

Issued February 14, 1914.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—MILTON WHITNEY, Chief.

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

SOIL SURVEY OF PRESTON COUNTY,
WEST VIRGINIA.

BY

W. J. LATIMER.

HUGH H. BENNETT, INSPECTOR IN CHARGE SOUTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1912.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1914.

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LETTER OF TRANSMITTAL

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., August 15, 1913.

SIR: In continuation of the cooperative work in West Virginia a soil survey was made of Preston County during the field season of 1912. The selection of this area was determined upon after a conference with Dr. I. C. White, State geologist of the West Virginia Geological Survey, which office is cooperating with the bureau in a study of the soils of the State.

I have the honor to transmit herewith the manuscript and map covering this work and to recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1912, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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MAP.

Soil map, Preston County Sheet, West Virginia.

tarries of Cheat River flow through similar although smaller gorges. Chestnut Ridge on the west side of the county, Laurel Ridge and Briery Mountains passing through the center of the county, Brushy Knobs and Snaggy Mountain on the east side, and Backbone Mountain in the extreme southeast corner are the most prominent mountain features of the county.

Physiographically the county is divided into two parts by the crest of the Laurel Ridge-Briery Mountains chain. The part lying to the north and west of this line is known as the Ligonier Valley. The country to the southeast of the line has no local name, but is more mountainous than the first division.¹ The Ligonier Valley—that is, the section of the county lying between the crest of the Laurel Ridge-Briery Mountains chain and Chestnut Ridge—constitutes about three-fourths of the county. It has an elevation of about 1,500 to 2,000 feet above sea level, with a few points rising to about 2,250 feet. The topographic features are very irregular, consisting of rounded hills and flat “glades.” In the southern part of this section the valleys are more V-shaped, the streams cutting down to about 1,250 feet in places, and the ridges are narrower, the country resembling that along the Baltimore & Ohio Railroad to the west.

The country to the southeast of the Laurel Ridge-Briery Mountains chain is a highly elevated plain, badly dissected by erosion along the outer edges. It has a general elevation of from 2,500 to 2,700 feet, with a few peaks extending to 3,000 feet. In general the topographic features consist of low parallel ridges with comparatively broad, shallow stream valleys.

The county has five drainage systems. Cheat River and its tributaries form the largest system, draining a wide strip through the middle of the county, through Wolf Creek, Buffalo Creek, Saltlick Creek, Muddy Creek, and Roaring Creek, and a large area in the northern part of the county through Big Sandy Creek. A narrow strip along the eastern edge drains into the Youghiogheny River. The Monongalia glades are drained by Deckers Creek. The southwest corner of the county is drained into Tygart River through Threefork and Sandy Creeks. Much of the country drained by Cheat River is rough and precipitous and the run-off is very rapid. Over the rest of the drainage basins, including the area drained by Big Sandy Creek, which flows into Cheat River, the run-off is much slower.

The Catawba warpath was originally the main trail from north to south through the western part of the county, and the Nemaquin Indian trail from the headwaters of the Potomac to the Monongahela

¹ The Ligonier Valley as referred to in this report covers both the Ligonier syncline and the Kingwood syncline.

passed through the county near the line followed by the Northwestern Virginia turnpike.

A settlement was made in the country now included in Preston County by a party of Dunkards, in 1756, on the large strip of bottom land along Cheat River near Kingwood, which now bears the name of Dunkard Bottom. This settlement was destroyed by the Indians and another settlement was made on the glades east of Aurora in 1761 by refugees from Fort Pitt. In 1763 a proclamation was issued by the King of England upon complaint of the Indians prohibiting settlement in what is now Preston County. About 1770 a few settlers moved into the northern part of this region, around Bruceton Mills. It was not until after the Revolutionary War, however, that the county was permanently settled. These early residents came mainly from Pennsylvania, Maryland, and Virginia. The first town established was Mount Carmel in 1793. Kingwood was settled in 1807 and established as a town in 1811. Brandonville was settled in 1815. Preston County was formed from Monongalia County, in 1818.

According to the 1910 census the county has a population of 26,341, or about 40 per square mile. This is well distributed, the mountain sections being the only parts of the county which are sparsely settled. There are no large towns, and a large part of the population is engaged in agriculture. The present population is made up largely of descendants of the original settlers. In the southeastern part of the county many of the people are of Dutch descent. Throughout the remainder of the county the population consists largely of English, Scotch, or Irish. Quite a number of Italians are employed at the coal mines. Very few slaves were owned in Preston County, and there are only a few negroes in the county at the present time.

Kingwood, the county seat, is situated near the center of the county, on the Morgantown & Kingwood Railroad and the West Virginia Northern Railroad. According to the 1910 census it has a population of 800. It is in the center of a good farming section, and a distributing point for the northern part of the county. Terra Alta is the largest town in the county, having a population of 1,126. It is about 2,600 feet above sea level and is a summer resort of some importance. This town also is in the center of a prosperous farming country. It is located on the Baltimore & Ohio Railroad. Rowlesburg is a small town situated on the Cheat River and on the Baltimore & Ohio Railroad, near the Morgantown & Kingwood Railroad junction. It has a population of 936. Tunnelton, with a population of 792, and Newburg, with a population of 823, are both situated on the Baltimore & Ohio Railroad. Newburg is the center of extensive coal-mining interests. Masontown, with a population of 520, and Reedsville, with

a population of 208, are located on the Morgantown & Kingwood Railroad, in prosperous farming sections. Bretz is the center of the coke industry in this portion of the county. Bruceton Mills and Brandonville are small villages situated in good farming country. Aurora is a summer resort and is the center of a very prosperous farming country.

Road building began about 1800. In 1813 a wagon road from Morgans Glade to Buffalo Creek was constructed and the National Road was built in 1818, passing about 3 miles north of the county and furnishing an outlet for the northern half of the county. The Northwestern Virginia Turnpike was built through the county in 1838, passing through Aurora, Macomber, and Evansville. From 1830 to 1850 a number of turnpikes of less importance were constructed between points in Preston County and surrounding counties. These roads played an important part in the development of the county.

The Baltimore & Ohio Railroad was opened through Preston County in 1852. Its main line, double tracked, passes through the county east and west and affords connections with eastern, western, northern, and southwestern points. The West Virginia Northern Railroad was built as a narrow-gauge line in 1887 from Tunnelton, on the Baltimore & Ohio Railroad, to Kingwood. It was made a standard-gauge road in 1894, and furnishes an outlet for a small strip of agricultural and coal-mining country. The Morgantown & Kingwood Railroad was completed to Kingwood in 1906, and extended to the junction with the Baltimore & Ohio Railroad at Morgantown in 1907. This road opened a rich agricultural and mineral section. It affords direct communication with Pittsburgh and the northwest. A lumber road up the Cheat River from Rowlesburg gives an outlet to the southern part of the county, and another from Corinth reaches the extreme southeastern corner of the county. At present a large part of the northern end of the county is not within easy reach of railroad transportation. A railroad is projected from Point Marion, Pa., along the Cheat River and Big Sandy Creek to Bruceton Mills. This will afford an outlet for a good agricultural and coal-mining country.

The construction and operation of furnaces for smelting iron ore began about 1818. Some of these were closed down for lack of ore in commercial quantities and others were discontinued for want of transportation facilities or capital. Coal was first mined at Newburg at the time of the opening of the Baltimore & Ohio Railroad. At the present time coal mining constitutes the largest industrial interest of the county. Much of the coal output is used for coke production.

Oil wells were drilled at various times, but oil has never been found in paying quantities in the county. Some of the sandstone strata in the county furnish excellent building material and are quarried to some extent for that purpose. Limestone outcrops are used for agricultural lime, commercial lime, and cement. Since the opening of the county lumbering has furnished considerable employment, and has been a constant source of revenue. Although most of the original timber has been removed, several large mills and numerous small ones are in operation. The timber is being removed from the rough country along the Cheat River gorge, from the western slopes of Briery Mountains and Laurel Ridge, and from the eastern slope of Chestnut Ridge.

The local mines and other industries furnish excellent markets for much of the produce of the county. Baltimore and other large towns of the East are good markets for that part of the county reached by the Baltimore & Ohio Railroad. Morgantown, Uniontown, Connellsville, and Pittsburgh receive the products of the northern end of the county.

CLIMATE.

In general the climate of the county is genial and healthful. The summers are comparatively short, the nights cool, and periods of hot weather are rare and of short duration. The winters are not rigorous, and the periods of extreme cold are not extended. There is ample precipitation for the growing of crops, and it is generally well distributed over the growing season. The prevailing winds are from the west and southwest.

Owing to the physiographic differences in the Ligonier Valley and the country southeast of the Briery Mountains, particularly in elevation, the climatic conditions of the county vary considerably.

One of the most noticeable variations between these sections is in the rainfall. The mean annual precipitation over the Ligonier Valley is about 44 inches, while over the more elevated section it is about 56.12 inches, or more than 12 inches heavier in the higher country.

The rainfall over the western part of the county is relatively light during September, October, and November, and pastures sometimes suffer for want of moisture during these months. In the section southeast of the Briery Mountains the rainfall is more evenly distributed throughout the year, and there is a fair amount of rain during the fall months.

The table below shows the mean monthly and annual precipitation at Terra Alta and Rowlesburg and the average for Grafton, Parsons, and Morgantown. The Terra Alta station is located near the

center of the more elevated southeast section of Preston County, and is 2,549 feet above sea level. The Rowlesburg station is in the Cheat River gorge in the Ligonier section of the county, and is 1,402 feet above sea level. In the third column are given the mean rainfall for three stations: Grafton, with an elevation of 985 feet, Parsons, 1,662 feet, and Morgantown, 1,250 feet. While these stations are located in adjoining counties to the west, their records represent fairly well the conditions over the Ligonier Valley section of Preston County. This table also gives the mean monthly and annual snowfall as recorded at Terra Alta, Grafton, Parsons, and Morgantown. No snowfall data for the Rowlesburg station are available. It will be seen that the snowfall of the mountain section is very much heavier than over the remainder of the county.

Mean monthly and annual precipitation at Terra Alta, Rowlesburg, Grafton, Parsons, and Morgantown.

	Rainfall.			Snowfall.			
	Terra Alta.	Rowlesburg.	Grafton, Parsons, and Morgantown.	Terra Alta.	Grafton.	Parsons.	Morgantown.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
January.....	4.81	3.81	3.77	26.3	11.1	11.6	8.8
February.....	3.33	3.20	3.33	12.6	9.0	14.2	5.6
March.....	5.67	4.30	4.60	14.9	8.5	6.6	6.1
April.....	3.53	3.98	3.62	12.4	3.3	3.4	2.4
May.....	5.32	4.29	4.09	Tr.	0.2	0	Tr.
June.....	6.90	4.60	4.75	0	0	0	0
July.....	6.79	4.74	4.87	0	0	0	0
August.....	4.63	3.67	3.65	0	0	0	0
September.....	3.27	2.60	2.75	0	0	0	0
October.....	3.45	2.49	2.63	0.7	0.4	0.5	Tr.
November.....	3.33	3.03	2.85	5.9	2.8	2.8	0.8
December.....	5.57	3.65	3.51	13.2	7.0	6.9	6.9
Annual.....	56.60	44.36	44.25	86.0	42.3	46.0	30.6

The table below gives the normal monthly, seasonal, and annual temperature recorded at Terra Alta and for Parsons, Grafton, and Morgantown combined. These figures show a difference in temperature between the different sections of Preston County. The mean annual temperature is lower in the elevated southeastern section than in other parts of the county, while the absolute lowest temperature recorded in the winter and the highest in the summer are shown in the Ligonier Valley, which section is represented by the combined records of Parsons, Grafton, and Morgantown.

Monthly mean and absolute temperatures at Terra Alta, Grafton, Parsons, and Morgantown.

Month.	Terra Alta.			Grafton, Parsons, and Morgantown.		
	Mean.	Absolute minimum.	Absolute maximum.	Mean.	Absolute minimum.	Absolute maximum.
	° F.	° F.	° F.	° F.	° F.	° F.
January.....	27.5	-7	72	3.5	-16	76
February.....	24.4	-24	75	28.9	-27	80
March.....	39.5	-11	81	42.3	-4	90
April.....	46.5	12	85	49.8	8	93
May.....	59.3	25	86	61.4	21	94
June.....	65.1	33	92	68.0	34	99
July.....	68.9	33	90	72.4	43	101
August.....	67.7	34	94	71.0	40	105
September.....	63.1	29	90	66.1	30	102
October.....	52.1	19	86	54.1	15	94
November.....	41.4	5	76	42.6	2	80
December.....	29.6	-11	62	33.4	-16	80
Annual.....	48.8	-24	94	51.8	-27	105

It is generally recognized that the growing season is about two weeks later in the spring in the region southeast of the Briery Mountains than in other parts of the county, and that killing frosts occur earlier in the fall in the former section than in the Ligonier Valley. Frosts of enough severity to kill the wheat have occurred in the former section in June. The mountain section has a very short growing season and here early crops and crops which mature quickly should be planted.

The following table gives the dates of the last killing frost in the spring and earliest in the fall, and average dates of the last in the spring and first in the fall at Terra Alta, Grafton, Parsons, and Morgantown:

Dates of killing frosts at Terra Alta, Grafton, Parsons, and Morgantown.

Station.	Record, in years.	Average date first killing frost in fall.	Average date last killing frost in spring.	Earliest killing frost in fall.	Latest killing frost in spring.
Terra Alta.....	10	Oct. 1	May 11	Sept. 15	May 28
Grafton.....	16	Oct. 7	Apr. 30	Sept. 21	May 22
Parsons.....	10	... do ...	May 10	Sept. 22	May 29
Morgantown.....	16	Oct. 13	May 1	Oct. 2	May 22

AGRICULTURE.

Up to the time of the Revolutionary War Preston County was covered with hardwood and pine forests, but soon thereafter settlers began to make clearings in this section and to build permanent homes. At first they grew some corn, but depended largely upon hunting for a livelihood. About 1785 wheat growing began in the county, and by 1800 the clearing had covered considerable areas, roads were being built, and agriculture began to take the place of hunting and trapping. Tobacco was also grown by the early settlers for home use, but it is not grown now.

Between 1820 and 1830 the raising of cattle became quite an important industry, and it has been more or less important since that time. Some improvement of breeds has taken place. About 30 years ago some Shorthorns were introduced, and about 20 years ago the Herefords were brought in. These breeds have given general satisfaction. The Polled Angus were introduced about five years ago, and have hardly been in the county long enough to become popular. They seem well suited to local conditions. At present nearly all of the cattle are sold at the age of 2 years. They are driven either to Harrison County, W. Va., or to adjoining counties in Pennsylvania or Maryland, where they are fattened for market. Owing to the relatively severe climate of the county very few cattle are "wintered."

No special attention has ever been paid to dairying, owing, probably, to the distance from large cities. The native dairy stock is composed largely of grade Jerseys. There are several large herds of both Jerseys and Holsteins in the county.

Sheep have been raised in considerable numbers since the early settlement of the county. Until the introduction of the Southdowns in the early eighties the breeds were selected primarily for the production of wool. This industry at one time was one of the most important in the area, and in 1850 several woolen mills were in operation in the county. The Merinos were the most satisfactory and were raised in large numbers. Since the introduction of the Shropshires and Dorsets about 20 years ago for wool and mutton the Merinos have disappeared. The Shropshire and Dorset breeds now constitute about 80 per cent of the sheep in the county. Although very little wool is produced at present the number of sheep is about the same as in 1870, when the wool industry was at its height. This is due to the increase in mutton breeds. According to the census there were 22,336 sheep in Preston County in 1869 and 23,078 in 1909.

Hogs are kept on nearly every farm. The Chester White breed was introduced about 1875, and the Poland-China about 25 years ago. Other breeds in the county are the Berkshire and Jersey Red. A large number of Poland-China and Chester White crosses are found,

and these hogs seem well suited to the conditions and needs of the county. Very few of the strains introduced have been kept pure. The number of hogs has not varied materially in the last 50 years.

Nearly every farmer raises a few horses. Percherons were introduced about 1880, and Belgians since that time. The general stock has been materially improved during the last few years. Draft horses are raised in greater numbers than other kinds, and the local market is largely supplied by home-raised horses.

The crops and the agricultural practices are well suited to the soil and climatic conditions. Corn, oats, wheat, buckwheat, potatoes, timothy, and clover are the principal crops grown.

In the southeastern part of the county, where the altitude is high, the rainfall heavy, and the growing season short, the crop practice differs slightly from that of other parts of the county. Oats, wheat, buckwheat, and potatoes are grown more extensively. Potatoes grown at this elevation are excellent for seed, and are sold to a small extent for that purpose. The growing of seed potatoes should be given more attention.

The soils of the county are best adapted to the production of oats, buckwheat, and potatoes. These crops are profitable and should be more extensively planted, especially potatoes. The relative importance of the latter crop has steadily increased. In 1850 the production was 12,635 bushels, and the census of 1910 shows an output of 124,533 bushels from 1,193 acres.

A relatively large acreage is devoted to oats and buckwheat. As early as 1850 the annual production of oats was 153,496 bushels, of buckwheat 28,283 bushels. Silver Hull seems to be the most common variety of buckwheat. The Japanese variety, however, gave excellent results in tests made in this county by the experiment station.¹ Wheat had become a crop of some importance by 1849, a production of 36,769 bushels being reported for that year by the census. The acreage now devoted to this crop is probably about the same as for the earlier year stated, as in 1909 the production was 41,860 bushels.

Corn is not grown as extensively as in most other areas so far surveyed in West Virginia, owing to the smaller extent of bottom land in Preston County. In 1849, 144,276 bushels were produced in the county. The production increased considerably between 1880 and 1910. There is a wide difference in the varieties grown in different sections of the county. In general, flint varieties are grown in the southeastern part of the county and dent varieties in the Ligonier Valley section. Rye was formerly a more important crop than at present.

¹ See Bulletin 84, W. Va. Expt. Sta.

All the vegetables common to this section of the country are grown in gardens with more or less success. Little or no attempt has been made to grow vegetables on a commercial scale. Cabbage, onions, celery, squashes, and tomatoes of excellent quality can be grown on the glade land, and the production of cabbage, onions, and celery, especially, could be extended upon these lands.¹ Cranberries can be successfully grown on the glade land.²

Orcharding has never been practiced in the county on a commercial scale, although many of the soil types are well adapted to the production of fruit, and some effort has been made around Terra Alta to establish commercial orchards. The soil and climatic conditions are well suited to the apple. Very little of this fruit is shipped from the area, most of the crop being disposed of at local markets, made into cider, or fed to hogs. The trees are generally healthy and long-lived, and the fruit is of good quality and color. Blight, apple scab, and brown spot are the diseases most common in the apple orchards. York Imperial, Rome Beauty, and Grimes Golden are the varieties best suited to the Ligonier Valley, and these are the leading varieties in the younger orchards. Maiden Blush, Smokehouse, and Stayman Winesap are also good varieties for this section. The Baldwin and Tompkins King varieties are grown extensively in the region southeast of the Briery Mountains. The best varieties for commercial orchards here are probably the Oldenburg, Northern Spy, and Baldwin. Orchards, especially commercial orchards, should not be started too close to coke ovens, as the smoke and gases from the ovens are injurious to vegetation and affect apple trees for considerable distances.

Cherries also do well in the county. While these trees are found in large numbers, usually along roads, the fruit is used only for home consumption. The surplus fruit might well be canned for market, so that some revenue would be derived from the trees. The best varieties of cherries are the Morello and Early Richmond of the sour varieties and Black Heart of the sweet. Most of the cherries are sweet, though sour cherries are most in demand. The Ligonier Valley is better adapted to cherries and apples than other parts of the county. This section of the county presents many ideal locations for commercial orchards.

Peaches and plums do well, but are found only in mixed orchards. Strawberries, blackberries, and raspberries thrive, but are grown to only a very small extent.

The production of grapes has never been given much attention. They suffer from fungous diseases and erratic frosts. Concord and Niagara are the varieties that have been found to do best.

¹ See Bulletin 51, W. Va. Expt. Sta., Vegetable Gardening in the Mountain Glades.

² Bulletin No. 83, W. Va. Ept. Sta., Cranberries in West Virginia.

Both soil and climate are favorable to the production of hay and forage crops. Timothy yields well. Redtop is sometimes used instead of timothy in the seeding and is often mixed with timothy. Bluegrass does not thrive on many of the soils with the result that permanent pastures are not as common as in most of the other areas surveyed in this State.

Of the leguminous crops clovers are the most important locally. Clover, particularly crimson clover, is grown to a small extent separately, but red clover is commonly sowed with timothy. A small quantity of alsike clover hay is produced on low, poorly drained land or it may be sowed with crimson clover. A small acreage of cowpeas is grown. Millet is used as a catch crop when a failure of the other hay crops is threatened.

Maple sugar and maple sirup are produced to some extent and some sorghum is grown from sirup. Bees are kept in a few places.

The following table, compiled from the census reports, gives the acreage and yields of the principal crops grown in the county from 1880 to 1910:

Acreage and yields of the principal crops grown in Preston County from 1880 to 1910.

Crop.	1910		1900		1890		1880	
	Acres.	Yield	Acres.	Yield.	Acres.	Yield.	Acres.	Yield.
		<i>Bushels.</i>		<i>Bushels.</i>		<i>Bushels.</i>		<i>Bushels.</i>
Corn.....	12,438	382,923	12,394	315,460	8,654	200,549	10,823	245,266
Oats.....	9,461	198,201	10,075	259,890	11,393	212,479	9,988	197,395
Wheat.....	2,822	41,860	5,696	73,490	4,691	42,673	7,102	65,913
Buckwheat.....	9,389	199,987	7,066	120,990	4,530	51,178	6,423	73,974
Rye.....	63	859	210	2,460	244	1,858	1,151	8,690
Irish potatoes.....	1,193	124,533	880	92,554	634	45,141	.....	54,372
Sweet potatoes.....	3	345	13	1,449	7	589	22	495
		<i>Pounds.</i>		<i>Pounds.</i>		<i>Pounds.</i>		<i>Pounds.</i>
Tobacco.....	2	745	1	630	3	1,290	10	5,255
		<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>		<i>Tons.</i>
Total hay.....	26,980	21,947	26,108	25,905	29,800	28,609	18,475	9,338
Timothy.....	4,494	3,720	.....	.....	.....	.....	.....	.....
Timothy and clover.....	18,977	15,478	25,271	25,018	.....	.....	.....	.....
Clover.....	166	206	344	365	.....	132	.....	129
Millet.....	70	82	70	94	.....	.....	.....	.....
Other grasses.....	3,273	2,467	423	428	.....	.....	.....	.....

Liming has been practiced for about 15 years. From 25 to 50 bushels per acre are applied at intervals of 4 to 5 years on poor land and 40 to 60 bushels at intervals of 5 or 6 years upon average land. Upon land in a high state of cultivation as high as 100 bushels is used at somewhat longer intervals. Lime is generally applied

just after the sod is turned, before the land is harrowed. Under the conditions of supply it is not advisable to use crushed limestone. The present method of burning it in the field is best. Liming is very beneficial to most of the soil types in the area, but heavy applications should not be made unless the organic supply is maintained.

Commercial fertilizers have been used about as long as liming has been practiced. Their use for many of the crops and practically all of the soils of the county is to be recommended. Acid phosphate, bone meal, nitrate of soda, and "complete" mixtures are most commonly used. The applications are comparatively light. Stable manure is generally applied on land intended for corn and vegetables. Acid phosphate and various fertilizer mixtures also are sometimes applied for corn, and high-grade brands for potatoes and vegetables. For wheat, oats, and buckwheat acid phosphate and bone meal at the rate 200 to 400 pounds per acre are used. About 150 to 200 pounds per acre of nitrate of soda is sometimes applied as a top dressing for oats and corn. "Complete" fertilizer mixtures are rarely used at the rate of more than 600 pounds to the acre. Many farmers do not use commercial fertilizers, but apply lime and depend upon stable manure and the occasional turning under of a sod to enrich the soil.

A marked increase in the use of fertilizers took place between 1890 and 1910. According to the 1910 census, 1,081 farmers out of a total of 2,824 reported the use of fertilizers. The 1880 census reported an expenditure of \$5,511 and the 1910 an expenditure of \$36,694 for fertilizers.

A rotation system admirably adapted to the county is: (1) Corn; (2) spring oats; (3) wheat (winter), with clover and timothy; (4) grass; (5) buckwheat (after turning sod); (6) grass; (7) grass. This gives a seven-year rotation. It should be varied, however, according to the particular soil type, giving more corn to the bottom-land soils, more wheat to the limestone soils, more oats to the Upshur silt loam, and more buckwheat, timothy, and clover to the Dekalb soils. A part of the land on which the sod is turned can be used for potatoes. If the farm is divided into several parts all of the crops can be grown each year, the labor being well distributed. The general plan at present is to turn the sod in the spring, apply lime, and put in corn, followed with spring oats, winter wheat, clover, and timothy sown with wheat, leave in mowing until the timothy runs out, usually from three to five years. Buckwheat or potatoes may be substituted for corn, or frequently the sod land is divided between these crops. This plan results in a rotation, but one which may be improved. The best farmers do not allow the timothy to run out before breaking the sod, but at three years plow and plant to timothy and clover again or to buckwheat, with rye and grass following.

At the present time the best types of reapers, binders, mowers, hayrakes, grain and fertilizer drills, disk and spring-tooth harrows, and cultivators are in use throughout the county. The disk harrow is not as much used as the spring-tooth harrow, owing largely to the quantity of stone in the soils.

In a general way the crops adapted to the soils are as follows: Buckwheat, potatoes, and timothy do best on the Dekalb soils. Oats are known to do best on the Upshur silt loam. Wheat, bluegrass, and clover thrive upon the Upshur silty clay loam. The Dekalb soils are best adapted to apples and cherries. The glade land is well suited to the production of certain vegetables. The Huntington soils are considered best for corn, and the lighter types are best suited to melons and sweet potatoes. While the most decided difference between the Ligonier Valley and the southeast sections is in climate, the variation in the soils is responsible to some degree for the difference between these sections in crop adaptations. These crop differences are recognized throughout the county.

In general the labor on the farms is efficient. A total of \$68,473 was expended for labor in Preston County in 1909, as compared with \$43,900 expended in 1899. The wage scale varies with the distance from industrial centers. In the rural districts \$20 to \$25 per month with board is the usual price paid for labor. For day labor \$1 a day with board or \$1.25 to \$1.50 without board is paid. For special work, or during rush seasons, the wage per day is higher. The laborers in the coal mines and lumber camps receive higher wages than those on the farms. Very little farm labor is hired during the winter months, unless large numbers of cattle are wintered. The greater part of the work on the farms is done by the owner or renter and his family, with hired help when the crops are harvested.

The total acreage in farms has declined from 324,123 acres reported in the 1880 census to 295,289 acres in 1910. The area of improved land, however, has increased from 140,495 acres in 1880 to 164,845 acres in 1910. The average farm in Preston County comprises 104.1 acres, of which on an average 58.1 acres is improved. Seventy-one per cent of the land area of the county is in farms, and 90.3 per cent of farms are operated by owners. Where tenanted the terms of the leases are varied to suit conditions and the contracting parties, but are usually based upon one-half of the field crops.

The prosperity of many parts of the county is largely due to the fact that farmers have disposed of the coal upon their farms and invested the proceeds in improvements.

The 1910 census gives the value of buildings in Preston County as \$1,857,810, of implements as \$412,437, and of live stock as \$1,857,-

813. The total value of land and improvements is given as \$4,918,937.

SOILS.

Eleven distinct types of soil have been mapped in Preston County. These have been differentiated on the basis of color, texture, origin, topography, organic content, and drainage conditions. The types are grouped into series. The members of each series are different in texture, but they have the same range of color in the soil material, the same kind of subsoils, and are similar in origin and condition of drainage.

The soils fall naturally into two divisions, upland or residual soils and bottom-land or alluvial soils. The residual soils vary mainly on account of differences in the rocks from which they are derived, the extent to which they have been subjected to erosion, and in the abundance of rock fragments present. The alluvial soils differ principally in texture or character of the material as affected by drainage conditions.

The geological formations of the county entering into the formation of soils are given in the following diagram:¹

Geological formations giving the residual soils of Preston County.

Age.	Geological formation.	Thickness.	Composition.
		<i>Feet.</i>	
Carboniferous.	Monongahela.....	400	Gray shales and sandstones predominating, with thin beds of coal and limestone. Pittsburgh coal.
	Conemaugh.....	600-650	Gray and buff shales predominating, with sandstones, thin seams of coal, and limestone. Upper Freeport coal.
	Allegheny.....	250-300	Sandstones and gray shales; sandstones predominating.
	Pottsville.....	250-350	Hard coarse-grained sandstones and conglomerates predominating.
	Mauch Chunk.....	300-600	Red shale, green shale, red sandstone, and thin strata of limestone.
	Greenbrier.....	100-200	Red shale, thin green sandstone; hard blue limestone predominating.
Devonian.	Pocono.....	500-525	Hard sandstones and conglomerates predominating near top; gray shale predominating near bottom.
	Catskill.....	600-900	Red sandstone and red shale predominating, with gray and buff shales.
	Chemung.....	900-1,200	Olive-green shales and thin sandstones.

The rocks of the region are thus seen to be sedimentary in origin. They thicken perceptibly from west to east. Subsequent to deposition they were bent into a series of low ridges or anticlines and shallow troughs or synclines. Since the bending or fold-

¹ See West Virginia Geological Survey reports and U. S. Geological Survey, folios 82, 160, 28.

ing took place erosion has been at work, acting most vigorously on the anticlines. The younger rocks of the region have been entirely removed from the anticlines, while they still exist in the synclines, especially the more pronounced ones. In addition to this general erosion the whole region has been thoroughly dissected. All of the valleys are deep, narrow, and steep sided.

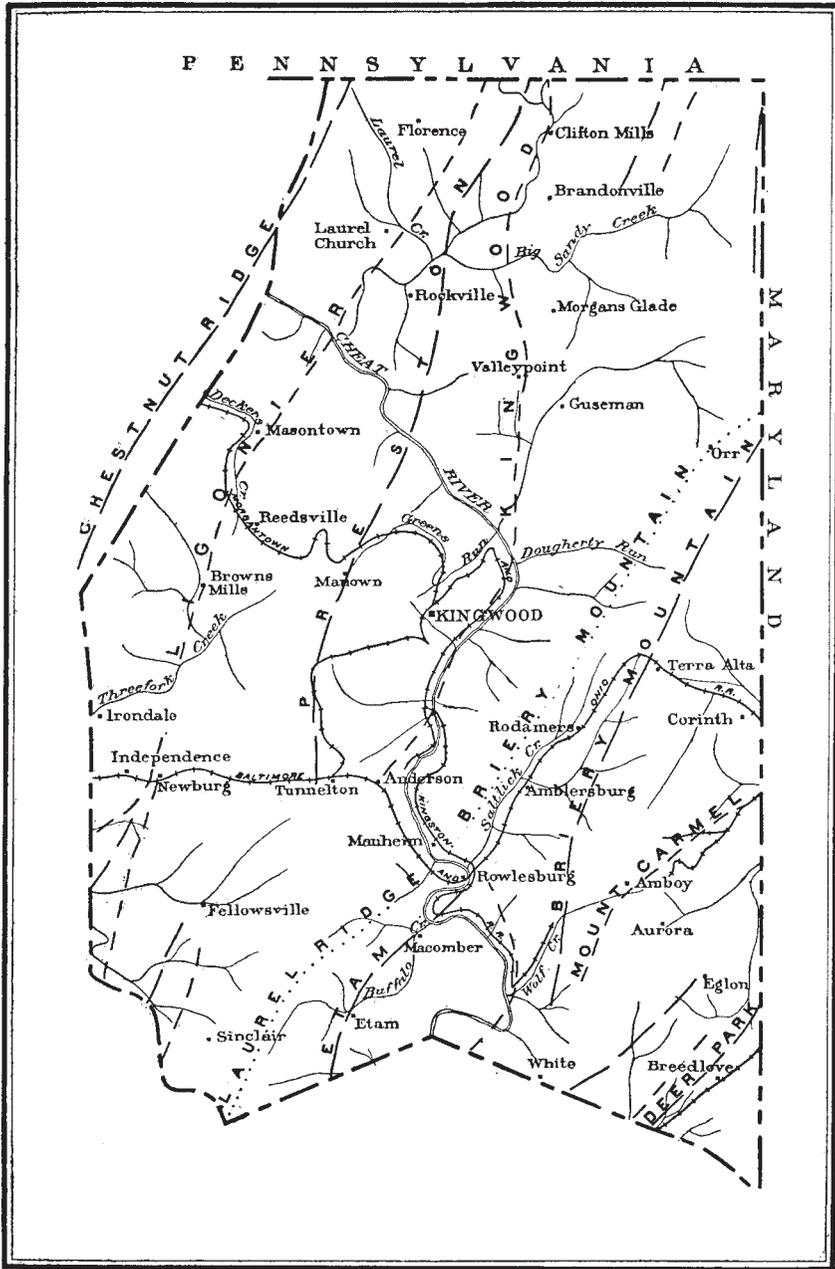
The Chestnut Hill anticline is the most westerly of those that traverse Preston County. Like all the other anticlines, as well as the intervening synclines, it trends northeastward and southwestward. From the top of this anticline the rocks sink rapidly to the Ligonier syncline. The rocks rise again from the Ligonier trough to the Preston anticline, which is represented by a low range of hills running almost north and south through the county. From the crest of this anticline the rocks sink rapidly to the Kingwood syncline, where the formations reach one of the lowest levels in the county, and where the largest area, and seemingly the greatest thickness of the younger rocks of the area, occur. From the Kingwood syncline the rocks rise very rapidly to the Briery Mountain and Etam anticlines, which represent the greatest of these uplifts. These two anticlines, though disconnected, lie in the same general line of strike, the latter lying considerably to the southwest of the former. These anticlines have both been severely eroded on account of their great elevations originally. Their ridge characters are, as a whole, lost, but there have been developed a pair of ridges, one the Briery Mountains and Laurel Ridge lying west of the anticlines, and Snaggy Mountain and Brushy Knobs on the eastern flank of the Briery Mountain anticline. The rocks exposed at the surface by the erosion of these anticlines include all the formations from the Chemung up to and including part of the Pottsville.

From the eastern crest the rocks sink rapidly to the Mount Carmel syncline, in which the rocks of the Conemaugh formation are exposed at the Maryland State line.

The rocks rise from the Mount Carmel syncline to the Deer Park anticline, on which the Chemung formation is again exposed. The Mount Carmel syncline rises rapidly at its southern end near Amboy and unites the outcrops from the Briery Mountain and Deer Park anticlines. Southeast of the Deer Park anticline the rocks sink rapidly, Backbone Mountain forming the eastern base of the Deer Park anticline.¹ Figure 2 shows the lines of anticlines and synclines of Preston County.

Over the greater part of the county the rocks of the Conemaugh formation constitute the surface outcrop. The dominant soil type, the Dekalb silty clay loam, which covers nearly all of the Ligonier

¹ See West Virginia Geological Survey, Preston County Report, for complete geological description of area.



——— Anticline - - - Syncline Crest line

FIG. 2.—Lines of anticlines and synclines, Preston County, W. Va.

Valley, is derived from this formation. The Briery Mountain, Etam, and Deer Park anticlines bring to the surface the rocks that form the Upshur silty clay loam and the Upshur silt loam.

The Upshur clay is derived from the Pittsburgh reds of the Cone-maugh. This formation is not very extensive, and the type is developed only in the southwestern part of the county. Near the Pennsylvania State line the Pittsburgh reds appear again, but not in sufficient thickness to give rise to a soil type. The Upshur silt loam is derived from the red sandstones and red shales of the Catskill formation. It differs somewhat from the type as mapped in the western part of this State, but is probably similar to the typical soil. The Upshur silty clay loam is influenced to some extent by limestone, thin beds of which are contained in the lower portion of Mauch Chunk shale. The Greenbrier limestone, however, is below the Mauch Chunk shale and is usually completely covered by wash from this formation. The Greenbrier limestone contains a large amount of red shale near the top of the formation, so that the group as a whole is composed of three-fourths red shale and thin red sandstone, the remainder being limestone with a small percentage of interbedded gray shale.

The Dekalb silty clay loam is derived from the formations above the Pottsville conglomerate. These formations are composed of alternate gray shale and sandstone. Where workable coal veins occur at no great distance from the surface which is above drainage, as is the case throughout much of this type, the moisture supply is materially decreased by removal of the coal, as the underground passage forms a perfect drainage way. Over such areas, after the coal is removed, crops suffer during dry seasons.

The Chemung formation, the lowest geologically in the county, is composed of gray and buff shale and thin sandstone. It gives rise to the Dekalb silt loam in large areas. The steeper slopes result in the Dakalb stony silt loam.

The Dekalb stony loam comes largely from the sandstones of the Allegheny, Pottsville, and Pocono formations. The fine soil material is in all probability derived from the shales of the overlying formations. However, these formations contain some interbedded shale. The large amount of conglomerate material in the type is the result of the weathering of the large number of conglomerate sandstones occurring in these formations.

Rough stony land is derived largely from the sandstones of the Allegheny, Pottsville, and Pocono formations. It occurs upon more level areas than have heretofore been encountered in the soil survey of West Virginia. Usually the Rough stony land occupies steep mountain sides or stream gorges, as along the Cheat River gorge in this county.

The Huntington silt loam is fairly typical of the soil as mapped in other areas. The material has been deposited by stream overflow, having been washed from the upland soils. The Huntington sandy loam was deposited by streams having swifter currents than those by which the Huntington silt loam was laid down. The material has been washed to a greater extent from sandy upland soils. The Holly silty clay loam represents first-bottom overflow land which has been subjected to poorer drainage between overflows than the Huntington soils. The type occupies broad, flat bottoms through which the streams flow sluggishly and over which water stands after heavy rains.

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

Type.	Origin.	Soil type.
Upland, or residual soils	Grayish and yellowish shales, with some sandstone influence.	Dekalb silty clay loam, Dekalb silt loam.
	Grayish and yellowish shales, sandstone and conglomerate.	Dekalb stony loam, Dekalb stony silt loam, Rough stony land.
	Indian red shale and sandstone chiefly.	Upshur clay, Upshur silt loam.
	Indian red shales, with some limestone influence.	Upshur silty clay loam.
Bottom, or alluvial soils	Wash from upland shale, sandstone, and limestone soils.	Huntington silt loam, Huntington sandy loam, Holly silty clay loam (poorly drained).

The following table gives the names and extent of the soil types of Preston County.

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Dekalb silty clay loam	149,568	36.2	Holly silty clay loam	13,056	3.2
Rough stony land	123,968	30.0	Upshur silty clay loam	12,416	3.0
Dekalb stony silt loam	38,080	9.2	Huntington silt loam	8,256	2.0
Dekalb silt loam	29,056	7.0	Upshur clay	2,688	.7
Dekalb stony loam	17,920	4.4	Huntington sandy loam	2,112	.5
Upshur silt loam	15,680	3.8	Total	412,800	.....

DEKALB SILTY CLAY LOAM.

The soil of the Dekalb silty clay loam varies in depth from 6 to 12 inches. It is a yellowish-brown to grayish-brown fairly friable heavy silt loam to silty clay loam. In the lower portion the soil is a yellowish silty clay loam, more compact than the upper soil, yet fairly crumbly. The immediate surface material is not very compact and has an open structure where the content of organic matter is relatively

high. Where proper methods of cultivation have been employed the soil is mellow. The subsoil is a yellow or yellowish-brown, heavy, crumbly silty clay loam to clay, which becomes heavier and more compact with depth. Throughout a large part of the type small quantities of sandstone and shale fragments are scattered over the surface and through both soil and subsoil. This is more noticeable where the type is derived from the lower lying strata of the Cone-maugh formation, the sandstone of which is thick and hard, giving more unweathered material. The fragments are not large and are not present in sufficient quantities to interfere seriously with cultivation.

The most extensive developments of this soil occur in the broad synclines between Chestnut Ridge and the Laurel Ridge-Briery Mountains uplift. It is typically developed around Reedsville and Masontown and in the Bruce-ton Mills and Brandonville section. A small area occurs in the syncline on the eastern edge of the county extending from Corinth to the top of Shaffer Mountain. There are small, detached areas capping Laurel Ridge and Chestnut Ridge that have not been removed by erosion.

The Dekalb silty clay loam is derived from the weathering in place of the gray shales and sandstones of the Monongahela and Cone-maugh formations. A greater part of the material comes from the Conemaugh, as there is very little Monongahela outcrop in the area. The heavy shales are predominant in the Conemaugh formation and give rise to a heavy soil type.

In general, the surface is comparatively smooth, the type occurring over low, well-rounded hills and gentle slopes. The greater part of it is suitable for cultivation.

The proper management of this type presents a difficult problem to the farmer. Owing to its heavy nature, the soil is very retentive of moisture, and it remains cold late in the spring. The soil should never be plowed while wet. The preparation of a seed bed of proper depth requires a heavy farming equipment. Plowing should be deep in order to increase the moisture-holding capacity of the soil, and the surface should be mulched by thorough harrowing and shallow cultivation to conserve the moisture. When properly handled the type is very productive, but if the organic-matter supply is not maintained the yields decline. Over much of the type an inadequate supply of organic matter has resulted in low yields.

Liming is practiced to some extent, 40 to 60 bushels of burnt lime per acre usually being applied. It is considered best to make light applications unless large quantities of organic matter have been turned under or some other effort made to improve the type in this respect. Ground limestone would probably help the land, but its value, as compared with that of burnt lime on this soil, is not definitely known.

The crops grown are wheat, oats, corn, buckwheat, rye, potatoes, timothy, and clover. Wheat is grown quite extensively and produces from 10 to 30 bushels per acre. Oats are grown to a limited extent, producing 20 to 40 bushels per acre. Very little rye is sowed, and the yields are only moderate. Buckwheat is probably grown more extensively upon this than upon any other type in the area. Yields of 20 to 30 bushels per acre are obtained. Potatoes do well, producing 100 to 250 bushels per acre, and are grown to some extent over areas within reach of transportation. Corn produces about 15 to 45 bushels per acre. Hay averages about 1 to 2 tons per acre. Timothy does well and is grown largely for hay. Some redtop is grown. A large part of the type is used for producing hay, and large numbers of cattle are kept. Bluegrass does only fairly well and permanent pastures are confined to small areas. Pastures are usually included with the rotations. Clover does well over most of the type and is used extensively in rotations.

This soil is well adapted to apples, peaches, plums, and cherries, especially apples and cherries, although very little fruit is grown. Small fruits do well, but are grown only for home consumption. Nearly all of the vegetables common to this section do well and are grown in home gardens, but are not produced commercially.

The topography of most of the type permits the use of labor-saving machinery, such as drills, sulky plows, disk harrows, cultivators, spraying apparatus, etc.

The Dekalb silty clay loam is naturally a strong type, and responds readily to good treatment. Plowing should be deep but should be deepened gradually. Liberal quantities of organic matter should be turned under to improve the structure and moisture-holding capacity of the soil. The type includes many excellent orchard sites which should be utilized for apples and cherries. Potatoes should be more extensively grown. Crop rotations should be so planned as to include more leguminous crops. Clover constitutes the best soil improving crop, but where clover fails, hairy vetch may be substituted. Even when clover is grown, such crops as cowpeas, and vetch can be included in the rotation. They furnish good hay and increase the nitrogen content of the soil.

The present method of handling pastures on the type is probably the best, as a sod does not last for an indefinite time, as on some of the other soils. In order to provide a permanent pasture, applications of about 1 to 2 tons of lime per acre should be made. A heavy application of lime will continue effective for about 20 years. A top dressing of phosphatic slag is also recommended for sod land.

The natural forest growth consists largely of oak, chestnut, chestnut oak, hickory, and maple. The type seems well adapted to the sugar maple, large numbers of which are found in the northern areas.

Nearly all of the type is cleared and under cultivation. The price per acre varies from \$20 to \$50, exclusive of mineral rights. Near the towns land values are greater because of the more desirable location.

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

Mechanical analyses of Dekalb silty clay loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	<i>P. ct.</i>	<i>P. ct.</i>	<i>P. ct.</i>
221101	1 mile north of Reedsville.	Heavy silt loam, 0 to 8 inches.	1.3	1.9	1.1	4.1	7.8	57.0	26.7
221102	Subsoil of 221101.....	Silty clay loam, 8 to 36 inches.	1.2	2.4	1.6	3.9	4.8	44.5	41.6

DEKALB SILT LOAM.

The soil of the Dekalb silt loam consists of a pale-yellow to grayish silt loam which quickly passes into a yellow or pale-yellow, slightly more compact and heavier, friable silt loam. The subsoil is encountered at depths varying from 6 to 10 or 12 inches. It is a yellowish-brown to golden-yellow very heavy silt loam to light silty clay loam of a compact or slightly friable structure. The type usually contains a few sandstone and in many places shale fragments.

The largest areas of the Dekalb silt loam occur around Terra Alta, and in the southeastern part of the county south of Eglon. A large development occurs near Kingwood, and small detached areas are found in nearly all parts of the county.

Weathering has been deep in most places, the parent rock being found ordinarily at about 5 to 6 feet or even deeper. The soil material is derived from fine-grained sandstone and argillaceous shales. These shales occur largely in the Monongahela and upper part of the Conemaugh formations, and in the Allegheny and Chemung formations. Detached areas of the type are found along the outcrops of the Pocono sandstone formation.

This type is much more easily cultivated than the Dekalb silty clay loam. It forms a mellow seed bed when properly handled. It has a slight tendency to become droughty in dry weather, and crops suffer from lack of moisture during prolonged droughts. The addition of large amounts of organic matter would relieve this condition to some extent and enable the soil to retain sufficient quantities of moisture to withstand droughts. The type responds readily to liming but its productiveness can not be maintained solely by this prac-

tice. Commercial fertilizers high in potash should be used where liming has been practiced extensively, even where manures have been used and the sod turned under.

The crops grown are Irish potatoes, buckwheat, oats, corn, wheat, rye, and some hay. Irish potatoes do exceptionally well on this soil, yielding from 150 to 250 bushels per acre. They are grown mainly on areas of the type nearest to transportation lines. Wheat, oats, and corn do well when fertilized, but make only fair to poor yields otherwise. Buckwheat yields from 30 to 35 bushels per acre. It is a good crop for the type and is grown quite extensively. The soil is not very well adapted to timothy and clover, of which only moderate yields are obtained. About three-fourths ton to one and one half tons per acre of hay is produced. Cowpeas and vetch are the leguminous crops that seem best adapted to the type. Vetch is probably best suited to the climatic conditions of the area, and should be used in rotations where clover does not do well.

The Dekalb silt loam is one of the best fruit soils in the State. Owing to the level to gently rolling topography the type is well suited to commercial orcharding, and its high elevation insures good air drainage and lessens the danger of frosts. The type is particularly adapted to apples. The trees are usually healthy and long lived. Other fruits do well, such as peaches, plums, and cherries, also small fruits, blackberries, and raspberries. Grapes do fairly well, but are only grown to a very small extent. It is upon the Dekalb silt loam that most of the orchard development around Terra Alta has been made.

The natural forest growth consists largely of chestnut and chestnut oak, with smaller amounts of hemlock, pine, oak, hickory, walnut, and maple. The type is known locally as "chestnut land," "light land," or "sandy land." Most of it is cleared and under cultivation. Land values range from \$20 to \$60 an acre.

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

Mechanical analyses of Dekalb silt loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.		Medium sand.		Fine sand.		Very fine sand.		Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.				
221105	Manown.....	Silt loam, 0 to 10 inches...	0.1	1.0	1.2	11.4	22.9	45.9	17.4					
221106	Subsoil of 221105.....	Heavy silt loam, 10 to 36 inches.	.4	1.2	1.2	11.0	25.0	37.8	23.3					
221111	5 miles south of Aurora..	Silt loam, 0 to 10 inches...	1.0	1.9	1.2	3.0	4.6	64.2	23.9					
221112	Subsoil of 221111.....	Silty clay loam, 10 to 36 inches.	1.4	4.0	1.9	2.5	3.0	59.6	27.4					

DEKALB STONY LOAM.

The soil of the Dekalb stony loam varies considerably in texture, ranging from a gravelly sandy loam to heavy loam.

The type consists mainly of a gray to yellowish-brown loam, underlain at varying depths, usually at about 4 to 8 inches, by a yellow, silty loam of quite friable structure. This usually grades below into a yellow heavy loam to silty clay loam. The immediate surface soil is often dark gray, owing to the abundance of organic matter from leaf mold. In places the soil varies to a yellowish silty clay loam, while in other areas it has the texture of a sandy loam, but these places were too small or too irregularly distributed to be satisfactorily mapped. Much of the type contains large quantities of rounded quartz pebbles, which were carried by the conglomerate rocks from which the type is largely derived. Small and large sandstone fragments are scattered over the surface and disseminated throughout the soil mass. Shale is also frequently present. Some of the type is so stony as to approach closely the characteristics of Rough stony land, and small areas of Rough stony land are included. In general, however, this type is much less stony than Rough stony land, and is better suited to grass and fruit culture. It includes a much larger area than can be cleared of stones and brought under cultivation. The parent rock is usually encountered at about 18 to 24 inches below the surface. In many places the quartz pebbles are missing and the sand content is low. The stone content within the 3-foot section in many places constitutes 30 to 50 per cent of the entire soil mass. These fragments interfere materially with cultivation. In many places large quantities of rock have been removed from the surface and piled in the field or used in building fences. Rock outcrops are common on the steeper slopes, but cover relatively small areas.

The type is confined chiefly to rather steep slopes, and much of it, even if the rocks were not present, could not be safely plowed, as erosion would undoubtedly ensue. The drainage is usually good, but in many places, where sandstone strata underlie the type, it is poor. In such places crops are very likely to suffer from lack of water during droughts as the soil is too shallow to retain an adequate supply of moisture.

The soil is derived from coarse-textured, hard sandstone formations and shales. It usually occurs along the outcrops of the Pocono sandstone, Pottsville conglomerate, and the sandstones of the Allegheny formation.

A very small part of the type is cleared and under cultivation. Most of the cleared area is devoted to pasture. Some fair crops of corn, potatoes, wheat, oats, rye, buckwheat, and hay are secured, but for the most part the type is too rough for the use of improved imple-

ments and is best adapted to grazing or to crops that can be cultivated largely by hand. Corn, potatoes, buckwheat, grass, and fruit are the crops probably best suited to the type. Vegetables do well, especially cabbage, but are grown only for home consumption. They can be profitably produced on areas of the type within reach of markets. Plowing is difficult, and over much of the type harrowing is impossible. Where the stones are not too large, a spring tooth harrow is used. Grass does not grow everywhere to the best advantage, but in general grazing is about as profitable as any other kind of farming. A large number of sheep are raised on this land.

The Dekalb stony loam can be successfully utilized for orchards. Several commercial orchards have been started and are in a flourishing condition. Apples and peaches do best. It may be necessary to use dynamite in preparing the land for fruit trees, as the rock substratum in places will interfere with the proper development of the root system. Small fruits do well and can be grown to advantage.

Where the soil is derived from the Pocono sandstone, which underlies the "Big Lime," the type is more productive than in other places. Material from the limestone formation has probably influenced the type considerably. These more productive areas are known locally as "good stony land" to distinguish them from stony land of lower agricultural value. Over nearly all of this phase of the type the stone has been removed and used in fence building, and the farms have a prosperous appearance.

The natural forest growth consists largely of white pine, spruce pine, and hemlock on the east side of the mountain, and mainly chestnut and chestnut oak on the west side, with a sprinkling of other trees, such as the other oaks, hickory, walnut, and maple. Hazel brush, blackberry bushes, mountain laurel, ferns, and moss are conspicuous in places. The land is valued at \$10 to \$30 an acre.

The following table gives the results of mechanical analyses of fine-earth samples of the soil and subsoil of the Dekalb stony loam:

Mechanical analyses of Dekalb stony loam.

No.	Locality.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
221123	One-half mile south of Howesville.	Loam, 0 to 8 inches.....	3.1	4.3	2.4	4.6	8.9	53.9	22.7
221124	Subsoil of 221123.....	Heavy loam, 8 to 24 inches.	2.4	4.3	2.5	4.7	7.1	58.3	20.6

DEKALB STONY SILT LOAM.

The Dekalb stony silt loam contains a large quantity of sandstone fragments, varying in size from small, angular pieces to boulders several feet in diameter. A large number of flaggy fragments, varying from about 6 inches to a foot square and several inches in thickness, are scattered over the surface of the type. Shale chips are also present. The fine soil material of the surface portion is a yellowish-brown to grayish-brown, mellow silt loam, averaging about 8 inches in depth. The subsoil consists of a yellow to yellowish-brown heavy silt loam to silty clay loam containing about the same proportion of sandstone fragments as the soil. In many places the parent rock is encountered within the 3-foot section, but it seldom occurs at depths of less than 2 feet. A few narrow rock ledges outcrop in the type, but these are too small to be shown on the map. In a few places the type contains a large amount of sand. These spots are small and the sand content is not high enough for the soil to be classed as a sandy loam. This type is somewhat similar to the Dekalb stony loam, except that it usually contains less stone, and the soil material is heavier.

The Dekalb stony silt loam usually occupies comparatively steep slopes.

The soil is derived from the sandstone and shales of the Cone-maugh, Allegheny, Pocono, and Chemung formations. The Allegheny and Chemung formations give rise to most of the type. Where the type is derived from the Allegheny formation the fine earth comes largely from the overlying shale formations. The Chemung formation consists largely of shales.

Owing to the uneven topography, the drainage is usually good. Notwithstanding the steep topography, the type is fairly retentive of moisture. The rocks prevent rapid evaporation and assist in holding the supply of water which seeps in from higher ground. This capacity to hold moisture renders the type better fitted for crop production than might be expected from such steep, rough land. Cultivation is difficult. The type is recognized as fairly good grazing land and is used to some extent for that purpose. Grass holds and lasts well, even during droughts. Sheep raising is probably more profitable than the raising of any other live stock. Farm machinery can not be successfully used, and crops must be cultivated largely by hand. Spring-tooth harrows are used where the rocks are not too numerous. In many places the rocks and the topography preclude the use of reapers and binders. This prohibits the production of such grains as wheat, oats, and buckwheat. Buckwheat is grown more extensively than any of the other cereals and produces

fairly good yields. In some cases the fields are cleared of the rocks, which are either piled in the field or used for building fences. The fields can then be cultivated with comparative ease, but the removal of the rocks involves considerable labor. Corn is probably the most profitable of the intertilled field crops. Potatoes and tomatoes can be profitably produced. Vegetables are grown in small patches, as hand cultivation is usually practiced in the case of garden crops.

The type is well adapted to fruit. The trees make a healthy growth and the fruit has good color, but most of the type is not suited to commercial orcharding because of its topography. Many small apple orchards have been established and are in a flourishing condition. Small fruits do well and should be more generally grown.

The producing power of this soil is about equal to that of the Dekalb silt loam where the same attention is paid to the preparation of the soil and to cultivation. Generally, however, the system of agriculture practiced on the type does not include proper preparation or thorough cultivation. Since very few cereals are grown, fertilizers are used to only a small extent. Stable manure is generally used on vegetables or corn. Very few leguminous crops are grown.

Much of the type is still in forest, and the rougher portions should be allowed to remain forested. The timber growth consists mainly of oak, chestnut, chestnut oak, walnut, hickory, ash, beech, and maple in the Ligonier Valley and spruce pine, white pine, and hemlock with a scattering of other trees in the country to the southeast of the Laurel Ridge-Briery Mountains chain.

The Dekalb stony silt loam has about the same value as the stony loam type.

In the following table the results of mechanical analyses of fine-earth samples of the soil and subsoil of this type are given:

Mechanical analyses of Dekalb stony silt loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.		Medium sand.		Fine sand.		Very fine sand.		Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.				
221125	1 mile east of Irona	Stony silt loam, 0 to 8 inches.	1.0	4.0	3.1	6.0	6.6	57.3	21.9					
221126	Subsoil of 221125	Heavy silt loam, 8 to 36 inches.	1.5	3.3	2.9	5.2	5.1	57.3	24.6					

ROUGH STONY LAND.

The Rough stony land in Preston County comprises steep stony land which has little or no agricultural value. Many rock outcrops and steep rocky cliffs occur throughout the type. The soil material ranges from yellowish silt loam to grayish sandy loam belonging mainly to the Dekalb series. In a few places Upshur material is found. Throughout the entire type small areas are found which could be cultivated with a fair degree of satisfaction, provided the surface were cleared of the larger stones. Over a large part of this land, however, the stones are too large to remove, and bedrock is encountered near the surface. Yet there is enough soil material even in much of this rough portion to support grass for fair grazing. By far the greater part of the type should be allowed to remain in forest.

The Rough stony land is located mainly along the Cheat River gorge and tributary streams, and upon the eroded slopes of Briery Mountains, Laurel Ridge, and Chestnut Ridge.

It is derived largely from outcrops of the Pottsville and Pocono formations, which are composed of hard sandstone and conglomerates. Where these formations outcrop the Rough stony land frequently occurs, even in level areas. Throughout the Cheat River gorge the soil is derived from nearly all of the formations found in its profile. Where the soft shale formations outcrop in steep places, boulders from the overlying sandstone formations are scattered over the surface.

Aside from its timber, coal, and such stone as may be suitable for building and other commercial purposes, a large part of the type has little value. The natural forest growth consists mainly of spruce pine, hemlock, white pine, oak, chestnut oak, and chestnut, with some hickory, walnut, beech, ash, hazel, and maple. The type can be utilized to a small extent for grazing sheep and goats.

UPSHUR SILT LOAM.

The Upshur silt loam is a dark reddish brown to Indian-red, friable silt loam, underlain at about 10 to 12 inches by Indian-red silty clay loam, which in turn grades at about 24 to 30 inches into Indian-red clay loam or clay. Both soil and subsoil contain large quantities of small sandstone and shale fragments. These fragments are usually Indian-red in color and are merely the partially weathered fragments of rocks from which the soil is derived. A few yellow sandstone fragments occur. The sandstone and shale fragments are never sufficiently large or numerous to interfere with cultivation. The soil is fairly deep. In only a few places is the parent rock encountered within the 3-foot section. Even upon the steep slopes the soil is deeply weathered.

The Upshur silt loam occurs in an interrupted belt along the line of outcrop of the Catskill formation, extending from the southern boundary of the county along the low hills to the east of Laurel Ridge and along a low range of hills to the east of Briery Mountains to near Dority, where it makes a horseshoe bend and passes southwest slightly to the east of Terra Alta. On the hilltops near Erwin it becomes a broad, flattened fan, passing out of the county just south of the point at which the Youghiogheny River crosses into Maryland. Another narrow strip extends along the low range of hills following the western base of Backbone Mountain.

The type is derived mainly from the red shales and red sandstones of the Catskill formation. A few thin strata of buff and gray shales and gray sandstones occur in this formation, but have very little influence upon the soil. Where Rough stony land is associated with outcrops of this formation, as along the Cheat River gorge and tributary streams in the southern part of the county, the rock fragments present usually come from overlying sandstone formations.

The topography of the type in general is gently rolling to rolling, except where it is traversed by stream gorges, in which case the slopes are decidedly steep. Drainage is well established, on account of the topography, the loose structure of the soil and subsoil, and the porous nature of much of the underlying strata. Most of the type lies above the 2,000-foot contour.

The crops grown are oats, corn, buckwheat, potatoes, wheat, clover, and timothy. The type is probably best adapted to oats. A large acreage is devoted to this crop, and the yields are heavy. Potatoes yield 100 to 150 bushels, hay $1\frac{1}{2}$ to $2\frac{1}{2}$ tons, wheat 15 to 20 bushels, buckwheat about 20 to 25 bushels, and corn about 40 to 50 bushels per acre. Buckwheat does not do quite as well on this type as upon the Dekalb soils. This is also generally true of fruits. Small fruits do fairly well. Such vegetables as cabbage, kale, etc., produce good yields. Clovers and leguminous crops do exceptionally well, especially where liming is practiced. Hairy vetch is not grown, but is well adapted to soils of this character and could be used to advantage in crop rotations. Oats and vetch combined could be profitably grown.

The lime content of this type is low and applications of this material should prove beneficial. An adequate supply of organic matter and good plowing puts the soil in excellent physical condition.

This soil is often confused with the strip of soil derived from the Mauch Chunk shale and Greenbrier limestone, the Upshur silty clay loam, which is much heavier and requires different treatment. The Upshur silt loam is not so strong as the silty clay loam type and is in need of fertilizer when heavy cropping is practiced. Fertilizers

high in phosphorus and potash should be used, and leguminous crops should be grown to supply nitrogen.

Owing to the friable texture of the soil a seed bed is easily prepared, and subsequent cultivation is not difficult. A large acreage is devoted to intertilled crops. Bluegrass does fairly well, but only a small part of the type is in permanent pasture. Timothy makes good yields, and a small area is devoted to this crop. Nearly all the type is cleared and under cultivation. Even the steep slopes of the type are put in corn or grass.

The natural timber growth includes chestnut and chestnut oak, with a scattering of other oaks, hickory, walnut, locust, and maple. The type is known locally as "red chestnut" land, and is valued very highly as an agricultural soil. It is held at \$60 to \$100 an acre.

The results of mechanical analyses of samples of the soil and sub-soil of the Upshur silt loam are given in the following table:

Mechanical analyses of Upshur silt loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.		Medium sand.		Fine sand.		Very fine sand.		Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.				
221113	1½ miles south of Aurora.	Silt loam, 0 to 12 inches...	0.0	1.8	1.1	5.6	15.2	57.1	19.1					
221114	Subsoil of 221113.....	Silty clay loam, 12 to 36 inches.	1.0	2.0	1.1	5.7	16.1	48.5	25.5					
221121	2 miles west of Terra Alta.	Silt loam, 0 to 8 inches....	.4	2.0	1.2	8.2	18.7	50.7	18.7					
221122	Subsoil of 221121.....	Silty clay loam, 8 to 36 inches.	1.6	3.0	2.2	8.1	16.1	45.1	23.9					

UPSHUR CLAY.

The Upshur clay consists of a reddish-brown to Indian-red silty clay loam to clay loam or clay, underlain at about 3 to 5 inches by an Indian-red, heavy, plastic clay, which becomes slightly heavier and more compact with depth. In some places the surface soil is grayish in color. The soil is deep, as is the case with nearly all soils derived from soft shales. In places a few rocks are scattered over the surface.

The type occurs usually in narrow strips on hillsides. In only a few places does it appear on the tops of the hills. The surface is usually steeply sloping, and the drainage is good.

The Upshur clay is derived from Indian-red and green shales of the Conemaugh formation. This type is confined to the southwestern corner of the county where these shales are thicker and more intense in color. Over other parts of the area the formation is either eroded or runs to gray and yellow shales.

The type is essentially the same as has been mapped in other areas in West Virginia, with the possible exception of a slightly lower lime content. The shales from which the soil is derived seem to be only slightly calcareous, as is indicated by the lack of lime concretions in the outcrops, although the soil contains enough lime to produce good crops of bluegrass and leguminous plants.

The Upshur clay is very hard to bring into cultivation in the spring. Its tenacious character renders it very retentive of moisture. It remains cold and damp longer in the spring than most of the other types in the county. When dry the soil bakes hard and cracks, which is characteristic of most clay soils. Clods formed by plowing when the land is too wet are very difficult to pulverize. The cultivation of a soil of this character requires a heavy farm equipment and the land should be thoroughly prepared by repeated harrowing to secure the proper seed-bed condition. Fall plowing is recommended where early spring planting is to be done. This will allow the soil to mellow under the influence of alternate freezing and thawing during the winter season.

Large areas of this type should be kept in permanent pastures or devoted to the production of hay. Cultivated crops should not be grown too frequently, especially on the slopes, owing to the danger of erosion.

The crops grown are wheat, oats, corn, buckwheat, potatoes, clover, timothy, and bluegrass. Wheat and corn probably cover a larger acreage than any of the other cereals. A fair acreage is devoted to clover and timothy. Buckwheat is not grown as extensively as upon the Dekalb soils. This type is not especially adapted to fruits, but a large number of home orchards are found in which fruit does fairly well. Potatoes are not grown on a commercial scale, but represent the most important garden crop. Many different vegetables are grown successfully in kitchen gardens. The soil is well suited to bluegrass and by far the larger part of the cleared portion is in bluegrass pasture. The sod lasts indefinitely if properly cared for. This type affords excellent grazing for steers, and stock raising is the most profitable business that can be carried on upon the type.

Corn produces 30 to 40 bushels, wheat 10 to 20 bushels, oats 20 to 30 bushels, and hay 1½ to 2 tons per acre. Timothy suffers in dry weather from the baking of the surface soil.

The use of manure, the turning under of cover crops or sod, and liming will improve the physical condition of the soil. Very little fertilizer is used. Bone meal and phosphates are used on wheat. Liming is practiced to some extent, and some farmers turn under a sod occasionally.

The Upshur clay is not very extensively developed in this county. It is nearly all cleared and under cultivation or in permanent pas-

ture. The natural forest growth is largely oak, hickory, maple, walnut, locust, and beech. -The type is valued at about \$30 to \$40 an acre.

UPSHUR SILTY CLAY LOAM.

The Uphur silty clay loam as typically developed is a brown to dark reddish brown mellow silty clay loam, underlain at 8 to 12 inches by a reddish-brown to Indian-red, compact and moderately friable silty clay to clay loam. Very few of the rock fragments present are derived from the parent rock. Rocks from the next higher formation (Pottsville conglomerate) in the geological column are quite abundant along the upper margin of the soil areas.

Both surface drainage and underdrainage are good. In a few places along the lower slopes adjoining stream bottoms narrow strips are kept wet by seepage water. The soil in such places is heavier, more tenacious, and yellowish brown in color. These spots are very small and could not be separated upon a map of the scale used in the present survey.

A strip of the Uphur silty clay loam is developed over the eastern face of Laurel Ridge and Briery Mountains, passing out of the county at Cranesville. Another strip enters the county along the western base of Snaggy Mountain and extends southwest to Amboy, where it passes around the base of Brushy Knobs and leaves the county along the base of Shaffer Mountain. Nearly all of the type is over 2,500 feet above sea level. It occupies hillsides and as a rule the surface is steeply sloping. Around Aurora it is smoother than elsewhere in the county.

The soil is derived from the weathering of the red shales and red sandstones of the Mauch Chunk formation with some local influence from the Greenbrier limestone. Colluvial material from the Mauch Chunk shale has covered the soil derived from the limestone. In the few places where the limestone formation influences the soil the sub-soil has a yellowish-red color and is usually heavier and more plastic than the average. The parent rock is ordinarily encountered at depths of 4 to 8 feet or more beneath the surface.

The type remains cold rather late in the spring. Fall plowing is advisable in order to subject the upturned soil to the beneficial action of freezing and thawing. The results from plowing while too wet are not as serious as might be expected upon such a heavy soil. If cultivated when moderately moist a mellow seed bed is easily prepared.

The Uphur silty clay loam is probably the best soil in the county. It produces good yields of wheat, oats, corn, buckwheat, potatoes, clover, and timothy without the use of commercial fertilizers. Wheat is one of the most profitable crops grown, and covers a large acreage. Corn produces better yields than upon any other upland type in the county. The type is not especially adapted to buckwheat,

but this crop is grown to some extent. Oats do fairly well, the yields being somewhat lower than on the Upshur silt loam. Clover does exceptionally well and is sowed alone more extensively upon this type than on any other in the county. Timothy gives heavy yields, and does not deteriorate as quickly as upon some of the other types. Potatoes yield well, though the soil is not so well adapted to this crop as the Dekalb soils. The yield is much more uncertain and the quality is not quite up to the standard. Wheat on the best managed farms produces about 30 bushels per acre. Bluegrass does better than upon any other type in the county, and large areas are in permanent pasture. Large numbers of cattle, horses, and sheep are raised and fattened for the market. Such vegetables as cabbage, kale, beans, etc., make good yields, but the soil is not especially adapted to truck crops, as it remains cold probably later than any other soil type in the county. It is not quite so well adapted to fruits as the Dekalb soils.

Very little fertilizer is used. Small applications of phosphate or bone meal are used for wheat when this crop precedes grass. Liming is practiced to a small extent. While the type is known locally as "limestone land," the surface soil of most of the type contains very little lime, although the lime content of this soil is higher than that of any other type in the county. Many farmers have never used commercial fertilizer or lime on the soil, but grow clover and turn under a sod about every 4 or 5 years and thus maintain the fertility of the soil.

Nearly all of the type has been cleared of the native forest growth, which consisted largely of oak, hickory, maple, walnut, ash, and locust. It is valued at about \$100 an acre.

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

Mechanical analyses of Upshur silty clay loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.		Medium sand.		Very fine sand.		Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.		
221115	One-fourth mile north of Carmel.	Silty clay loam, 0 to 12 inches.	0.6	2.4	1.3	5.0	5.0	59.5	26.0			
221116	Subsoil of 221115.....	Silty clay loam, 12 to 36 inches.	.6	3.1	1.9	4.9	5.4	53.8	30.1			
221119	3 miles west of Terra Alta.	Heavy silt loam, 0 to 10 inches.	2.2	3.6	1.8	6.0	10.0	53.6	22.6			
221120	Subsoil of 221119.....	Silty clay loam, 10 to 36 inches.	1.2	3.2	1.6	5.6	7.2	50.5	30.6			

HOLLY SILTY CLAY LOAM.

The soil of the Holly silty clay loam consists of a dark-gray or drab to grayish-brown, slightly plastic heavy silt loam to silty clay loam, faintly mottled in the subsurface portion with shades of brown. At about 10 to 12 inches the soil passes into a subsoil of heavy silty clay loam to silty clay of a mottled yellowish brown and drab color. In poorly drained spots the mottling shows bluish and rusty brown colors. Black oxide of iron material is present in such places. A large proportion of the type is water logged below a depth of 24 to 30 inches.

In places where the organic content is high the soil to a depth of a few inches is dark to almost black. This condition is more often found in uncleared areas. Where the type receives wash from the Dekalb and Upshur soils there is present along the outer edges a mantle of brownish material which varies in thickness. In a few places near outcrops of sandstone the sand content is relatively high, but such areas are small.

The type is most extensively developed around Reedsville, Terra Alta, and Glade Farms. Detached areas are found in nearly all parts of the county.

This is an alluvial soil subject to overflow. Portions of the type lie a little above normal overflow.

The topography is level to very gently sloping toward the stream channels. The streams follow meandering courses through the type, frequently dividing into numerous channels. In many places in the center of the glades or along the streams strips of swampy land are found whose drainage is difficult. Drainage can be established over most of the type, however, without any serious trouble from lack of fall. Some of the land has been drained by open ditches, the main channels of the streams having been straightened and enlarged. The sloping areas are usually plowed into "lands" varying from 10 to 20 feet wide with the "dead furrows" running with the direction of the slope. A very small part of the type has been tile drained.

The native growth on the glades in the Ligonier Valley region is largely alder and willow, while in the more elevated southeastern section of the county it consists of alder and pine. Mosses and ferns flourish in the uncleared areas. Bulrush is common on the pastures of the cleared portions. The early settlers found cranberries growing wild over these bogs, and they are very often referred to as "cranberry bogs." The term "crawfish" land is also used, although "glade land" or "glades" is the name most commonly applied to such areas.

After drainage, heavy applications of lime should be made to correct the acidity or other unfavorable conditions of the soil. Under present conditions the type would require a great amount of lime for

that purpose. The soil is cold and clammy and can not be brought into good tilth until late in the spring. This is due in part to the poor drainage conditions and partly to the heavy texture of the subsoil.

The greater part of this soil contains sufficient organic matter for the production of most crops, but it probably is not in the most favorable condition. The material is generally in need of aeration. Care should be taken to cultivate the type while in the proper condition with respect to content of moisture. Otherwise clods will form, and, on drying, the soil will assume an unfavorable, hard structure.

Very little of the type is cleared and under cultivation, and much of the cleared portion is in permanent pasture. Corn and timothy do fairly well, but such crops as wheat, oats, and rye have a tendency to produce too much stalk, and are grown to a very small extent. Buckwheat does fairly well and is grown more extensively than any other crop. The yield of this grain averages about 30 bushels and of corn about 40 to 60 bushels per acre. Potatoes make good yields on the better-drained portions of the type. Such vegetables as cabbage, cauliflower, kale, onions, lettuce, celery, tomatoes, beans, and squash do well and can be grown profitably. Of these, the type is best adapted to cabbage, onions, and celery, and large yields of these crops can be obtained. The type can not be recommended for early truck crops on account of its heavy, cold nature. Large yields of late truck crops can be secured. A series of experiments has been conducted by the West Virginia experiment station to determine the vegetables and the varieties best suited to this type.¹

Liming and manuring are practiced to some extent. Very little commercial fertilizer is used. In growing truck crops, fertilizers of high grade should be liberally used. Fertilizers, however, are of little benefit unless the proper drainage is provided.

The type furnishes good, succulent pasture during the dry seasons of the year, and on this account dairying should prove profitable. The type is not very well suited to leguminous crops. Alsike will do fairly well on the better-drained areas. Blackberries, raspberries, and strawberries do well, especially the latter. The type can not be recommended for fruits on account of its low position.

This soil is not valued as highly for agriculture as it should be, and its producing power is not appreciated. The land is held at \$50 to \$100 an acre.

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam is a dark-brown, mellow silt loam about 10 inches deep. The subsoil is a yellowish-brown, heavy, slightly compact, and friable silt loam, becoming somewhat lighter in color and in texture and less compact as depth increases. A few fragments occur on the surface and throughout the soil mass.

¹ See Bulletin No. 81, West Virginia Expt. Sta.

The type occupies first bottom or overflow land along streams, which receive the wash from the uplands. The surface is nearly level to slightly undulating, the latter configuration being due to the presence of swells and swales such as are common to many portions of the stream bottoms. The swales are very narrow and usually occur near the hills. They are usually poorly drained and represent more nearly the condition of the "glade lands." The subsoil in such places is heavy and more or less mottled with gray. These swales should be tile drained.

A few strips are found in some places, as in Dunkard Bottom, along the edge of the larger streams, where the sand content is high and the subsoil is reddish. The soil in such places approaches the characteristics of the Moshannon fine sandy loam, but the areas are too small to map separately.

The type occurs at 5 to 30 feet above the normal level of the streams, and the drainage is generally good.

The soil is easily cultivated, and only a light draft is required in plowing. A mellow seed bed may be established with but little harrowing. Labor-saving machinery can be used to advantage.

The crops grown are corn, oats, wheat, buckwheat, potatoes, clover, and timothy. Corn is grown more extensively than any other crop and yields from 50 to 60 bushels per acre. Wheat, oats, buckwheat, and potatoes are grown most extensively on the higher-lying areas. These areas are subject to occasional overflow, yet there is little danger of losing a crop upon the high bottoms, such as Dunkard Bottom. Wheat and oats do well, but have a tendency to lodge. Buckwheat gives good yields. Potatoes yield from 150 to 200 bushels per acre. Timothy makes splendid yields and is well adapted to the type. Alsike does well and is used quite extensively. It takes the place in the rotation filled by crimson clover on the upland. The growing of cowpeas, soy beans, or vetch has never been practiced, but these crops could be grown with profit. Sweet potatoes, peanuts, sorghum, and melons are well suited to the type, but are grown to only a small extent. The type is a good trucking soil. It is well adapted to cabbage, kale, turnips, cauliflower, spinach, onions, beets, tomatoes, sweet corn, lettuce, and celery. Pumpkins and squash do exceptionally well. Conditions are not favorable for fruits. The air drainage is poor and the crop is likely to be injured by frost, and saturation of the soil during overflows would be injurious to the trees. Blackberries, raspberries, and strawberries should do well over those portions of the type subject to only occasional overflow.

The Huntington silt loam is practically all cleared and under cultivation. The original forest growth consisted largely of sycamore, elm, gum, ash, beech, birch, and willow. The type is valued at about \$100 an acre.

HUNTINGTON SANDY LOAM.

The soil of the Huntington sandy loam is a dark-brown to yellowish-brown, mellow, light sandy loam about 6 to 8 inches deep. The subsoil is a brownish-yellow, fairly loose and open light sandy loam. The sand content increases with depth. In many places beds of sand or gravel, consisting mainly of sandstone fragments, are encountered at 24 to 30 inches.

The type forms a mellow seed bed. When dry the soil is loose and open, and it packs slightly when wet. Cultivation is easily accomplished. The soil is slightly droughty, especially in the higher areas. The topography is level to slightly undulating, and the drainage between overflows is good.

The Huntington sandy loam is used largely for meadow and the production of corn, oats, and buckwheat. Only fair yields of these crops are obtained. Such crops as cowpeas, soy beans, and vetch should do well. Both sweet and Irish potatoes give good results, the soil probably being better adapted to sweet potatoes. Nearly all of the vegetables common to the region do well where grown in gardens, and the production of truck crops on a commercial scale should receive greater attention. Owing to its sandy nature the soil has a tendency to mature crops earlier than other soils, and it can be handled earlier in the spring. Such vegetables as lettuce, onions, turnips, beans, and beets do well. Pumpkins and squash also thrive upon this soil. Melons also do well. Timothy does not produce as large yields as on heavier soils, and the type is better suited to redtop.

The plowing under of such crops as rye, vetch, and cowpeas would result in the improvement of the land.

Nearly all of the Huntington sandy loam is cleared and under cultivation. The natural forest growth is sycamore, elm, birch, and beech. The land is valued at about \$75 an acre.

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

Mechanical analyses of Huntington sandy loam.

No.	Locality.	Description.	Fine gravel.		Coarse sand.		Medium sand.		Fine sand.		Very fine sand.		Silt.	Clay.
			P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.				
221107	1½ miles east of Kingwood	Loamy sandy loam, 0 to 7 inches.	0.2	4.7	15.3	34.2	17.2	18.4	10.1					
221108	Subsoil of 221107.....	Light sandy loam, 7 to 36 inches.	.2	11.4	29.2	37.5	9.5	7.6	4.3					

SUMMARY.

Preston County lies in the northern part of West Virginia, bordering Pennsylvania and Maryland. It comprises 412,800 acres, or 645 square miles.

With the exception of the deep gorge cut by Cheat River and the Laurel Ridge-Briery Mountains range, the county presents a fairly even surface for a mountainous country. The area is divided into two physiographic sections by the crest of the Laurel Ridge-Briery Mountains range. The country to the north and west of this line, comprising about three-fourths of the county, is known as the Ligonier Valley, and southeast of the line consists of a more elevated plain deeply dissected with high ridges and mountain peaks and relatively broad intervening valleys. These two sections have a difference in general elevation of about 1,000 feet.

The first settlements were made in the county about 1770. After the Revolutionary War large numbers of settlers came into the county from Maryland, Pennsylvania, and Virginia. Preston County was formed in 1807.

Between 1820 and 1850 many roads and turnpikes, including the Northwestern Virginia Turnpike, were constructed. The building of these roads gave great impetus to the internal development of the county. The Baltimore & Ohio Railroad, passing through Preston County, was completed in 1852. An era of progress followed the completion of this road, as means of transportation for products was assured, and additional pikes and roads were built to connect with points along the railroad. The Morgantown & Kingwood Railroad, completed in 1906, opened a good farming and mineral section. Since the early settlement of the county the principal markets have been Baltimore and Pittsburgh.

The two physiographic sections of the county differ to some extent in climatic conditions, but in general the climate is mild and healthful. The summers are short and comparatively cool, and the winters, while cold, are not rigorous. In the higher country the season is about two weeks later in the spring. This section is not entirely free from the possibility of frost at any time of the year, and frosts severe enough to kill wheat have occurred as late as June. The mean annual precipitation at Terra Alta is 56, and at Rowlesburg 44 inches. These stations represent the Ligonier Valley and the country to the southeast of Laurel Ridge-Briery Mountains chain.

Corn was the first crop grown in the county. This was followed by wheat, and by 1820 to 1830 practically all of the crops now grown in the county had been introduced.

No attention was paid to the maintenance of fertility by the early settlers, new land being cleared upon the failure of the old fields. It is only within the last 20 or 30 years that any attention has been paid to the building up of the soil. At present a fairly definite system of cropping is used, although the systematic rotation of crops is not practiced. Liming has been practiced for about 15 years. Comparatively small amounts of commercial fertilizers are used. These include phosphates, bone meal, and some complete mixtures.

Although large numbers of cattle and sheep are kept in the county, only a relatively small acreage is in permanent pastures. As a rule the land used for this purpose consists of grass lands that no longer produce profitable crops of hay. More and better cattle are kept now than ever before. The improvement of breeds has received attention for about 30 years. Herefords predominate. There are about the same number of sheep to-day as when the wool industry was at its highest, but the breeds kept now are for mutton.

There are no bearing commercial orchards in the county, although fruits, especially apples, do well. Small orchards in good condition are found on nearly every farm. Practically no attention is given to trucking, although several of the soil types are well suited to the growing of vegetables.

Of the entire land area of the county 71 per cent is in farms. Of this, 55.8 per cent is improved. The average size of the farms is 104.1 acres, and 90.3 per cent of the farms are operated by the owners.

Including Rough stony land eleven soil types, representing four soil series, were mapped. The Dekalb and Upshur series and Rough stony land occupied the upland, and the Huntington and Holly series the bottom-land areas of the county. The upland soils are derived from the weathering in place of the shales and sandstones of formations of the Carboniferous and Devonian periods. The bottom-land types are derived by wash from the upland types. The alluvial soils occupy a relatively smaller area than in other counties in West Virginia.

The Dekalb silty clay loam is the most extensively developed type in the area. It is well suited to general farming, and is particularly adapted to potatoes, buckwheat, and timothy. Apples and cherries do well.

The Dekalb silt loam is not so extensive but covers large areas in the southeastern part of the county. It is best adapted to potatoes, buckwheat, and apples.

The Dekalb stony loam and stony silt loam are best suited to grazing and orcharding.

Rough stony land is of little or no agricultural value. Its best use is for forestry.

The Upshur silty clay loam is the strongest soil in the area and is well adapted to general farming and stock raising. Wheat, oats, corn, clover, timothy, and bluegrass do well.

The Upshur silt loam is an excellent type for intertilled crops, owing to the ease with which it can be cultivated. Oats, wheat, corn, and potatoes are the principal crops grown. It is best suited to oats. Vegetables do well.

The Upshur clay occurs in small areas but is typical of the soil as mapped in other areas in West Virginia. It is best suited to bluegrass and a considerable area is in pasture. Wheat, timothy, and clover do fairly well.

The Huntington silt loam is not very extensively developed. A large acreage is devoted to corn and timothy. The type is well adapted to these crops and to vegetables.

The Huntington sandy loam has the smallest total area of any soil type in the area. It is best suited to corn, peanuts, sorghum, sweet potatoes, melons, and leguminous crops such as cowpeas, soy beans, and vetch, and to early light truck crops.

The Holly silty clay loam occurs on the "glades." It is best suited to vegetables such as cabbage, onions, lettuce, celery, and squash. It is fairly well adapted to grass and buckwheat. Cranberries once grew wild upon this type, and conditions are favorable for the production of tame varieties.



[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 4, 1904.

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

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