphates to stimulate the growth of grass. In this way the life of the sod may be extended for many years and better protection be given the hillsides.

SOILS.

The soils of the Huntington area fall into two natural groups, according to method of formation. They are either residual, i. e., derived from the underlying rocks, or alluvial, formed from stream deposits. The residual types consist of soils that have weathered from sandstones and red and gray shales. The alluvial soils are divided into two groups, terrace and first-bottom soils. The terrace soils represent the old flood-plain deposits of the streams when they flowed at a higher level, and the first-bottom soils the deposits of the present flood plain of the streams.

The following scheme gives the names of the several soils mapped and the material from which they are formed:

	Materials from which derived.	Soil types.		
Upland, residual..	{	Fine-grained sandstone.....	} Dekalb silt loam.	
		Arenaceous shales.....		
	}	Sandstone (fine and coarse) and gray shales.....	} Dekalb stony silt loam.	
		Sandstone, red and gray shales, and limestones.....		
Terrace, old alluvium.	{	Coarse, hard sandstones.....	} Meigs clay loam. Rough stony land.	
		Ohio River (glacial material).....		
	}	{	Derived from Meigs soils.....	} Wheeling silt loam. Wheeling silty clay loam. Wheeling fine sand.
			Other streams {	
First-bottom over-flow land, alluvium.	{	Derived from De- kalb soils.....	} Tyler silt loam. Holston silt loam. Holston silty clay loam. Holston fine sandy loam.	
		Derived from Meigs soils.....		
	}	Derived from Dekalb soils.....	} Huntington silt loam. Huntington loam. Huntington fine sandy loam.	

For convenience the soils are subdivided into series which include types similar in origin, formation, color, and other characteristics, with the exception of texture. The members of a series are known as soil types, this separation being based upon differences in texture.

The upland soils are derived from the stratified formations of the lower Dunkard, Monongahela, Conemaugh, Allegheny, and Pottsville

<sup>1</sup> See Farmers' Bulletin No. 356.

series of the Upper Carboniferous era. The geological disturbances and subsequent erosions have had a marked influence upon the distribution of the soil types.

The formations rise gradually in both directions from the Parkersburg syncline, the line of which passes through the area in a general northeast and southwest direction. Entering the area from Mason County 3 miles from the intersection of the Mason-Cabell County line west to the Putnam County line, the line of the syncline passes through Teays Valley 3 miles west of Milton, crosses the Guyandot River 2 miles south of Martha, passes one-half mile south of Bowen, crosses Twelvepole Creek three-fourths mile south of Dickinson, and passes out of the area near the mouth of Grayston Creek on the Big Sandy River.

The axis of the syncline varies but rises gradually to the southwest. Thus in the extreme northern part of the area the lower strata of the Dunkard formation are found capping the hills, and in the western part the Monongahela formation occupies the same relative position. Passing south or southwest from the syncline the formations rise slowly until they reach a line, rising in the same general direction with the syncline through Hamlin, Wayne, and Louisa. Proceeding beyond this line the formations rise rapidly for several miles, then follow a fairly even horizon until within a few miles of the southern boundary of the area, where they rise toward the Warfield anticline.

The first of these rises brings the sandstones of the Allegheny formation to the surface. These form the Dekalb stony silt loam and the Rough stony land. From the crest of the first rise to the beginning of the second the formations of the lower Conemaugh, giving rise to the Meigs clay loam, are found capping the hills. These formations disappear before reaching the southern boundary of the area, leaving the sandstones and gray shales of the Allegheny formation on the hilltops. Here the soil of the hillsides is derived from the upper Pottsville formation. As there is no red shale and very little gray shale below the Conemaugh formation, the Dekalb soils predominate over the part of the area where these formations outcrop. The red shales are not as prominent in the Huntington area as in other regions previously surveyed in this State, and consequently there is no extensive development of the Upshur clay, the Upshur material occurring only intermingled with Dekalb material and being mapped as the Meigs clay loam.

The Dekalb silt loam is developed to a very small extent. Erosion has reduced the hills that are capped by sandstone to narrow "hogback" ridges, in most places leaving no room for a type that is deeply weathered and normally occurs upon broad, flat-topped ridges.

The Rough stony land is more prominently developed in this area than in the Point Pleasant area, owing to the outcropping of a large

number of coarse, hard, massive sandstone formations. To this is also due the stony character of the Dekalb stony silt loam.

The first-bottom or overflowed lands form the Huntington series. The type shows a marked relation to the main upland soil types. The Huntington silt loam is derived largely from the Meigs clay loam, while the Huntington fine sandy loam comes almost wholly from the Dekalb stony silt loam. The Huntington loam is found developed along the Ohio River, occupying the same relative position as found in the other areas to the north.

The Wheeling series comprises the brown Ohio River terrace soils having a gravelly substratum. Some of the included material undoubtedly comes from glacial soils farther north from which a part of the Ohio drainage is drawn. Only three members of the Wheeling series are found in this area. The Wheeling silt loam is quite extensively developed and is fairly representative. The fine sand occurs in only one small area. The Wheeling silty clay loam has not been encountered in other areas and is due largely to the intermingling of large quantities of local material from lateral streams with the glacial material.

The Holston and Tyler soils include old alluvium of the terraces and abandoned valleys of streams rising in the unglaciated Appalachian region. Most of the material comes probably from sandstone and shale formations. The Holston series comprises the well-drained brown soils; the Tyler the poorly drained gray soils. The Holston silty clay loam represents the second-bottom land along the streams that receive their drainage from the Dekalb stony silt loam. The Holston fine sandy loam is found along the streams just below the outcrops of the series of sandstones belonging to the lower Cone-maugh, Allegheny, and Upper Pottsville formations. The Tyler silt loam is developed along streams whose drainage basins are composed mainly of the Meigs clay loam.

The Holston silt loam occupies the ancient river beds and terraces. The material that comprises this type was probably originally deposited largely when the streams were dammed with ice.<sup>1</sup> In any event, the deposits were deep across the entire valley. Originally the deposits existed as a valley plain, and in places such is the case now, but there has been considerable dissective erosion over the bottoms of the old valleys. The type in this area contains fewer laminated clay beds than the areas in the Teays Valley section of the Point Pleasant area.

The extent of alluvial soils in this area is small in comparison with the extent of upland soils.

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

The following table gives the names and actual and relative extent of the soil types encountered in the Huntington area:

*Areas of different soils.*

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Meigs clay loam.....	421,440	52.5	Wheeling silt loam.....	3,904	0.5
Dekalb stony silt loam.....	245,248	30.5	Wheeling silty clay loam.....	3,392	.4
Huntington silt loam.....	37,440	4.7	Dekalb silt loam.....	3,392	.4
Huntington fine sandy loam.....	22,272	2.8	Holston fine sandy loam.....	2,624	.3
Holston silt loam.....	22,080	2.7	Huntington loam.....	1,152	.1
Rough stony land.....	21,376	2.7	Wheeling fine sand.....	256	.1
Holston silty clay loam.....	13,248	1.6			
Tyler silt loam.....	5,376	.7	Total.....	803,200	.....

#### DEKALB SILT LOAM.

The Dekalb silt loam consists of 8 to 10 inches of gray, light, friable silt loam, underlain to 36 inches or more by yellow to yellowish-brown heavy silt loam, becoming heavier and more compact in the lower portions.

The type is weathered to a considerable depth and the parent rock is not usually found at less than 6 feet below the surface. Rock fragments are rarely encountered within 36 inches of the surface.

The Dekalb silt loam is derived from the weathering in place of fine-grained sandstone and arenaceous shales and is confined to the flat-topped ridges in the northern part of Cabell County, where the Waynesburg sandstone comes to the surface. Some areas of this type are also scattered through the Meigs clay loam, usually on the tops of narrow ridges. Such areas were too small to be shown on a map of the scale used in this survey.

The topography is usually level to gently rolling and drainage is well established, owing both to the elevation and slope of the areas and to the porous condition of the substratum of sandstone fragments.

Practically all the areas of this soil are cleared and under cultivation. The principal crops produced are corn, tobacco, potatoes, wheat, and hay.

Corn does only fairly well, yielding from 15 to 45 bushels per acre, according to season, fertilization, and condition of soil. In dry seasons crops do not give good returns. The type grows a fine grade of Bright Burley tobacco, with a thin tough leaf that can be used to advantage for plug wrapper. It is the general practice to use fertilizers or stable manure for tobacco, usually 400 or 600 pounds of an 8-2-5 mixture. Under such conditions about 1,000 or 1,200 pounds of tobacco is secured. Where stable manure only is used the yield is somewhat less.

Wheat usually yields from 15 to 18 bushels. Fertilizers are always used upon this type with wheat, applications ranging from about 250 to 300 pounds per acre. Ammoniated phosphate or bone meal are

the most commonly used. Cowpeas, soy beans, and clover are used to some extent in rotations and are found to be beneficial to the soil. Vetch should be grown more extensively as a cover crop.

Alsike clover will be found to do well upon the more level areas. The type is not adapted to grass, but produces fair yields of timothy hay and good bluegrass pasture with the use of about 1,000 pounds of lime per acre. Heavy applications of bone meal or floats to wheat crops to be followed by grass are very beneficial to the latter.

All vegetables do well, but are grown largely for home consumption. Cabbage, beans, and Irish potatoes give relatively the best yields. The type is especially adapted to Irish potatoes, which yield from 200 to 250 bushels per acre. More attention should be paid to this crop and larger areas planted.

The type is probably the best fruit soil in the area. It is well located with reference to air drainage and the even surface permits the use of spraying machinery. Trees make a healthy growth, are long lived, and both color and quality of the fruit are excellent. Apples constitute the larger proportion of the fruit grown and probably are the most profitable. The Ben Davis and Rome Beauty are the leading varieties. Elberta peaches appear to be the variety best adapted to the type. Plums and cherries do well, but are found only in small numbers in mixed orchards. Strawberries and raspberries should be given more attention. Commercial orchards are not very extensively developed upon this type in this area, but are found upon it in adjoining counties in Ohio.

The type as a rule is deficient in organic matter, and when stock is not kept in sufficient numbers to furnish manure, green crops should be turned under. Plowing should be deep to incorporate with the soil all the organic matter left on the surface, such as stubble and weeds. The soil is easily cultivated and when plowed under the proper moisture condition forms a mellow seed bed.

Land of this type of soil is valued at \$20 to \$30 an acre, the price depending largely on the character of improvements.

The following table shows the results of mechanical analyses of samples of soil and subsoil:

*Mechanical analyses of Dekalb silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Me- dium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220917	5 miles north of Milton.	Gray silt loam, 0 to 10 inches.	0.4	2.0	1.3	3.1	5.2	76.8	11.0
220918	Subsoil of 220917.	Heavy silt loam, 10 to 36 inches.	.0	1.3	.9	2.1	3.5	68.0	23.9

## DEKALB STONY SILT LOAM.

The Dekalb stony silt loam consists of a gray or grayish-brown, friable silt loam to silty clay loam, underlain at variable depths, usually between 4 and 18 inches, by a friable, yellow or yellowish-brown silty clay loam, usually slightly compact and heavier in the lower part of the profile. Typically both soil and subsoil contain considerable quantities of sandstone fragments, occasionally of sufficient size and quantity to make cultivation difficult and in some places impossible. Some areas are stony enough to constitute Rough stony land, but these were inextensive and therefore of too little importance to justify separation in mapping.

The topography of the type is prevailingly very steep and drainage is excessive (see Pl. II, fig. 1). There are gentler sloping areas, however, that are cultivated, but even the most of these are so steep that plowing is done with considerable difficulty. In mapping this type the question was raised as to whether it could be classified with such land as has been called in other areas Steep broken land. A thorough study of the type as a whole showed that it included too many areas that could be cultivated. The lower slopes of many of the small stream valleys, "coves," are cultivated. Not infrequently abandoned fields are seen in which the soil has practically all been washed away, leaving very stony areas and in places practically rock outcrop. Good fields of tobacco were seen even above the 1,200-foot contour line (see Pl. II fig. 1). In harvesting tobacco it is a common practice in some sections, as in the Big Creek neighborhood near the Logan County line, to transfer the stalks with leaves attached to the curing barn in the valley below by a wheel operating on a wire stretched between the field and barn.

In many places, especially along the horizon of the outcrops of the Charleston sandstone, there is an appreciable increase in the quantity of sand in the soil, though the content is not high enough to warrant its classification as a sandy loam. These sandy areas usually contain a large quantity of fragmental rock.

By far the greater part of the type is covered with forest, some virgin, but for the most part cut-over and second-growth land. The timber consists mainly of oak, chestnut, walnut, hickory, and locust. Very little of the type is cleared and used for agriculture. As a rule it is too steep to cultivate and is not well adapted to grass, although many patches are found where tobacco and corn are grown. New land is usually used for tobacco. A good grade of Bright Burley tobacco is produced, the yields running usually about 1,000 pounds per acre. Fertilizers should be used for this crop. Corn yields from 10 to 25 bushels per acre. The type is too steep for harvesting such crops as wheat, oats, and barley. Cowpeas could be used to advan-

tage with corn. They add nitrogen and organic matter to the soil, and thus increase the subsequent yields of crops. They furnish a nutritious feed for stock, the roots help to hold the soil in place and prevent erosion. Both apples and peaches do well upon the hill-tops and more level benches and may to a great extent prove the solution of the agricultural development of the cultivable portion of the type. Most of the type is entirely too steep for successful orcharding, but there are many places upon which orchards would pay.

The number of live stock that can be kept upon the type is small, as the land is not adapted to grass. Liming would improve the pasturage and hay yields in a considerable degree.

A very large part of the type should be left in forest, as its surface features do not adapt it to agriculture. Some land of this type is valued at \$15 an acre. There are large cut-over tracts that can be bought exclusive of mineral rights for less than this.

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

*Mechanical analyses of Dekalb stony silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Me- dium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220921	2 miles north of Big Creek.	Silty clay loam, 0 to 6 inches.	<i>P. ct.</i> 0.6	<i>P. ct.</i> 3.5	<i>P. ct.</i> 9.6	<i>P. ct.</i> 23.1	<i>P. ct.</i> 7.8	<i>P. ct.</i> 42.0	<i>P. ct.</i> 13.4
220922	Subsoil of 220921.	Silty clay loam, 6 to 36 inches.	.3	2.6	4.0	17.8	15.9	38.5	20.8
220925	5 miles southeast Fort Gay.	Gray silt loam, 0 to 8 inches.	1.4	4.4	3.0	13.9	15.1	50.0	12.2
220926	Subsoil of 220925.	Silty clay loam, 8 to 36 inches.	.8	3.9	2.7	10.9	11.1	52.9	17.3

MEIGS CLAY LOAM.

The Meigs clay loam consists of undifferentiated Dekalb and Upshur material. The formations giving rise to the type are alternating thin strata of sandstone and red shale, with an occasional thin bed of gray arenaceous shale and limestone. The sandstones weather into Dekalb silt loam with a gray soil and yellow subsoil.<sup>1</sup>

The red shales, which are more or less calcareous, weather into Upshur clay, which consists of dark-red to dark reddish brown, slightly friable clay loam soil from 3 to 6 inches deep, underlain by a red plastic clay.

<sup>1</sup>This soil is fully described on p. 22

The gray shales weather into a heavier phase of the Dekalb soil, but are not extensive enough to influence appreciably the type. Where the coarse-grained sandstone and shales outcrop—usually upon the narrow ridges—the sand content is noticeably higher and the material approaches the Dekalb sandy loam in texture. Such areas are too small to be shown upon a map of the scale used in this survey. The limestone strata are thin and scattered, but influence the surrounding soils to some extent, particularly upon Watts Ridge, in Wayne County, and upon the hillsides in the eastern part of Lincoln County.

Upon the steep slopes the weathered materials from the formations that give rise to the type become very much mixed through landslides and colluvial action and an intermediate (Dekalb-Upshur) soil is the result. The greater proportion of the intermediate soil is usually a gray or reddish-gray silt loam to silty clay loam varying in depth from 2 to 8 inches and underlain by a yellow or reddish-yellow silty clay loam, grading at about 20 inches into a dull red or mixed red and yellow clay. Much of the type has a gray silty soil (Dekalb material) and an Upshur clay subsoil.

In this area the proportion of the Upshur material and of the intermediate type included in the Meigs clay loam are about equal to the Dekalb material, owing to the fact that the red shale formations are thinning and the sandstone thickening to the south. The proportions vary at different points, owing to the unequal mixture of the material comprising the type.

Nearly all of the type carries large quantities of small, partially weathered sandstone and shale fragments scattered over the surface and throughout the soil mass. These fragments are rarely present in quantities sufficient to interfere with the cultivation of the type, being found more abundantly in the deeper subsoil. In many places the parent rock material lies at depths of 24 to 30 inches, but over the greater proportion of the type it does not occur within 36 inches of the surface.

The topography of the type is steep over the greater portion of its extent, and the ridges are usually narrow. In some places where they broaden out and the hilltops are more rounded, a more gentle topography occurs. The alternating hard and soft strata of the formations give rise to frequent benches on the hillsides, which show up very plainly in the cleared areas. Owing to the steep topography the drainage is excessive and crops often suffer during dry seasons for lack of moisture.

The Meigs clay loam is the most extensively developed soil in the area, comprising nearly all of the upland sections north of a general east and west line passing south of Griffithsville, Wayne, and Fort Gay. To the south of this line the type is found upon the ridge

tops and it entirely disappears before the southern limit of the area is reached.

On account of the large percentage of Upshur material contained in the Meigs clay loam, it is difficult to handle and requires a very heavy draft for plowing to the proper depth. If plowed too wet clodding results and when dry it has a tendency to bake and become very hard, making plowing very difficult. This tendency is more pronounced over the red clay portions of the type.

Plowing should be done upon this type late in the winter to gain the advantage of the alternate freezing and thawing of early spring in reducing the clods to a mellow seed bed. If the preliminary preparations of the land be delayed until early spring the type can not be brought into proper condition for seeding until late in the season.

The principal crops grown upon the type are corn, wheat, tobacco, and hay. Corn gives fair yields, ranging from 15 to 45 bushels per acre, wheat from 10 to 20 bushels, the best results being obtained upon the ridges. Applications of 250 to 300 pounds of bone meal or ammoniated phosphate per acre are used for the latter crop. Tobacco does well and is the most extensively planted crop upon this type. Except where new land is used from 400 or 500 pounds of an 8-2-5 fertilizer is required to produce from 1,000 to 1,500 pounds of average quality Bright Burley tobacco. Timothy hay yields about 1½ tons per acre, but most of the type is too steep for the use of mowing machines. The type is fairly well adapted to clover, especially in the areas influenced by limestone. Burnt lime should be applied at the rate of about 1,000 pounds per acre before seeding to grass or clover. Bluegrass comes in naturally, but where sowed with a nurse crop it gives a better stand. Where seeding is carefully done a sod is secured that will last for 10 to 15 years under ordinary circumstances and if judiciously grazed and properly cared for the life of the pastures can be prolonged indefinitely. By far the greater proportion of the cleared area of the type is in bluegrass pasture at present.

A large number of beef cattle and a few sheep are grazed on the Meigs clay loam. Stock raising is recommended as the best means of utilizing the hillsides which are too steep for cultivation.

It is recommended that the hilltops be kept under cultivation, using rotations of corn, tobacco, wheat and grass (timothy and clover). Cowpeas, soy beans, and vetch should be more generally used. Vegetables do fairly well and where the type is located near markets trucking could be made profitable. At the present time vegetables are grown only for home consumption.

Where the topography permits the type is well adapted to the growing of fruit on a commercial scale. Very little attention has been

paid to fruit and only a few large orchards are found. These are mainly apple and peach orchards. The varieties of apples seemingly best adapted to soil and climatic conditions are the Ben Davis and Rome Beauty. The Elberta and Crawford peaches seem to do best and are the most extensively grown. Very little attention has been given to plums, cherries, or small fruits, although they are apparently well adapted to the local conditions.

A large proportion of the type is cleared and either in pasture or cultivated crops. The natural forest consists largely of oak, chestnut, chestnut oak, hickory, and walnut. The second growth is largely oak and locust.

Land composed of this type of soil may be bought for prices ranging from \$10 to \$20 an acre.

#### ROUGH STONY LAND.

The Rough stony land comprises areas so covered with stone or containing so many rock outcrops as to make farming impracticable.

Areas of this character occur for the most part along the valley walls of the larger streams. They are very steep and broken and in many places form rocky cliffs.

Rough stony land is most extensively developed in the southern part of the area, where the thick, hard sandstone strata of the Allegheny and Pottsville formations lie above drainage levels.

By far the greater proportion of the type is in forest and should remain so, as crops can not be successfully cultivated, and the small areas that might be used as pasture hardly warrant the clearing of the land.

#### WHEELING SILT LOAM.

The soil of the Wheeling silt loam consists of a light-brown, friable silt loam, 10 to 12 inches deep. The subsoil is a yellow or yellowish-brown, slightly compact, heavy, though friable, silt loam to silty clay loam, becoming lighter in color and more compact with depth. Beds of gravel and sand are usually encountered at 10 to 20 feet below the surface and a few waterworn quartz fragments are found scattered over the surface and throughout the soil profile. Slight elevations or swells are found throughout the type where the sand content is relatively high, but not sufficiently so to place the type in a lighter class. The material forming the type was deposited by the river upon an old flood plain, when the stream flowed at a higher level than at present. Undoubtedly the type carries considerable glacial material brought down from the glacial soils in the northern portion of the Ohio River drainage basin. Also it contains material from the residual soils of the drainage basin to the south of the glacial lakes. The underlying beds of gravel appear to be largely glacial in origin.

Areas of the Wheeling silt loam occur along the Ohio River, where they occupy the third and fourth terraces, with an average elevation of 50 to 70 feet above the first bottoms of the stream. This soil has not suffered markedly from erosion and the terraces are fairly intact, although a great proportion of the original terrace has doubtless been removed by stream action. The topography is level to gently undulating, though owing to the underlying strata of gravel the drainage is excellent.

This type of soil is not very extensively developed in the Huntington area, being found at intervals along the Ohio River. The largest developments are near Huntington, Kenova, Greenbottom, and Cox Landing. The larger proportion of the type is within the limits of Huntington and Kenova, and as it lies above high water much of it is occupied by buildings. This leaves but a small area to be considered agriculturally.

Owing to its light texture and friable structure, this soil is easy to cultivate, and when plowed under the proper moisture conditions forms a mellow seed bed. Any clods that may result are easily broken down and very little trouble is encountered in handling the type. It is the strongest of the Wheeling soils and one of the best types in the area. It has been under cultivation since the opening of the country and in places much of the organic matter has been depleted by continued clean-culture cropping. In other places this type is probably the best cared for of the soils found in the area and the results obtained under such conditions show its possibilities where properly farmed.

The Wheeling silt loam is well adapted to the general farm crops produced in this section. Corn yields 40 to 80 bushels per acre, wheat 15 to 20, oats 25 to 30, rye from 30 to 35 tons, and hay 1½ to 2 tons. Tobacco is grown to a limited extent and yields satisfactorily both as regards quality and quantity. The type is the best Irish potato soil in the area, from 200 to 300 bushels per acre being secured. Vegetables do well and trucking could be profitably extended. Good orchards of apples and peaches are found, but the hill lands are generally preferred for commercial orcharding.

Fertilizers are seldom used upon this type, except for wheat, tobacco, and heavy truck crops. Intensive farming should be practiced and truck growing for the local markets made the chief interest. At least 10 or 15 wagon loads per acre of stable manure should be used where practicable, and where this can not be secured leguminous crops should be grown and turned under to supply organic matter. Where clover does not thrive, about 1,000 pounds of burnt lime per acre should be applied and well harrowed in some time before seeding. Alsike clover thrives and should be used more extensively, as should cow-peas, soy beans, and vetch. In preparing for wheat to be followed by

grass applications of bone meal ranging from 500 to 600 pounds per acre should be made.

The type is all cleared and occupied either by buildings or cultivated crops. The price of the agricultural land varies from \$100 to \$250 per acre, according to location and improvements.

The results of mechanical analyses of samples of the soil and subsoil of this type are shown in the following table:

*Mechanical analyses of Wheeling silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220901	Huntington.....	Silt loam, 0 to 10 inches.	0.0	1.1	1.5	10.5	9.0	63.0	14.8
220902	Subsoil of 220901.	Heavy silt loam, 10 to 36 inches.	.0	.9	1.3	10.4	12.5	54.2	20.4

WHEELING FINE SAND.

The soil of the Wheeling fine sand consists of a gray or brownish-gray to grayish-brown, loose and incoherent fine sand, from 8 to 10 inches deep. The subsoil is a yellowish-brown, slightly compact fine sand to a depth of 36 inches or more and frequently extending to depths of 20 or 30 feet.

This type of soil is developed only in one place in the Huntington area. It occurs upon domelike areas banked against the base of the hills at Greenbottom. It is largely formed by wind-blown material derived from the other Wheeling terraces during dry seasons, and represents old alluvium. Drainage is excessive, owing to the rolling topography and open structure of the soil and subsoil.

The type is not naturally strong, but with the use of manure fair yields of nearly all the crops grown in this section can be obtained. The soil is best adapted to light truck crops, including melons. Grasses, clover, oats, tomatoes, cabbage, tobacco, millet, wheat, and heavy truck crops do not thrive. Rye does fairly well, yielding from 20 to 30 bushels per acre. Corn gives 30 to 40 bushels where manure is used. When this is not practicable the necessary organic matter may be supplied by plowing under cowpeas, soy beans, or vetch. The soil is also well suited for the production of peanuts and sweet potatoes. The type can not be recommended for orcharding, as the trees bloom too early and are likely to be caught by frost.

The Wheeling fine sand is easily cultivated and can be plowed in almost any moisture condition without impairing its physical

condition. Crops mature earlier than upon any other type in the area, and for this reason alone it should all be used in the production of early truck. Late crops are apt to suffer for lack of moisture.

All of the Wheeling fine sand is cleared and under cultivation, values ranging from \$75 an acre upward.

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

*Mechanical analyses of Wheeling fine sand.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220905	Greenbottom....	Yellowish-brown fine sand, 0 to 8 inches.	0.2	2.9	8.6	64.6	8.0	11.2	4.2
220906	Subsoil of 220905.	Fine sand, 8 to 36 inches.	.0	2.4	8.6	58.6	8.1	17.2	5.2

WHEELING SILTY CLAY LOAM.

The Wheeling silty clay loam consists of about 10 inches of dark-brown, friable silty clay loam, underlain by yellow or yellowish-brown, compact though friable silty clay loam, slightly mottled with drab. In poorly drained areas the subsoil is much more plastic than in better drained areas.

Second terraces along the Ohio River, slightly lower than those occupied by the Wheeling silt loam, show the Wheeling silty clay loam. The material is identical with that giving the Wheeling silt loam, except that it is slightly heavier in texture and poorly drained. The areas are inundated during very high floods, but this does not appreciably affect the character of the soil, as the periods of inundation are widely separated and their duration is very short.

The type is found in comparatively narrow strips along the Ohio River, and, like the silt loam type, the largest areas occur within the corporation limits of Huntington and Kenova.

The Wheeling silty clay loam is easily cultivated and adapted to practically the same crops as the silt loam. It is not as early as the latter type and probably a little better suited to grass, corn, oats, and varieties of vegetables requiring a moist soil. It is not quite so well suited to potatoes as the better drained silt loam. Alsike clover does well and may be used where red clover will not give a satisfactory stand.

The type is better supplied with organic matter than the silt loam, but needs lime, applications of about 1 ton per acre being required to correct acidity.

Growing truck crops for local markets is the most profitable way to utilize areas of this type.

Prices for land of this type range from \$100 to \$150 an acre.

Mechanical analyses of samples of the soil and subsoil of the Wheeling silty clay loam gave the following results:

*Mechanical analyses of Wheeling silty clay loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Me- di- um sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220915	½ mile west of Central City.	Heavy silty loam; 0 to 10 inches.	<i>P. ct.</i> 0.0	<i>P. ct.</i> 0.4	<i>P. ct.</i> 0.7	<i>P. ct.</i> 4.5	<i>P. ct.</i> 8.4	<i>P. ct.</i> 65.9	<i>P. ct.</i> 20.5
220916	Subsoil of 220915.	Silty clay, 10 to 36 inches.	.0	.1	.4	2.2	9.8	59.7	27.8

HOLSTON SILT LOAM.

To a depth of 8 to 12 inches the Holston silt loam consists of a dark-brown to grayish-brown, medium heavy, friable silt loam. Beneath this is a yellowish-brown or yellow, heavy but friable silt loam, becoming heavier and more compact with depth.

Areas of this soil occupy old river channels and terraces. They have suffered greatly from erosion. The depth to the original bed rock upon which the component material of the type was deposited is somewhat variable, the result, at least in many instances, of erosion. There are some places where residual material from the underlying sandstone or shale comes within the 3-foot section. In places beds of water-rounded gravel and small boulders varying in size from one-fourth inch to 2 feet in diameter are developed in the lower part of the subsoil. These are mostly of quartz and flint. Occasional beds of sand are encountered, but they are usually not extensive enough to have much effect upon the soil.

To the east of Milton, in Teays Valley, beds of laminated clays occur at varying depths. Where exposed by erosion this clay gives rise to areas known as "gall spots." They are caused by the impervious nature of the clay. The water flowing through clay beds along the bedding planes seeps out in places to give rise to poorly drained spots of little agricultural value.

The largest bodies of the Holston silt loam occur in Teays Valley, the ancient bed of the Kanawha River.<sup>1</sup> Smaller areas occur also in the old bed of the Big Sandy River. The material was probably derived originally from sandstones and shales.

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

The surface is level to gently rolling, with an average elevation of about 700 feet above sea level. The greater part of the type lies about 150 feet above the first bottoms of the larger streams. Drainage is usually good, but in places where the clay strata are near the surface it is only fairly well established.

This is naturally a fairly strong soil, but through heavy cropping and poor management, extending over a period of many years, many fields have had their productiveness markedly lowered. In the few cases where the type has been properly managed it is still very productive. Only within the last few years has any attention been paid to building up the type in general.

Diversified farming is the usual practice upon this type. Tobacco, wheat, oats, corn, potatoes, and hay (timothy, clover, and cowpea) are the principal crops. Tobacco is probably the best paying crop. The quality of leaf is good and the yields, where fertilizers are used, are heavy. With the use of about 400 or 600 pounds of 8-2-5 fertilizer a yield of 1,200 to 1,500 pounds of tobacco per acre may be expected. The leaf commands a better price than any other grown in the area and is used largely for plug wrapper.

Wheat, with the use of about 250 pounds of bone meal, yields from 18 to 20 bushels per acre. Oats, rye, and barley are grown only in a limited way. Grasses do fairly well, but very little of the type is in mowing or pasture. Timothy hay yields about  $1\frac{1}{2}$  to 2 tons per acre. Corn is planted to some extent, yielding 20 to 60 bushels per acre, according to the condition of the land. Soy beans and cowpeas are grown for forage and have been found very beneficial to the land. Clovers do fairly well and they are used in rotation more than any other of the leguminous crops. Where difficulty is experienced in growing red clover heavy applications of lime should be made or alsike clover substituted. Vetch should be used as a cover crop, as it is well suited to both soil and climatic conditions. It is not used at present, so far as could be ascertained.

Irish potatoes are well adapted to the Holston silt loam and yield from 150 to 250 bushels per acre. This crop should be grown more extensively. Both early and late potatoes seem to do well. Other vegetables and truck crops succeed. Trucking might become one of the leading industries upon the type, but at present it is given very little attention. Cabbage, beans, peas, and tomatoes yield particularly well. Strawberries, blackberries, and raspberries thrive. They are grown largely for home consumption. Plums, cherries, and pears are found in nearly all home orchards. Vineyards appear to be productive. Some commercial apple and peach orchards are found, but the type can not be recommended for fruit growing on a large scale, as the fruit does not color highly and the crop is too often damaged by frost.

Fertilizer should be used upon the type for most crops and as much organic matter incorporated in the soil as possible. The type is easy to cultivate, breaking down into a mellow seed bed when plowed in the proper moisture condition. Plowing should be deep and all added organic matter thoroughly mixed with the soil.

The original forest growth consisted largely of white oak, poplar, elm, sycamore, and beech. Most of the type is cleared and under cultivation. Land values range from \$25 to \$50 an acre.

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

*Mechanical analyses of Holston silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220911	Near Gaylorsville.	Silt loam, 0 to 10 inches.	0.2	0.5	0.5	0.9	9.9	76.8	11.2
220912	Subsoil of 220911.	Heavy silt loam, 10 to 36 inches.	.0	.0	.2	.5	8.0	72.0	19.3
220933	2 miles east of Milton.	Silt loam, 0 to 10 inches.	.8	4.4	8.2	11.8	4.8	58.9	10.9
220934	Subsoil of 220933.	Heavy silt loam, 10 to 36 inches.	.6	3.7	5.6	8.9	2.1	62.6	15.9

HOLSTON SILTY CLAY LOAM.

The Holston silty clay loam consists of a dark-brown, mellow silty clay loam, 10 to 12 inches deep, underlain by a yellowish-brown, fairly compact, friable silty clay loam, grading below into compact silty clay. Slight mottlings of drab and reddish or brownish iron stains and a tendency to plasticity are noted in the deeper subsoil of poorly drained areas. The latter approach the Tyler soils in general characteristics.

Areas of this type form second-bottom lands along the larger streams. The material is largely washed from upland areas of Dekalb and is found only upon the streams that head in regions occupied chiefly by Dekalb soils.

The topography is level to gently rolling and drainage is fairly well established. The type is found well developed along the Big Sandy River, Guyandot River, and Twelvepole Creek. The type usually lies from 40 to 60 feet above stream level.

The soil is not hard to handle if care is exercised not to disturb the surface while too wet. If plowed in this condition clodding results, and it is very difficult to bring the land into proper condition for

crops. When dry plowing is difficult, but when undertaken at the right stage of moisture conditions a mellow seed bed results.

The crops grown upon the type are corn, wheat, oats, tobacco, hay (timothy), cowpeas, millet, and soy beans. Corn is grown more extensively than any other crop, with the exception, perhaps, of timothy, and yields from 30 to 50 bushels per acre. Wheat and oats are grown to a very limited extent, yielding from 10 to 20 bushels and 20 to 30 bushels per acre, respectively. These yields are usually made with the use of small quantities of bone meal.

In some sections tobacco is grown extensively, the leaf being of good quality and the yields heavy, particularly when manure or fertilizer is used. Vegetables, especially tomatoes, potatoes, beans, and cabbage, do well. Fruits do not thrive, owing to the low position occupied by the type.

This soil is better adapted to grass than to any other crop, and a large proportion of the type is in mowing land and pasture. Timothy yields from 2 to 2½ tons per acre. Crab grass comes in naturally and makes sufficient growth to warrant cutting it for hay. It usually forms a part of the growth on land sowed to cowpeas or soy beans. The soil is better adapted to alsike clover than to red clover. The legumes, and especially cowpeas, soy beans, and vetch, should be extensively used to build up the type.

In places the soil is acid, especially where the subsoil is mottled. These areas should be treated with applications of 1 ton of burnt lime per acre or twice this quantity of ground limestone. Where the mottling is not so pronounced lesser quantities will suffice. The lime should be harrowed in thoroughly some time before planting the crop. Liming, in addition to correcting acidity, will improve the physical condition of the soil and in this way also make it more productive.

The production of heavy truck crops may well be extended on the Holston silty clay loam, as the areas are located near excellent markets for these products. Several dairies are maintained upon the type and seem to be on a profitable basis.

Like other terrace soils of the area that are above overflow, the type is deficient in organic matter, and some systematic plan for building up the humus content should be adopted.

The natural forest growth, consisting largely of beech, elm, and sycamore, has been removed, and most of the type is either in pasture or cultivated crops.

Farms composed of this type of soil may be purchased for \$50 to \$100 an acre.

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

*Mechanical analyses of Holston silty clay loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220931	Buffalo.....	Brown silty clay loam, 0 to 10 inches.	0.0	0.3	0.9	4.6	6.1	62.0	26.3
220932	Subsoil of 220931.	Silty clay loam, 10 to 36 inches.	.0	.1	.4	2.5	6.3	59.4	31.1
220935	1 mile northwest of Barboursville.	Silty clay loam, 0 to 10 inches.	.0	.3	.9	4.0	5.0	65.7	24.0
220936	Subsoil of 220935.	Silty clay loam, 10 to 36 inches.	.0	.0	.4	1.5	4.3	61.5	32.2

#### HOLSTON FINE SANDY LOAM.

The Holston fine sandy loam to a depth of about 12 inches consists of a brown light fine sandy loam, loose and open in structure. Below this is found a light-brown to yellowish-brown, medium heavy to heavy, slightly compact fine sandy loam, becoming heavier and more compact with depth.

The type occurs as second bottom along the larger streams. It lies above overflow and from 30 to 40 feet above the streams. In some places the areas form indistinct terraces; in others the surface is marked by ridges and swales running parallel to the streams. The ridges are usually sandy, while the swales are heavy. In general the topography is level to gently undulating.

The open structure of the soil and the comparatively open structure of the subsoil give free internal drainage and make the type somewhat droughty during dry seasons.

The Holston fine sandy loam is not extensively developed in the Huntington area, occurring only on Mud River and Twelvepole Creek below outcrops of the sandstones of the lower Conemaugh, Allegheny, and Upper Pottsville series. It has been formed mainly by deposits of material washed from these sandstone areas.

The light texture and open structure of the soil make it easy to cultivate. There is little tendency to clodding when plowed even in a wet condition, and the soil does not bake. The type is not naturally strong, but is well adapted to the growing of certain crops, such as sweet potatoes, peanuts, melons, cucumbers, and light garden truck. Corn and oats do fairly well, the former yielding from 20 to 50 bushels per acre, the higher yields being secured on fields in good condition and with the use of manure. The ordinary yield of oats is 20 to 25

bushels per acre. The type is not particularly adapted to wheat and tobacco, and where grown large quantities of fertilizers must be used. Cowpeas and velvet beans do well and are grown to some extent. Hairy vetch is well adapted to this type and should be used more generally as a cover crop. Oats and vetch make an excellent combination for sowing in the fall. Cantaloupes and watermelons are probably the best paying crops at present. The rotation of cowpeas and melons give excellent results, the cowpeas leaving the soil in perfect condition for melon culture.

The natural forest, consisting of elm, sycamore, and beech, has been cleared away and practically all of the type is under cultivation.

The price of farms composed of this type of soil ranges from \$50 to \$75 an acre.

The following table shows the results obtained from mechanical analyses of samples of soil and subsoil of the Holston fine sandy loam:

*Mechanical analyses of Holston fine sandy loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220907	One mile north of Wayne C. H.	Brown fine sandy loam, 0 to 12 inches.	0.0	2.8	17.0	40.7	9.9	20.5	8.9
220908	Subsoil of 220907.	Heavy fine sandy loam, 12 to 36 inches.	.0	.7	7.7	29.7	8.9	34.9	17.7

TYLER SILT LOAM.

The soil of the Tyler silt loam consists of 6 to 10 inches of a dark gray or drab, compact but friable heavy silt loam to silty clay loam, mottled with whitish and dark-brown colors. The subsoil is a light-gray to drab, compact, plastic silty clay loam to silty clay, mottled with yellow, drab, and whitish colors, and in the deeper profile with reddish brown. In better drained areas the mottling in the soil and subsoil is not quite so pronounced. Plate II, figure 2, shows a section of this type in a stream bank at Barboursville.

The topography is level to gently undulating. The close structure of the subsoil prevents the downward movement of water and makes the drainage conditions upon the type very poor.

The Tyler silt loam is not extensively developed in the Huntington area. The largest tracts occur along the lower courses of Mud River. Smaller areas are found along the smaller streams in the northern part of the survey. The type occurs as second bottom lying above overflow. It represents the old flood plain of the stream when its

bed was at a higher level than at the present time. The type is derived from Upshur and Dekalb material and is found largely along streams whose drainage basins lie within areas of Meigs soils.

Owing to the heavy nature of the soil and to its poor drainage, the type is very difficult to handle, requiring heavy draft animals and clodding badly when plowed too wet. The type remains wet a long time after rains. When it does dry out a very hard, compact condition results. The type is known locally as "crawfish land."

This soil is best suited to grass. It supports many excellent pastures of bluegrass. Timothy yields from 1½ to 2 tons per acre. Corn does only fairly well, yielding 15 to 30 bushels per acre. Oats and wheat make fair yields when fertilized. Acid phosphate usually gives the best results upon this type, but is used very little. Vegetables do well where large quantities of organic matter are added to the soil, but otherwise garden crops suffer from the baking of the soil. Leguminous crops, as a rule, do not thrive unless the type is supplied with underdrainage.

The Tyler silt loam is usually acid and in need of drainage and liberal applications of lime. At least a ton of burnt lime or twice as much ground limestone should be used. The use of lime will sweeten the soil and markedly improve its physical condition. A leguminous crop or other vegetation should be turned under occasionally and thoroughly incorporated with the soil. This will assist in securing needed aeration.

Practically all the original forest, consisting of white oak and beech, has been removed and the land is in cultivated crops or pastures. The land is valued at \$50 to \$75 an acre.

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

*Mechanical analyses of Tyler silt loam.*

No.	Locality.	Description.	Fine gravel,	Coarse sand,	Me- dium sand,	Fine sand,	Very fine sand,	Silt,	Clay,
			2 to 1 mm.	1 to 0.5 mm.	0.5 to 0.25 mm.	0.25 to 0.1 mm.	0.1 to 0.05 mm.	0.05 to 0.005 mm.	0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220919	Barboursville....	Silty clay loam, 0 to 6 inches.	0.3	3.5	4.4	9.5	11.5	49.3	21.3
220920	Subsoil of 220919.	Silty clay, 6 to 36 inches.	.3	1.4	1.7	5.4	7.4	49.4	34.4

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam consists of 12 inches of dark chocolate brown, medium heavy, mellow silt loam, fairly high in organic matter. The subsoil is a heavy, compact, and friable silt

loam to silty clay, the same color or only a little lighter than the surface soil, becoming heavier and more compact with depth.

Areas of this type occupy first-bottom or overflow land along the Ohio River and smaller streams draining the northern half of the area surveyed. The material comprising the type is derived largely from the Meigs soils. In a few places where heavy red beds are found above drainage levels the soil has a slightly reddish cast. Such areas are very small. In some places, usually in the smaller valleys, beds of sandstone and shale fragments are found about 2 feet below the surface.

The type reaches its largest development in the Teays Valley portion of Mud River and along Beech Fork of Twelvepole Creek. Smaller areas are found along the Ohio River and smaller streams. The type is easily cultivated, and when plowed in the proper moisture condition breaks down very readily into a mellow seed bed. When plowed too wet clodding results, but this is not as serious as upon the heavy upland soils, and the clods left by the harrow are dissolved by the overflows of the following season.

The topography is level to slightly undulating, and drainage over most of the type is good. A few swales and low places are found where drainage is poorly established.

Annual inundations serve to maintain the productiveness of this soil, and it is probably the strongest type in the area. It produces good crops of corn, hay, potatoes, tomatoes, and vegetables. More than half of the type is planted to corn each year. The ordinary yields range from 50 to 60 bushels per acre, but in many places 70 to 80 bushels per acre are secured, and individual cases of much higher yields are reported. The type makes good mowing lands, timothy cutting  $1\frac{1}{2}$  to 2 tons per acre. Tomatoes do especially well and are grown to some extent. Potatoes yield 150 to 250 bushels per acre, and nearly every farmer on this type uses a part of his land for this crop. Cereal crops have a tendency to lodge, and for this reason are not grown. Tobacco is planted extensively, and large yields of a heavy, dark, rather inferior leaf are secured, the larger yields about offsetting the difference in price between the product of this soil and the upland types. During good seasons yields ranging from 1,200 to 2,000 pounds per acre are obtained, usually without fertilizers. Some farmers use small quantities of fertilizer even upon this soil, and these say that the tobacco makes a more balanced growth than where dependence is placed on natural fertility alone. Broom corn is another crop that does well, yielding about 600 to 800 pounds per acre.

It is believed to be advantageous to leave some vegetal covering upon this type to serve as a collector of sedimentary material during the spring freshets.

The natural forest growth, which consisted largely of sycamore, elm, and beech, has been removed and the type is practically all

under cultivated crops or in mowings. Most of the land is held at \$100 an acre.

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

*Mechanical analyses of Huntington silt loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220903	One mile south of Cox Landing.	Brown silt loam, 0 to 12 inches.	<i>P. ct.</i> 0.0	<i>P. ct.</i> 0.2	<i>P. ct.</i> 1.1	<i>P. ct.</i> 11.5	<i>P. ct.</i> 22.1	<i>P. ct.</i> 49.2	<i>P. ct.</i> 16.4
220904	Subsoil of 220903.	Heavy silt loam, 12 to 36 inches.	.0	.0	.5	5.4	14.9	56.0	23.2

#### HUNTINGTON LOAM.

The soil of the Huntington loam consists of 8 to 12 inches of brown to dark chocolate brown, medium heavy loam. The subsoil is a fine, friable, compact brown loam, somewhat lighter in color than the surface soil and becoming slightly heavier at depths below 24 inches, where it frequently approximates a silt loam in texture. In low places or swales the soil is heavier and often mottled with blue and drab, but such areas are not very extensive. Beech usually makes a vigorous growth in such locations.

The type occurs along the Ohio River as high bottom land, subject to overflow during the early spring months. This inundation occurs before the growing season, and there is generally little danger from this source during the growing or harvest seasons. The overflows add rich sediments, high in organic matter, and tend to maintain the soil in a good state of productiveness.

The topography is level to gently undulating, and with the exception of a few swales the type is well drained. It is not extensively developed in this area. The largest tract reaches from the Mason County line to Crown City Ferry.

Corn, oats, hay, tobacco, and potatoes, tomatoes, and other vegetables are grown. Corn gives yields ranging from 60 to 80 bushels per acre and occupies a greater acreage than any other crop. Some oats are grown and a little rye, but the cereal crops are likely to lodge and on that account are grown to a limited extent only. Tobacco produces a leaf of excellent quality, but the acreage of this crop is at present small. Potatoes, both sweet and Irish, do exceptionally well, yielding from 200 to 250 bushels per acre. Grasses do only fairly well, but are grown over small areas. The mowing lands are good, especially in some of the wetter areas. Cowpeas and soy beans thrive. Pumpkins and squash give excellent results. Alfalfa has been grown with some success upon this type at other points along the Ohio

River, but it has been more or less difficult to secure a satisfactory stand and replanting has been necessary rather too frequently. This crop does not withstand flooding as well as other grasses. Owing to its loamy structure, the type is easily handled, and no difficulty is experienced in working it. It is a strong soil, and fertilizers are not necessary. Thorough underdrainage of the low places would benefit the soil, and at the present price of the land would be economically justified. Intensive farming should be practiced upon this type.

The natural forest of walnut, sycamore, beech, and elm, has been cleared away and the type is now under cultivation. Land values range from \$100 to \$150 an acre.

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

*Mechanical analyses of Huntington loam.*

No.	Locality.	Description.	Fine gravel, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
220929	Central City.....	Dark-brown loam, 0 to 8 inches.	<i>P. ct.</i> 0.2	<i>P. ct.</i> 1.0	<i>P. ct.</i> 1.6	<i>P. ct.</i> 25.5	<i>P. ct.</i> 24.3	<i>P. ct.</i> 36.2	<i>P. ct.</i> 11.1
220930	Subsoil of 220929.	Brown loam, 8 to 36 inches.	.0	.2	.4	21.5	22.0	40.7	15.2

HUNTINGTON FINE SANDY LOAM.

The Huntington fine sandy loam in its typical development consists of a brown, light, fine sandy loam soil, loose and open in structure, from 8 to 14 inches deep, underlain by a light-brown, slightly compact, medium heavy fine sandy loam.

The structure and texture of the surface soil are fairly uniform over most of the type, but the subsoil varies greatly. Along the banks of the streams the texture is very light and in many places beds of sand are found, varying from medium to fine in grade. Swales occur in many places near the hills or second bottoms, where the subsoil approaches a silt loam in texture. Occasional beds of sandstone and shale fragments are found underlying the surface at depths ranging from 24 to 40 inches, and in some places such beds are exposed by the removal of the surface material by stream action. In many of the narrow valleys floods have stripped the surface of soil for miles along their courses.

The type occurs as first-bottom land along the streams that head in the southern half of the area and is formed by stream deposits of material eroded from the Dekalb soils. The largest developments of the type occur above Hamlin on Mud River and above Wayne on Twelvepole Creek.

The soil is not as good a soil as the Huntington silt loam, but the annual inundation serves to maintain its productiveness. The type is best adapted to the production of corn and melons. The former yields from 30 to 50 bushels per acre. Irish potatoes yield about 150 bushels and sweet potatoes from 200 to 250 bushels per acre. The type is not adapted to grass and the yield of hay averages less than 1 ton per acre. Tobacco does only fairly well. The leaf is not of the best quality, and the yields are relatively low, varying from 750 to 1,000 pounds per acre. Cowpeas and soy beans do well and should be grown more extensively. Some cover crop should be kept upon the ground to catch sediments during the spring overflow.

Fertilizers are not used upon this type and there is little need for them except where tobacco is grown. All the ordinary vegetables of the section are grown for home consumption and local markets. Near the mines trucking on a small scale may be carried on successfully. The Huntington fine sandy loam is easily cultivated. There is little danger of its clodding when plowed too wet.

The natural forest growth of elm, sycamore, beech, and birch has been removed from probably more than two-thirds the area of the type and most of the cleared portion is under cultivated crops. The price of land of this type of soil ranges from \$30 to \$60 an acre.

The following table gives 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, 2 to 1 mm.	Coarse sand, 1 to 0.5 mm.	Medium sand, 0.5 to 0.25 mm.	Fine sand, 0.25 to 0.1 mm.	Very fine sand, 0.1 to 0.05 mm.	Silt, 0.05 to 0.005 mm.	Clay, 0.005 to 0 mm.
			<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
220909	1 mile south of Wayne Court-house.	Brown fine sandy loam, 0 to 10 inches.	0.0	0.3	0.6	37.4	32.9	22.6	6.0
220910	Subsoil of 220909.	Brown fine sandy loam, 10 to 36 inches.	.0	.1	2.0	47.7	27.6	16.8	5.5
220927	1 mile southwest of Hamlin.	Brown fine sandy loam, 0 to 12 inches.	.0	.7	5.2	33.7	24.1	28.6	7.7
220928	Subsoil of 220927.	Brown fine sandy loam, 12 to 36 inches.	.0	.8	6.0	44.4	19.5	21.1	7.6

#### SUMMARY.

The Huntington area is located in the extreme southwestern corner of West Virginia and includes the counties of Cabell, Lincoln, and Wayne. The total area is 803,200 acres, or 1,255 square miles.

The topography is rough and broken, except for the bottom land, river terraces, and old river channels, which have a comparatively even surface. The elevation of the area ranges from about 500 feet along the Ohio River to more than 1,800 feet in places along the southern boundary.

The drainage is into the Ohio River, through Guyandot, Mud, and Big Sandy Rivers, and Twelvepole Creek.

The first settlements of any extent were made in the early part of the last century by settlers from Virginia and North Carolina. Within recent years many have come from Ohio and Kentucky.

Huntington is the largest town and chief commercial center of the area. The other towns are much smaller and control only local trade.

Most of the population is confined to the valleys and well apportioned over the area of bottom lands. The hill land is sparsely settled, especially in the southern part of the area. A considerable proportion of the population is engaged in farming, but many are employed in lumbering, in the oil and gas fields, and in the coal mines.

Oil and gas are piped out of the area in considerable quantities and large shipments of coal are made.

Areas of valuable forests still exist in the rough sections.

The facilities for shipping are excellent, both water and rail transportation being available, the latter giving direct connection with the best markets of the country.

Wheat, corn, hay, potatoes, and vegetables were the principal general crops grown by the early settlers and these continue important at the present time, with the addition of sorghum, cowpeas, and peanuts, which are grown to a limited extent. Tobacco now represents the main money crop of the area. Some commercial fruit growing is done. The number of cattle shows an increase over the earlier days, though little attention is paid to maintaining pure-bred stock and nearly all the animals found in the area are grades. Sheep are decreasing in numbers, but the figures for hogs show a marked increase.

The agricultural practices differ greatly over the area. In the larger stream valleys crops are more or less diversified and some truck is grown. On the hill land of the northern two-thirds of the area tobacco, hay, and fruits are grown and a considerable number of stock kept. In the southern section tobacco and corn represent the principal crops and only a few cattle are carried on the farms.

Labor has been attracted from the farms by outside industries offering higher wages. Farm labor receives about \$1 a day. Very little land is rented except for the purpose of growing tobacco.

The river bottom and terrace land is held at a high figure in all parts of the area, while the hill land is cheap, even in the more thickly settled sections.

The area lies wholly within the Appalachian Plateau and is divided physiographically into upland, terrace, and flood plain. The upland consists of sandstone and shale formations of the Upper Carboniferous era. The weathering of these rocks gives rise to the Meigs and Dekalb soil series, the former derived from red and gray sandstones, shales, and limestones, the latter from sandstone and gray shales.

The terrace soils comprise the Wheeling, Holston, and Tyler series. The Wheeling soils are derived largely from glacial material, the Holston largely from sediments washed from Dekalb soils, and the Tyler is mainly wash from the Meigs soils.

The Huntington soils are river flood plain types. The loam is found on the high overflow bottoms along the Ohio River, the silt loam along the streams receiving drainage from the Meigs soils, and the fine sandy loam along streams draining areas of the Dekalb soils.

The Meigs clay loam, the most extensively developed type in the area, is a good soil for tobacco, wheat, fruit, and grass.

The Dekalb silt loam is developed to a very limited extent and is best adapted to apples and tobacco.

The Dekalb stony silt loam is developed to a considerable extent in the southern part of the area and for the most part is too steep and rocky for cultivation. It is a good tobacco and potato soil and corn does fairly well on it.

The Wheeling silt loam is one of the strongest types in the area. It is well adapted to trucking and to the heavy farm crops. The Wheeling silty clay loam when properly drained has about the same crop value as the silt loam type. The Wheeling fine sand is a good melon and light truck soil.

The Holston silt loam is not a very strong soil, but produces good yields of tobacco, potatoes, and beans. It is a good soil for diversified farming. The Holston silty clay loam is best adapted to grass. The Holston fine sandy loam is best adapted to melons, peas, sweet potatoes, and peanuts. It is not a strong soil.

The Rough stony land, found mainly along the valley walls of the larger streams in the southern part of the area, is of little agricultural value.

The Tyler silt loam is poorly drained and is best adapted to grass. It is known locally as "crawfish land."

The Huntington loam is a good soil for corn and truck crops, such as tomatoes and potatoes.

The Huntington silt loam is a very strong soil and is best adapted to corn. More than half the cultivated area is annually planted to this crop. Tobacco yields heavily and truck crops give good returns.

The Huntington fine sandy loam is not as strong as the silt loam or loam types, but makes good yields of corn, sweet potatoes, and melons.

[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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