

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS.
IN COOPERATION WITH THE WEST VIRGINIA GEOLOGICAL SURVEY.

SOIL SURVEY OF TUCKER COUNTY,
WEST VIRGINIA.

BY

S. W. PHILLIPS.

[Advance Sheets—Field Operations of the Bureau of Soils, 1921.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1925.

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[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

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

CONTENTS.

	Page.
Description of the area	1329
Climate	1333
Agriculture	1334
Soils	1339
Dekalb stony loam	1343
Dekalb stony silt loam	1344
Dekalb loam	1345
Dekalb silt loam	1347
Dekalb silty clay loam	1349
Upshur stony silt loam	1350
Upshur silt loam	1350
Upshur silty clay loam	1352
Lickdale silty clay loam	1354
Lowell silty clay loam	1354
Holston silt loam	1355
Tyler silt loam	1356
Moshannon loam	1357
Moshannon silt loam	1358
Atkins silt loam	1359
Holly silty clay loam	1359
Dunning silty clay loam	1360
Muck	1361
Rough stony land	1362
Summary	1363

ILLUSTRATIONS.

PLATE.

	Page.
PLATE XLI. Fig. 1.—Rough stony land on the plateau near Davis. Fig. 2.— Hemlock stump on Rough stony land	1357

FIGURE.

FIG. 43. Sketch map showing location of the Tucker County area, West Virginia	1329
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MAP.

Soil map, Tucker County sheet, West Virginia.

SOIL SURVEY OF TUCKER COUNTY, WEST VIRGINIA.

By S. W. PHILLIPS.

DESCRIPTION OF THE AREA.

Tucker County lies in the northeastern part of West Virginia, just south of the southwestern tip of western Maryland. It is roughly rectangular in shape and comprises an area of 421 square miles, or 269,440 acres.

The county lies in the severely dissected part of the Appalachian Plateau, and the topography is chiefly hilly to mountainous. The hilltops and ridges are generally narrow and frequently hog-backed, with V-shaped valleys between. The mountain tops are broad, with abrupt rocky slopes and precipitous scarps. The mountains and ridges are remnants of a broad plain which has been deeply eroded. The elevation of this plain was greatest in the southeastern part of the county; its sky line dips therefore to the northwest.

Tucker County includes three principal topographic regions, which are largely the result of structural disturbances and subsequent erosion.

The western half of the county includes rounded and narrow hills, relatively low mountains with steep slopes, and narrow valleys. The valley of Cheat River is one of the prominent features of this section. Where the river, which flows in a general northwesterly direction, passes out of the county in the northwestern part, its valley is V-shaped and narrow, but is wider from St. George to Parsons. At Parsons the river is formed by the confluence of Shavers and Dry Forks, which flow in narrow valleys with steep, abrupt slopes. The Blackwater River, a tributary of Dry Fork, flows through a deep gorge or canyon 1,200 to 1,500 feet below the general level of the surrounding mountains.

Backbone and McGowan Mountains, extending through the center of the county, and Canaan, Mozark, Green, Brown, and Cabin Mountains, in the eastern part, are the most prominent mountain features. They are characterized by extremely steep, rocky slopes, with tops varying from narrow ridges to broad, rolling, so-called plains, which are strewn with large rock fragments. They follow a general northeast-southwest line parallel to the line of the structural disturb-



Fig. 43.—Sketch map showing location of the Tucker County area, West Virginia.

ances. Laurel Ridge, a narrow, steep-sided mountain, forms the western boundary line.

The Canaan Valley is a long, cigar-shaped valley in the eastern part of the county, carved out of the arch of the Blackwater anticline by the action of the Blackwater and Little Blackwater Rivers. Its present form is maintained by hard sandstone beds which form much of the mountain rim around it as well as the river bed and the gorge through which the river flows out of the valley.

Local slopes and ridges reflect the nature of the underlying rock formations. The trough of the Cheat River basin is bounded by the Backbone-McGowan chain on the east and Laurel Ridge on the west. The general elevation of ridges and hills in this section is 2,500 to 2,700 feet above sea level. This basin includes most of Licking, St. George, Clover, and Black Fork districts, where the underlying rocks are chiefly alternating beds of sandstone and shale. Upon weathering, these beds produce narrow ridges with steep slopes, owing to the occurrence at regular intervals of hard sandstones in the shales. Isolated hills are conical or pyramidal in shape. The more resistant sandstone formations, when they are thick, on the other hand, usually form rounded slopes. In this section the valleys are V-shaped and stream bottoms are narrow, except between St. George and Parsons, where the Cheat River bottom widens out to about a mile in some places.

East of the Backbone-McGowan Mountain chain lies an area of rugged mountain top and high rolling plateau with steep mountain sides. The southern part of this area has been severely dissected by Blackwater River and Dry Fork, and the tributaries, Otter Creek, Glady Fork, and Red Creek. The stream bottoms are very narrow, with precipitous sides, in some cases consisting of rock bluffs. Above these, on a bench from one-fourth to 1 mile wide, is some hilly to fairly level rolling land supported by a resistant sandstone formation, the rolling land being formed on shale and limestone. Sinks are found in the limestone section. The northern part of this area has the topography of a high rolling plateau in the vicinity of Thomas and Davis, with rugged mountain scarps flanking it on the east and west. This section, which includes Fairfax and most of Davis and Dry Fork districts and some of the Black Fork district, comprises about 3½ per cent of the total area of Tucker County. The elevation of this northern section ranges from about 3,000 to over 4,000 feet, the higher levels developing to the southeast as the main Allegheny Mountain chain is approached along the eastern border of the county.

In the eastern part of the county the Canaan Valley, with its low smooth hills and wide bottoms, presents a sharp contrast to the steep, rocky mountain slopes and tops which almost surround it. The valley floor lies at an elevation of 3,100 to 3,250 feet above sea level.

Cheat River passes out of the county at an elevation of 1,450 feet, the lowest point in the county, while Weiss Knob, in the southeastern part near Laneville, rises to 4,420 feet. Thus the maximum relief in Tucker County is 2,970 feet. Parsons, the county seat, is

located at an elevation of 1,664 feet; Hendricks, at the confluence of Blackwater River and Dry Fork, has an altitude of 1,720 feet; Davis, on the top of the plateau, 3,100 feet above sea level, is said to have the highest elevation of any town in the eastern half of the United States.

Practically all Tucker County is drained by the Cheat River, the waters finally reaching the Ohio River. A small area in the north-eastern part, in the vicinity of Kempton, Md., drains into the North Branch of the Potomac River. In the northwestern part a somewhat larger area is drained through Brushy Fork into the Tygart River.

Branches of these streams ramify to every part of the county, so that most of the area is well drained. Many of the streams are swift flowing and offer opportunity for the development of water power.

The first settlement in the county was made in 1774 near the present site of St. George. There was considerable trouble with the Indians in those early days and settlement was confined largely to the river bottoms and the adjacent hill slopes. Later settlers came in from Pennsylvania and Virginia and some of the hills and ridges were gradually cleared. The county was organized in March, 1856, by an act of the Virginia Assembly, from a part of Randolph County, with St. George as the county seat. By this time most of the smaller stream bottoms and the best of the uplands had been cleared and fenced for cropping and pasture. With the completion of the railroad to Parsons in 1889 lumber mills and tanneries were started and a number of towns established. Parsons soon outstripped St. George in population and importance, and, being on the railroad and more easily accessible to all sections of the county, was made the county seat.

The present inhabitants in the farming sections are nearly all descended from the original settlers. However, many negroes and Italians are employed in the coal-mining and lumber industries at Thomas, Davis, and Pierce, in the northeastern part of the county. Fairfax district, which includes the industrial towns of Thomas, Pierce, Benbush, and Douglas, is the most thickly settled part of the county. The Cheat River Valley region, containing Parsons, Hambleton, St. George, and several other villages, is the most thickly settled and best developed agricultural section of the county. The mountain and ridge sections and back valleys are sparsely populated.

The population of Tucker County is reported by the census of 1920 as 16,791, and is all classed as rural, there being no town of more than 2,500 inhabitants in the county. This is an increase of 731, or 4.5 per cent, over that of 1910. The largest increase in population was made in the decade from 1890 to 1900, when the number of inhabitants increased from 6,459 to 13,433, or more than double. This was during the time of industrial expansion following the building of the railroad through the county and the development of its coal and timber resources.

Davis, the largest town, with a population of 2,491 in 1920; is situated on the high plateau in the northeastern part of the county.

Although it is off the main line of the Western Maryland Railway, it has excellent railroad service over the 6-mile branch running out from Thomas. A large lumber mill and tannery and several coal mines are located there and furnish employment for a majority of the inhabitants. Very little farming is done in this vicinity, owing to the high altitude and rugged, rocky nature of the section. The Canaan Valley is largely dependent upon Davis as a trading point. Because of its high altitude, the summers are cool and pleasant and the winters are cold.

Thomas, with a population of 2,099, is situated on the main line of the Western Maryland Railway. It is entirely a coal-mining town and is considered the best business town in the county. Branch railway lines run from Thomas to Pierce, Benbush, and Davis.

Parsons, the county seat, with a population of 2,001 in 1920, is the main shipping point for the Cheat River Valley agricultural section. It has a large pulp mill and tannery. These two industries furnish a market to this and adjoining counties for hemlock and spruce bark and pulp wood. A small flour mill and planing mill are also located there.

Other towns of importance in the county are Pierce, with 1,500 inhabitants, a coal-mine town on a branch of the Western Maryland Railway out from Thomas; Douglas, on the Western Maryland Railway, a coal-mine town of 600 population; Benbush, a coal-mine town of 500 population, is on a branch of the Western Maryland Railway west of Thomas; Hendricks, population 622, at the junction of the Western Maryland Railway and the Central West Virginia & Southern Railroad, has two wholesale stores and a handle factory and was once an important mill town; Hambleton, 488 population, was once an important tannery and mill town; Porterwood, population 150, has a sawmill; St. George, about 10 miles down the river from Parsons, is an agricultural town with a population of 150.

The main line of the Western Maryland Railway from Cumberland, Md., to Elkins, W. Va., crosses the county and is the chief means of transportation. Connections are made with the Baltimore & Ohio and the Pennsylvania Railroads at Cumberland and with the Baltimore & Ohio Railroad and Coal & Coke Railway at Elkins via Belington. The Central West Virginia & Southern Railroad, running up Dry Fork from Hendricks to Horton in Randolph County, furnishes passenger and freight service to inhabitants along the line, but depends for its chief revenue upon the lumber mills at Horton.

A system of roads has been planned for Tucker County to connect Parsons with the county seats of the adjoining counties. There are about 915 miles of public road in Tucker County. With the exception of a stretch of cinder road near Parsons, a few miles of limestone road in Canaan Valley, and a concrete road from Davis through Thomas and William over Backbone Mountain to the Preston County line, the roads are built entirely of local sandstone and shale materials, which make fairly good roads in fair weather. Many of the roads are not constructed on the proper grades nor kept in repair. The majorities are rough and hard on automobiles and other vehicles.

Telephones are in use through the better developed agricultural sections and in the coal and timber areas.

The coal-mine towns and lumber camps offer a good market for meats, vegetables, and other farm products. Thomas and Davis are the most important local markets and Pittsburgh and Baltimore are the principal outside markets.

CLIMATE.

There is considerable variation in the climate of Tucker County, owing chiefly to differences in elevation, the configuration of the valleys, and the degree of exposure to sunlight. West of Backbone Mountain the climate is generally somewhat more moderate than east of it. There are warm spells in the summer, but the nights are usually cool. In the high plateau about Thomas and Davis, with an altitude around 3,000 feet above sea level, and over other sections of about the same and higher altitudes, frosts have occurred in every month of the year and the winters are cold and severe. The summers at such altitudes are generally cool and delightful.

The mean annual temperature recorded at Parsons is 50.4° F. The warmest month is July, with a mean temperature of 70.4° F., and the coldest is February, with a mean of 29.3° F. The summer mean is 68.9° F., and that of winter 30.9° F. Periods of extremely hot or cold weather are usually of short duration. The absolute maximum and minimum temperatures recorded at Parsons are -28° F. in January and 101° F. in August.

The mean annual precipitation, 46.86 inches, is fairly well distributed over the year, being heaviest during the spring and summer periods, when most needed by the crops, June leading with an average of 5.58 inches of rainfall. The fall is the driest period, with a mean rainfall of 8.58 inches. November, with a mean rainfall of 2.52 inches, has less rainfall than any other month. The annual snowfall averages 46 inches, of which 32.7 inches fall during the three winter months. In the lower elevations snow does not lie long on the ground, but through the mountains and plateaus it sometimes remains until April or May. Floods usually occur in the spring, when the melting snow in the mountains swells the small mountain streams.

The average date of the last killing frost in the spring, as recorded at Parsons, is May 12, and that of the first in the fall October 10, giving an average growing season of 151 days. However, killing frosts have occurred as late as June 11 and as early as September 19. The growing season in the plateaus and in Canaan Valley will probably average about two weeks shorter than at Parsons. In the high eastern region potatoes, oats, buckwheat, and grass thrive under the cooler season, which is generally too short for corn. In the western part of the county the climatic conditions are favorable for all general crops and fruits.

The following table, compiled from records of the Weather Bureau station at Parsons, elevation 1,656 feet above sea level, represents the climatic conditions throughout the county, with the exception of the higher parts.

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

[Elevation, 1,656 feet.]

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1901).	Total amount for the wettest year (1907).	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December	31.3	71	-26	3.78	7.50	4.80	6.9
January	32.0	80	-28	4.50	2.60	8.33	11.6
February	29.3	76	-21	3.47	1.10	4.16	14.2
Winter	30.9	80	-28	11.75	11.20	17.29	32.7
March	39.5	85	-8	4.25	.90	6.20	6.6
April	48.8	89	10	3.82	2.50	4.14	3.4
May	59.4	94	22	3.90	2.50	4.75	.0
Spring	49.2	94	-8	11.97	5.90	15.09	10.0
June	66.3	95	31	5.58	3.37	5.42	.0
July	70.4	96	40	5.20	3.50	11.82	.0
August	70.1	101	40	3.78	5.10	2.00	.0
Summer	68.9	101	31	14.56	11.97	19.24	.0
September	63.3	93	28	3.32	1.90	3.00	.0
October	52.6	86	19	2.74	.75	3.79	.5
November	41.2	78	0	2.52	1.75	4.50	2.8
Fall	52.4	93	0	8.58	4.40	11.29	3.3
Year	50.4	101	-28	46.86	33.47	62.91	46.0

AGRICULTURE.

The pioneers who first settled in Holly Meadows were attracted by the level, well-drained bottoms, which they rapidly cleared and put in corn. For meat they depended chiefly upon game in the surrounding forests. They had brought in a few cows, mainly for milk production, but the decrease in the supply of game and the abundance of pasture afforded throughout the woods soon led them to raise cattle and sheep and, later, hogs, for meat, wool, and hides. Other crops, such as wheat and oats, were introduced, but corn remained the chief cultivated crop. Gradually the smaller valleys were settled and adjacent hill slopes cleared. Much of the steeper hill land after a few years of cultivation failed to give profitable yields and was turned into pasture or allowed to grow up in brush or second-growth forest, and new areas were cleared. Surplus cattle and sheep were bought by itinerant cattle buyers and driven overland to the eastern markets. Such articles of clothing, food, and farm equipment as could not be raised or made were carried with great difficulty on wagons or on pack trains from points on the Potomac River or from Virginia via the old Northwestern Pike.

In 1880 there were in the county 385 farms, with an average size of 233 acres and an average value of \$1,863, including land, buildings, machinery, and animals. In 1900 there were 768 farms containing an average of 122.5 acres, with an average of 46 acres of improved land, an average total value of farm property of \$1,464 per farm, and

an assessed land value of \$7.39 an acre. In 1920, 34.8 per cent of the total land area was in farms, the number of farms had decreased to 724, and the average size increased to 124.5 acres including 49.3 acres of improved land. The total value of farm property was \$3,801 per farm, and the assessed land value \$16.25 an acre. The value of farm property was divided in the proportion of 53.2 per cent in land, 22.8 per cent in buildings, 5.5 per cent in implements, and 18.5 per cent in domestic animals of all kinds.

The accompanying table, compiled from the census reports, shows the acreage and production of the leading crops in 1879, 1889, 1899, 1909, and 1919, and indicates the general trend of agriculture in Tucker County during the last 40 years. It will be noted that among the grain crops corn has regularly occupied the largest acreage, the area in oats has increased, and the wheat acreage has been somewhat variable. Hay and buckwheat have steadily increased in importance, and potatoes show a marked and rapid increase in acreage.

Acreage and production of leading crops of 1879, 1889, 1899, 1909, and 1919.

Crop.	1879		1889		1899		1909		1919	
	<i>Acres.</i>	<i>Bush-els.</i>								
Corn	2, 193	63, 632	3, 337	81, 815	3, 714	97, 220	3, 553	105, 521	2, 994	125, 489
Oats	1, 012	15, 221	1, 591	26, 624	1, 554	30, 360	1, 430	25, 512	2, 799	66, 951
Wheat	935	6, 973	585	4, 912	666	6, 670	153	1, 808	712	8, 701
Buckwheat	661	5, 784	364	3, 670	800	11, 060	1, 248	24, 448	1, 346	27, 627
Potatoes		7, 216	167	9, 413	365	32, 966	581	66, 379	646	78, 286
Hay	3, 803	<i>Tons.</i> 1, 253	5, 456	<i>Tons.</i> 4, 885	6, 250	<i>Tons.</i> 4, 862	6, 729	<i>Tons.</i> 4, 871	7, 210	<i>Tons.</i> 6, 795

The following shows the total value of agricultural products in 1919, by classes, as reported by the Federal census:

Value of agricultural products in 1919.¹

	<i>Dollars.</i>		<i>Dollars.</i>
Cereals	351, 964	Dairy products	88, 652
Other grains and seeds	2, 326	Poultry and eggs	93, 887
Hay and forage	217, 305	Wool and mohair	13, 860
Vegetables	280, 277		
Fruits and nuts	38, 709	Total	1, 089, 682
All other crops	2, 702		

The production of hay, corn, oats, wheat, and vegetables (principally potatoes) and the raising of some cattle, sheep, hogs, and horses constitute the chief agricultural interests in Tucker County at the present time.

Corn is the most important cereal crop and is grown in all farming sections of the county except the Canaan Valley and the high plateaus in the northeast. All of the corn raised is used locally for feeding farm stock and fattening cattle. In addition to the acreage harvested for the grain, an area of 905 acres was cut for forage and 126 acres for silage.

¹ This table does not include the value of livestock sold and slaughtered, which in 1910 was \$94,981 and probably was considerably greater in 1919.

Grasses for hay occupy the most extensive area, and hay is the product next in importance to corn. Of the 7,210 acres harvested for hay in 1919, mixed timothy and clover occupied 3,384 acres, timothy alone 2,651 acres, and clover alone 31 acres. All other tame grasses occupied 1,104 acres. Wild marsh grasses grow in profusion in the poorly drained sections of Canaan Valley, and if cut before becoming too tough they make excellent hay. In the wet areas along stream bottoms and around the heads of streams these swamp grasses, bulrushes, and poverty grass comprise the chief growth. Weeds rapidly crowd out the grasses in mowing lands and injure the quality of hay if the land is mowed too long without reseeding. Bluegrass grows on much of the hill pasture land, particularly in those sections influenced to any degree by limestone or calcareous shales.

Vegetables, consisting chiefly of potatoes, do well, particularly in the higher parts of the county around Thomas and Davis and in the Canaan Valley, where the soil conditions and cool climate seem well adapted to their growth. Potatoes are grown for home use, and also constitute one of the more important cash crops of the county.

Rye and barley are grown to a small extent, chiefly for cattle feed.

Fruits, including apples, peaches, pears, cherries, and plums, are grown in home orchards, and some seasons there is a surplus for sale. Strawberries are grown in many farm gardens. Blackberries, raspberries, and elderberries grow wild. Blueberries grow in large quantities on the high mountain tops or "plains" and in the Canaan Valley. Some grapevines are found on most farms.

Poultry is raised on nearly all farms, chiefly to supply home needs, though the sale of surplus poultry and eggs constitutes an important source of income. In 1919 the value of all poultry and eggs produced was \$93,887. Around the larger towns milk and butter bring a good price, but there are no large dairy herds in the county. Holstein and Jersey are the favorite types of dairy cows.

According to the census report, there were 1,299 horses and 33 mules, 2,606 beef cattle, 1,620 dairy cattle, 5,278 sheep, 24 goats, and 2,248 hogs on farms of the county in January, 1920. The total value of all domestic animals on farms is reported as \$477,598.

The livestock raised consists chiefly of grades, although in recent years efforts have been made to improve the stock by introducing registered sires. In the rough mountain sections cattle of inferior character are still by far in the majority. The improved breeds include Hereford, Aberdeen Angus, and Shorthorn, the Hereford being the most popular. A number of silos have been built and have been found a profitable means of supplying succulent feed for cattle during the winter. Some of the cut-over land held in large tracts by lumber companies in Canaan Valley has been seeded to grass by broadcasting the seed over the land without clearing the tree tops or brush. A fairly good stand of timothy, clover, bluegrass, and some redtop has been obtained in one notable instance, and furnishes excellent pasturage for cattle and sheep. The sheep are largely used to clear up the brush and weeds in cut-over or brushy land. They yield good returns in meat and wool, and it would seem that they could be raised even more extensively than at present.

The grade of hogs has been improved in the last 10 years, and now a considerable proportion of the animals are one-eighth to one-half

Duroc-Jersey or Poland-China, with a scattering of grade Chester White. Hogs are raised chiefly for meat supply for the home or for sale, dressed, at the local markets. Horses sufficient to meet the local demand are raised on the farms. They are mainly of a mixed draft and saddle-horse type.

Chestnut, walnut, and hickory trees are often left standing in pastures and along fences for the nuts which they produce. In the forests these trees, together with the oaks, produce excellent mast, which serves as a means of fattening hogs and is said to impart a particularly fine flavor to the meat.

The topography and the character of the soil have a direct influence upon the agriculture of the county. The county may be divided into three sections: The western part, including the Cheat River bottoms and terraces and the uplands of shale soils, with some areas derived partly from limestone; the high plateau region, with soils derived mainly from shale and sandstone; and the Canaan Valley, with soils derived from red shales and gray sandstones and shales.

The first area contains the best developed farming section, in particular the Cheat River bottoms and terraces, which are considered among the most productive and easily worked soils in the county. The bottoms are considered best adapted to corn and grass, although some wheat, oats, and potatoes are also grown upon them. The terraces are well suited to all of the general farm crops. Where a farm includes a strip of bottom, together with some terrace and upland, it is considered a very good combination for general farming. The shale ridges and uplands are well suited to buckwheat, grass, and rye, and the upland derived in part from red shale and limestone is adapted to grass and general crops and well suited for cattle and sheep pasture.

The high plateau section has been recognized as excellent for potatoes, grass, oats, and buckwheat. It is now held in large tracts by lumber and coal companies and is little used for farming. The Canaan Valley, with its soils derived from limestone and red shale and sandstone, is adapted to oats, grass, buckwheat, and potatoes, but its climate is not favorable to corn. Much of the grass land is devoted to pasture, and grazing of cattle is an important industry of this section. However, the soils in all sections of the county are used to some extent for all of the general crops, except that corn can not be grown with any certainty of maturing before frosts in the Canaan Valley and plateau sections. Where the topography is very broken or rocky and hillsides or mountain slopes are extremely steep the land is left in forest or brush.

Over the larger part of the county the land is steep, hilly, or rolling, so that much of the cultivation must be done by hand or with light horse-drawn implements. Labor-saving machinery can not be used economically, and the wheat, oats, and buckwheat are cut with cradle or reaper. However, on the smoother ridges and the wide, flat bottoms and terraces the topography is well suited to the use of machinery, and cultivators, binders, and mowing machines can be used advantageously.

In many sections no definite crop rotation is practiced, corn being grown several years in succession before being followed by oats and grass. When finally seeded to grass the land is usually cut for hay until weeds render the quality poor and a diminishing crop makes it

unprofitable, when the sod is again plowed for corn. In many instances no grass or grain crop is seeded after corn, and the land sometimes washes or gullies, depreciating its value or making it difficult for subsequent cultivation. In the more progressive sections, however, a rotation of corn, wheat, oats, and clover and timothy is used, the grass being cut two or three years before the sod is broken.

The topography and the soil govern to a large extent the equipment found on farms. In the rougher, more hilly regions, where the soil is thin and unproductive, the buildings are small, in most cases unpainted, and farm tools are few and light. On the bottoms and terraces and on the limestone areas of upland, however, the houses are painted and well kept, silos and large well-built barns and farm buildings for stock, feed, and machinery are maintained, and the most improved farm implements, including tractors, are used.

In preparation for corn the land is broken during winter or spring and fairly well prepared by use of drags and harrows. Where barnyard manure is made in quantities it is usually put on the corn land and plowed under. Little commercial fertilizer is used. The corn is planted during the latter part of May or early June, cultivated with single or double shovel 1-horse plows, and hoed until nearly shoulder high. It is generally cut from about the middle or last week of September through the first week of October. When wheat is to follow corn, the corn is cut and stacked or shocked in rows from 10 to 16 hills apart and the stubble land between is disked and prepared for seeding. Sometimes acid phosphate is applied at the rate of 100 to 200 pounds per acre at the time of seeding the wheat.

Little barnyard manure is made, as the stock for the most part runs unconfined in feed lots or pasture. Not much commercial fertilizer is used. According to the census, the average expenditure for fertilizer in 1919 was \$30 per farm for the 493 farms reporting its use. Where limestone is available, some farmers utilize rainy days to haul lime and coal for local kiln burning. Lime is not in general use through the county, owing largely to the long distance the rock must be hauled and excessive cost when shipped in. Excellent returns have been obtained from the use of lime, and the applications have generally proved profitable.

Most of the farms are either small or of moderate size. Land holdings range from these relatively small tracts used for farming to the large areas held by lumber and coal companies. Most of the timber of commercial value, except some in the northwest part of the county, has been cut.

The census report shows that 91 per cent of the farms were operated by owners in 1920, 7.6 per cent by tenants, and 1.4 per cent by managers.

The value of the farm land ranges from about \$15 to \$100 an acre, depending upon character of the soil, topography, improvements, and nearness to main public roads. The rough, rocky, cut-over land which is not underlain with coal has a very low value, ranging from \$2 to \$5 an acre. Some of the better situated bottom or terrace farms have sold for prices ranging from \$75 to \$125 an acre. The average farm land over the sandstone and shale ridges will bring from \$15 to \$40 an acre.

SOILS.

The upland soils of Tucker County have been derived from the underlying shale, sandstone, and limestone of the region through processes of rock decay and soil development. These soils, mainly yet in a stage of incomplete profile or soil-section development, like all soils in a corresponding stage of development, owe their main characteristics to the nature of the parent materials, or the underlying rocks, from which they have developed. This is particularly true of the texture. The soils throughout the region consist of the disintegrated rock material, slightly modified by the processes of true soil development, which processes change so profoundly the products of rock disintegration in regions of smooth topography where the soil may lie in place long enough to receive the full impress of soil-making forces. The sandstone formations have given rise to sandy types and the fine-textured shale rocks have given silty and clayey soils.

Probably the most striking evidence tending to show the slight changes that have been affected in this region by the real soil-making forces is the identity of color of some of the soils of the county with that of the underlying rock, the soil-making processes not yet having brought about any change. The peculiar Indian-red shade of the red rocks is also the color of the resultant soils. The limestone, on the other hand, has given a heavy-textured soil of a strong brown color very different from that of the rock. Of all the soils of the county these soils show the greatest degree of modification by soil-making forces; witness the absence of lime carbonate. During the process of decay the calcium carbonate in the original rock has been removed to such an extent that the soil at no place through its profile or vertical section contains enough to cause effervescence with hydrochloric acid.

Some changes have of course taken place everywhere in the fine residual material formed through decay and disintegration of the underlying rocks and the processes of weathering through which this fine material has gone in the development of the existing soils. There has been less change on the steeper slopes, where erosion, slides, and gravitational creep have combined to cause the accumulation of disintegrated material to proceed at a slow rate, often not greatly exceeding the rate of rock decay. On more flat situations, however, and in places where the angle of repose and a not too rapid rate of erosion have permitted the soil-forming material to stand long enough, a grayish-brown to yellowish-brown surface layer has developed in case of the soils derived from the light-colored sandstones and shales. This brownish layer, which lies beneath the leaf mold of the forest, varies in thickness from less than an inch to about 4 inches, and is underlain by material of yellow color. At depths of about 6 to 10 inches this passes into somewhat heavier textured material of yellow color, which generally shows but slight change downward to the parent rock. In places there is a little more clay at lower depths, or a layer of looser coarser textured material is present immediately over the basal beds, which includes varying proportions of incompletely decomposed rock fragments. In some places of exceptionally

good drainage a reddish color has developed in varying degrees of intensity from a mere reddish cast to a reddish yellow and, rarely, to light red.

This gives at least three distinct sections or horizons to that part of the soil material overlying the rock or the first product of rock decay, the coarser textured layer immediately over the basal beds. The thin top section derives its somewhat darkened color through accumulation of organic matter from decaying vegetation or to stains of decaying vegetation. It appears that the higher content of fine particles in the third section may be due to removal of these finer particles from the surficial layers by downward percolating water—in other words, by a process of eluviation.

These soil characteristics through the vertical section predominate over the relatively smooth situations where the soil has lain in place for long periods in a comparatively undisturbed condition. Larger areas are constantly being disturbed by the washing off and tumbling down of material from the surface on steep slopes, giving rise to mixed soils on the lower slopes, where the underlying rock may not be the same as has contributed the bulk of the superimposed soil, and where it is frequently difficult to outline areas of definite soil characteristics or to draw sharp boundaries of separation between distinct types.

The climate obviously has played an important rôle in modifying the soil material, particularly in the coarser soils at high elevations. A very striking result of this climatic effect is found at elevations of about 3,500 feet on the flattish plateau of Canaan Mountain between Davis and Canaan Valley. Here the soil is exceedingly stony, but between the rocks comparatively coarse textured soil is present, which in places has the following characteristics: Beneath the leaf mold is a thin layer of gray material of less than an inch to about 2 inches thickness, overlying a coffee-brown to deep-yellow layer of faint compactness and apparently high content of organic matter. The second layer is usually about 4 to 6 inches thick, grading below into yellow or first into ochreous-yellow and then into yellow material having the texture of sandy loam or fine sandy loam to light loam, not distinctly compact. The gray layer is usually quite sandy, and apparently has been leached of its organic material which has apparently accumulated in the coffee-brown section immediately below. Soil having the features described has been designated by the Russians as podsol, and its genesis ascribed to soil-development processes taking place under forest cover in a cool climate.

Most of the upland soils have developed under conditions of good drainage and aeration. Oxidation has gone on actively through the upper layers and in a less degree through the lower section, at least down through the distinctly yellow material of the zone of oxidation. Where the subsoil is especially heavy or fine textured less air has penetrated, and consequently there has been less oxidation. The material of the less oxidized layers is of lighter color. In some places, as in case of the poorly drained Lickdale soil, there has been an almost complete exclusion of air, the pore space having been filled much of the time with water. Here the imperfectly oxidized soil developed light-gray and bluish-gray colors, and rusty-brown and black concretionary material has formed locally. Such features are the products of inhibited oxidation and are never present in the better drained soils.

The recently formed alluvial soils consist of stream-deposited materials washed from the uplands. Their color has been influenced locally by red material washed from the Upshur soils, which, even in small quantities, carries its distinctive color in the alluvial soils far down the stream bottoms where the drainage is good. In wet situations it tends to lose its red color and to take on gray and bluish colors, as do the other alluvial soils which under good drainage conditions have original colors of brown and yellow.

On the old flood plains left as benches or terraces by the lowering of the stream channel through continued wearing down the soils in well-drained situations tend to develop along the same lines as the uplands, that is, they develop through the vertical section distinct layers of differing color and textural characteristics. The first bottoms are subject to change by repeated addition or removal of material by floods, and therefore have not developed as distinctive profile characteristics as the soils that have lain in more or less undisturbed condition for long periods. These overflowed soils, being constantly altered, are more or less comparable to the lower slope soils in those situations where material is being repeatedly placed over the surface by wash and creep from above.

For purposes of classification and mapping, the soils are arranged in groups called series, which include soils of different textures but having the same range in color and structure, a similar origin and manner of development, and similar drainage conditions. The soil series thus consists of soil types that differ from each other only in texture or the relative proportions of the coarser and fine particles composing the surface soil. The type is the unit of mapping.

The Dekalb, Upshur, Lickdale, and Lowell series include all of the upland soils, with the exception of the areas mapped Rough stony land. All of these soils are low in lime, the Upshur having the largest content.

The Dekalb series consists of types having grayish to yellowish or yellowish-brown surface soils, over a yellow or light-yellow moderately friable to rather stiff subsoil. They are derived from gray sandstone and olive-green and yellow shales. Five types have been mapped, including the stony silt loam, silt loam, loam, stony loam, and silty clay loam. A valley phase of the loam is also shown on the soil map.

The Upshur soils are derived chiefly from red calcareous shales and sandstones and in places are influenced by material derived from limestone. They have chocolate or brownish Indian-red surface soils and an Indian-red rather stiff subsoil. The silt loam, with a valley phase, stony silt loam, and silty clay loam are mapped in this county.

The Lickdale soils have grayish or mottled gray and yellow surface soils and a mottled bluish-gray and yellow subsoil, which is usually heavy and impervious. They occur on the lower slopes, between Dekalb soils and stream bottoms, and owe their color to imperfect drainage conditions. One type, the silty clay loam, is mapped.

The Lowell series includes limestone soils with light-brown or yellowish-brown surface soils and a yellowish-brown or brownish-yellow, stiff, heavy subsoil. One type, the silty clay loam, is mapped.

The terrace soils occur on second, third, fourth, and higher old alluvial bottoms, and range in position from just above to benches over 300 feet above the present stream bottom. They are no longer subject to overflow. These terraces are made up of old-alluvial deposits consisting of material derived chiefly from the upland soils developed from the sandstones and shales of the region. The soils are classed in the Holston and Tyler series.

The Holston series consists of types with yellowish-brown to light-brown surface soils and a yellow or yellowish-brown rather compact subsoil, which in places at lower depths is somewhat mottled with gray and reddish yellow. It is represented in this area by the silt loam. The Tyler series includes types with grayish-brown to gray surface soils and a mottled bluish-gray and yellow subsoil resistant to good underdrainage. The Tyler silt loam is mapped in this county. The Holston soils have good drainage and the Tyler soils have poor drainage.

The first-bottom or recent-alluvial soils consist of materials carried down by the streams from the adjacent uplands, chiefly from soils derived from sandstones and shales, with some limestone. These soils are subject to overflow and repeated deposition of material from these overflows. Four series are recognized.

The Moshannon series consists of well-drained bottom lands with brown or brownish Indian-red soils and Indian-red friable subsoils. The color is due to wash from Upshur soils of the neighboring uplands. Two types, the loam and silt loam, have been mapped.

The Atkins series includes gray or grayish-brown surface soils with mottled gray and yellow, plastic, impervious subsoils. They have poor drainage and occur along streams which drain uplands consisting of Dekalb soils. One type, the silt loam, is mapped.

The Holly series is characterized by soils which are gray in the surface and mottled bluish gray and yellowish brown in the subsoil. Generally it is poorly drained, being known locally as crawfishy land. The Holly silty clay loam is mapped. The Holly soils differ from the Atkins in that part of the material is washed from soils of limestone origin.

The Dunning series is represented in this area by the silty clay loam. The types of this series have black to dark-gray surface soils and bluish-gray subsoils somewhat mottled with yellow or yellowish brown. They occur in poorly drained stream bottoms which receive wash from soils derived from sandstone, shale, and limestone.

Besides the soils already described two miscellaneous materials or conditions are shown on the map. One of these is Muck and the other Rough stony land.

Muck consists of black, more or less decomposed vegetable remains. It is somewhat peaty in places, that is, it is fibrous and less thoroughly decomposed than true Muck and has a lower content of mineral soil material.

Rough stony land consists of such areas of rocky mountain crests, steep slopes, and cliffs as are unsuitable for agriculture. The plateau areas, although strewn with large boulders, are not so steep and have more soil between the rock fragments and outcrops to support vegetation, but they are practically nonagricultural.

The accompanying table gives the names, thickness, and composition of the rock formations, as geologically classed, which underlie the uplands of Tucker County, and the soils formed by their weathering.¹

Geological classification of rock formations.

Age and formation.	Thick-ness.	Composition.	Principal soils formed by weathering of or influenced by the underlying rocks.
Carboniferous:	<i>Feet.</i>		
Monongahela ..	400	Sandstone and gray shale	Dekalb stony loam.
Conemaugh	840	Chiefly red and gray shale, some sandstone and thin limestone.	Dekalb silty clay loam and silt loam.
Allegheny	150	Red shale and sandstone	Lickdale silty clay loam.
Pottsville	660	Gray shale and sandstone, hard coarse-grained sandstone and conglomerate predominating.	Dekalb loam and stony loam.
Mauch Chunk	975	Red and green shale and sandstone predominating, some thin limestone.	Rough stony land.
Greenbrier	50 to 100	Hard blue limestone predominating, some red shale and green sandstone.	Upshur silt loam and silty clay loam.
Pocono	75 to 250	Hard sandstone and conglomerate over gray shale.	Upshur silt loam (mixed limestone variation) and silty clay loam.
Devonian:			Dekalb loam, Dekalb stony loam, and Rough stony land.
Catskill	600	Red sandstone and shale, with some gray shale.	Upshur silt loam.
Chemung	3,000	Olive-green and drab shale and thin limestone.	Dekalb silt loam and stony silt loam.

In the subsequent chapters of this report the different soils are described in detail and their relation to agriculture brought out. Their distribution is shown on the accompanying soil map. The following table gives the actual and relative extent of each soil type mapped:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Rough stony land	101,888	37.8	Holly silty clay loam	4,352	1.6
Dekalb stony silt loam	68,096	25.3	Dunning silty clay loam	4,224	1.6
Dekalb silt loam	18,240	6.8	Holston silt loam	3,072	1.1
Upshur silt loam	13,440	5.2	Atkins silt loam	1,600	.6
Valley phase	576		Moshannon silt loam	1,088	.4
Dekalb silty clay loam	11,456	4.2	Muck	896	.3
Upshur stony silt loam	10,368	3.8	Lickdale silty clay loam	512	.2
Dekalb stony loam	7,872	2.9	Lowell silty clay loam	512	.2
Dekalb loam	7,232	2.8	Tyler silt loam	64	.1
Valley phase	256				
Upshur silty clay loam	7,296	2.7	Total	269,440
Moshannon loam	6,400	2.4			

DEKALB STONY LOAM.

The Dekalb stony loam is a light-brown to yellowish-brown loam or fine sandy loam with a friable sandy clay or silty clay loam subsoil. Angular fragments of sandstone are present on the surface and through the soil and subsoil, rendering the type in its natural condition very difficult to cultivate or unfit for cultivation.

¹ Geological data from Geological Survey of Tucker County, W. Va., by D. B. Reger.

In some areas the surface is rather sandy owing to the sandy nature of the parent rock, which is everywhere encountered within the 3-foot depth, and the texture of the type is generally variable. Where the rock fragments have been removed from the surface, the soil closely approximates that of the Dekalb loam. Where the type occurs close to areas of the Dekalb silty clay loam or silt loam, it includes small patches of stony silty clay loam or stony silt loam which are too unimportant to separate.

This type is derived largely from the Pocono and Chemung formations. It occurs chiefly in the Canaan Valley, on the slopes of low hills along Blackwater River, whose tops are occupied by Dekalb loam, and also on low narrow ridges and lower slopes of mountains, the upper slopes and tops of which are occupied by Rough stony land. It is also widely scattered over the western part of the county, where it occupies ridge crests, knobs, and steep slopes.

The Dekalb stony loam has a small total extent and is of little agricultural importance. It is well drained, owing to the topography and porous nature of the soil and subsoil, and is rapidly gullied and washed in cultivated fields. Crops often suffer in very dry seasons.

Most of this type is in forest or second growth and brush, and only a small part of the cleared land is in cultivation. Upon being cleared it is usually farmed for a few years, although the numerous fragments of sandstone are hard on tools and implements, and then abandoned to pasture and allowed to grow up in brush. Cultivation, seeding, and harvesting are largely done by hand, and with more or less difficulty, depending on the stoniness and steepness of the land. Corn, oats, and buckwheat are the chief crops, and the yields are low except on newly cleared land. Little or no fertilizer or manure is applied. Good yields of oats and fairly good crops of clover and timothy hay and buckwheat are produced on the less hilly areas from which the stones have been largely removed. In some parts of the State orchard fruits, particularly apples and peaches, do well on the slopes and ridges of this type where the proper exposure and air drainage are obtainable. Most of this type is best suited to sheep and cattle pasture and to forestry, as its cultivation is very difficult and generally unprofitable.

DEKALB STONY SILT LOAM.

The Dekalb stony silt loam consists of a brown or light-brown to yellowish-brown silt loam passing at 2 to 4 inches into pale-yellow silt loam, at 8 to 10 inches into pale-yellow silty clay loam, and a little below this into yellow silty clay loam. Fragments of shale and slabs of fine-grained sandstone are so abundant in the soil and subsoil that it is generally impossible to penetrate it with a soil auger to depths greater than 10 to 12 inches, and the bedrock is often encountered at 3 to 18 inches below the surface. The fragments of sandstone and shale scattered over the surface greatly interfere with farming operations.

Included in this type are small patches of fairly smooth and relatively deep soil similar to the silt loam type, as well as some areas where the disintegrating sandstone has imparted a loamy or even sandy texture to the soil. Such areas are too small to be mapped separately. Some areas in hollows at the heads of streams have an accumulation of dark leaf mold upon the surface. Such areas are

more productive than the average of this type, apparently because of the good supply of organic matter. In several places small remnants of old, high stream terraces have been included. These contain only a few rounded boulders and gravel and the material has been derived mainly from the local sandstones and shales.

With the exception of Rough stony land, the Dekalb stony silt loam is the most extensive soil in Tucker County. It occurs in large areas to the west of Backbone Mountain and includes most of the slopes and ridge tops through the western part of the county. In many places it occupies the lower slopes where the silt loam type is mapped upon the ridges and upper slopes. Other areas lie in the vicinity of Thomas in the northern part of the county and a few scattered areas occur on the slopes along Dry Fork. The type is derived chiefly from the Chemung formation. It occupies steep slopes and narrow ridges through the sections of hilly or broken topography. Drainage is well developed and in places is excessive, owing to the steepness of the slopes.

Only a small proportion of this type is farmed because of the unfavorable topography and the large quantity of stones on the surface and mixed with the soil. The forest growth consists of chestnut oak and other oaks, witch-hazel, butternut, beech, hickory, maple, chestnut, hemlock, spruce, tulip poplar, ash, sumac, and rhododendron. Most of the original forest has been removed and the land allowed to run into brush or second-growth trees. About one-third of the type is cleared and about one-fifth is farmed, the rest of the cleared area being devoted to grazing.

When first cleared this soil produces fairly well, in spite of its stony nature, but in a few years the yields fall so low and the work of cultivation becomes so difficult that the fields are relegated to pasture and new ones are cleared. The farmed areas are devoted to corn, oats, buckwheat, and wheat, ranking in acreage about in the order named. Yields of 20 to 40 bushels of corn, 20 to 30 bushels of oats, 15 to 25 bushels of buckwheat, and 8 to 10 bushels of wheat are about the ordinary range for the type. Buckwheat does well in the higher situations. Potatoes give good yields of excellent quality. Cultivation is done with light 1-horse tools or with hand hoes and harvesting is done entirely by hand. Mixed timothy and clover produce most of the hay, with some redtop and orchard grass. After a few years in corn and oats or other grain the land is seeded to grass, and after a few years cutting it is left in permanent pasture. The soil washes badly on steep slopes. In summer and late fall the pasturage becomes scant in dry seasons. Methods of improvement similar to those described under the Dekalb silt loam type are suggested for the stony silt loam. Most of it should be kept in forest or used for cattle range, and the steeper and more stony areas should be used only for forestry.

This land ranges in price from \$10 to \$40 an acre, depending upon the topography, proportion cleared, and the quality of the timber growth. The heavily timbered areas and those underlain with coal bring the higher prices.

DEKALB LOAM.

The Dekalb loam consists of a light-brown to yellowish loam about 8 inches deep, underlain by yellow or light-yellow friable fine sandy

clay loam grading into pale-yellow friable fine sandy clay. Bedrock is encountered at about 20 to 30 inches. Where the type occurs on slopes or narrow ridge crests, fragments of the underlying rock are present through the soil and subsoil, and to a very small extent on the surface, in the form of small angular gravel or small pieces of flaggy sandstone. Some areas approach a fine sandy loam in texture. Near areas of Upshur soils the subsoil has a slight reddish cast in places.

The principal areas of Dekalb loam are mapped in the Canaan Valley, in the vicinity of Davis, and on some of the low hills or shoulders above Dry Fork and Red Creek. Other areas are located on Pifer Mountain, in the vicinity of Limestone Mountain, and scattered through the western part of the county. This type is derived chiefly from the rocks of the Pocono formation. It occupies low smooth ridges in the Canaan Valley and rounded shoulders or hill-tops and ridge crests in the other parts of the county. The type is well drained, owing to the porous friable nature of soil and subsoil and the favorable topographic position. It is not generally affected much by washing or erosion.

The greater part of the Dekalb loam has been cleared of its timber and is in cultivation or pasture. A large part of the type in Canaan Valley, however, consists of cut-over land that has not been entirely cleared and is used for cattle pasture. The native forest growth consists of oak, chestnut, some hemlock, and poplar. The chief crops are corn, grass, oats, and potatoes. In the Canaan Valley corn is grown only for silage, owing to the short growing season. This type is easy to cultivate and is well suited to the production of potatoes and the general farm crops. It yields 25 to 40 bushels of corn and 15 to 30 bushels of oats per acre. Potatoes ordinarily return 100 and 175 bushels per acre, although higher yields have been obtained where the land was manured and fertilized. Buckwheat does well, and wheat does fairly well if fertilized and protected from winds, which are likely to blow off the snow cover in winter. The principal grasses are mixed timothy and clover and redtop, which cut about three-fourths to 1 ton per acre.

This soil is rather low in natural fertility and lacking in organic matter. In seasons of prolonged drought the crops are likely to suffer, particularly where the bedrock lies near the surface. Frequent cultivations are therefore required to prevent too rapid loss of soil moisture. The type is adaptable to any of the general farm crops where the climatic conditions are favorable, and in the hilly western parts of the county it is considered one of the most desirable soils. Little manure is applied and only small quantities of 16 per cent acid phosphate, chiefly on the small grains.

This type, when in fairly large areas and well located, ranges in price from \$30 to \$50 an acre, with correspondingly lower prices in the rougher, more hilly sections of the county.

The growing of legumes and the turning under of considerable quantities of manure or cover crops such as rye or clover would increase the content of organic matter and of nitrogen. Applications of lime would show profitable results, and liberal quantities of fertilizer, when obtainable at normal prices, should be used to bring the soil to its highest state of productiveness. Potatoes and other vegetables are well adapted to this soil, and could be grown profitably if the distance to market were not too great. Fruits, particularly apples

and peaches and small fruits such as strawberries, also would do well. Of course, situations having good air drainage should be selected for orchard sites.

Dekalb loam, valley phase.—The valley phase of the Dekalb loam differs from the typical soil in position and to some extent in its mode of formation. It occurs in a few places in Canaan Valley upon nearly flat or gently sloping land at the foot of hill slopes and consists largely of colluvial material carried down from the rough, stony uplands. The principal areas are near Buena. In color and general characteristics it is similar to the typical Dekalb loam and is handled and cropped the same. It probably averages deeper to bedrock than the typical Dekalb loam.

DEKALB SILT LOAM.

The Dekalb silt loam is a grayish-brown to yellowish-brown silt loam, 1 to 4 inches deep, overlying pale-yellow silt loam, which passes at 6 to 10 inches into yellow, moderately friable silty clay loam grading into silty clay which is slightly stiff at lower depths. This soil is derived chiefly from noncalcareous shale and sandstone of the Chemung formation. Partly decomposed fragments of shale are encountered from the surface downward. Bedrock is usually reached within the 3-foot section, being nearer the surface than is the case in many other parts of the State. On the steeper slopes rock fragments are found in places on the surface and the bedrock lies nearer the surface than usual. In some areas the clay in the subsoil has a reddish cast.

Areas are included with this type which vary somewhat from the typical. Where sandstone predominates the soil may approach the texture of a loam and where clay lies close to the surface or predominates the soil is heavier and somewhat stiffer, approaching the character of the silty clay loam.

The type occurs chiefly in the western half of the county where the Chemung sandstones and shales outcrop. The principal areas lie on the north slope of Limestone Mountain, around the head of Right Fork of Bull Run, the western part of Pifer Mountain, the smoother slopes on each side of Haddix Run from Moore toward the Randolph County line, and the hill crests on each side of Coketon, near Thomas. Other areas occur along Horseshoe Run near Leadmine, on the smoother benches and ridges overlooking Dry Fork and Red Creek, on the east side of Shavers Fork south of Porterwood, and on some of the smoother hill crests in the vicinity of Texas, and some small areas are mapped in the northwestern part of the county.

This type occurs in positions varying from steep mountain sides, such as that near Moore, to smooth hilltops, ridges, and gently rolling uplands like those at Coketon. It occupies the less broken areas within areas of the stony silt loam type. The drainage is well established on the greater part of the type, owing to its favorable position on hill crests or slopes and in some degree to the permeability of the subsoil. Unless the land is properly cared for it may suffer from washing and gullying. Grass and trees constitute the best crops for these steeper slopes. The forest growth includes dogwood, hickory, chestnut, black walnut, chestnut oak and other oaks, maple, and sourwood. Wild grapevines are plentiful.

Most of the type is cleared and in grass for hay or pasture; about one-third of it is used for cultivated crops. It is a soil of agricultural importance, particularly in the western and northwestern parts of the county around Texas, Moore, and Limestone Mountain. It probably would be farmed more because of its favorable topography and smoothness but for the fact that much of it occurs on the tops of mountain ridges or hill crests, rendering it difficult for the farmers, who usually live in the valleys, to reach it over the rocky mountain roads with their wagons and farming implements or to haul away the crops after harvest.

Corn, oats, hay, and buckwheat are the principal crops grown on this type. Corn yields from 20 to 45 bushels per acre, depending upon the season, the length of time the land has been in cultivation, and the methods employed. On newly cleared land yields upward of 60 bushels of corn per acre are reported, but the yield is said to decline quickly, because little barnyard manure or commercial fertilizer is used. Oats yield 15 to 40 bushels per acre. The crop is cut for hay, fed in the sheaf, or threshed. Buckwheat is particularly important in the areas of higher elevation on ridge crests and hilltops. Some wheat is grown, usually only enough for home needs; it is the least important of the small grains. Potatoes of excellent quality are grown, principally for home use, with yields ranging from 75 to 100 bushels per acre. Probably half of the improved land of this type is in grass. The principal seeded grasses—timothy, clover, and redbud—yield from three-fourths ton to $1\frac{1}{4}$ tons of hay per acre. Bluegrass does not do very well upon this soil, except where the land has been limed. This type is not a strong grass soil; the sod becomes thin where allowed to continue too long without reseeding, and in dry seasons the grass burns up and pastureage becomes very scant.

This type is suited for cultivation and is free from stones upon the surface, except upon the steeper slopes. For corn it is plowed in winter and planted late in May. For wheat or rye the land is disked after corn is cut. On the higher and more exposed ridges the snow is generally removed by wind, and wheat often winterkills. Oats are seeded in the spring and buckwheat in July. Little barnyard manure is made on most farms, as only a few head of cattle, chiefly milk cows, are wintered, and feeding is usually done in the open. What manure is saved is usually scattered on the corn land. High cost of fertilizer, freight charges, and long hauls from the railroad over hilly roads usually limit to a very great extent the use of commercial fertilizers. The fertilizer used is generally applied with the wheat. Little lime is used.

The Dekalb silt loam ranges in price from \$20 to \$50 an acre, depending upon the improvements, location, topography, and nearness to main roads and towns. Where timber or coal is present the price may be considerably more.

Although this soil is thin and often rather unproductive, it can be brought to a higher state of fertility and productiveness by the application of manure or the turning under of green-manure crops and by the use of lime, either crushed fine or burned. The soil should never be allowed to go uncovered through the winter, as this increases gullyng, and any ditches or gullies formed on hillsides should be quickly filled with brush to prevent their extension and the rapid

loss of the surface soil. Rye should be used extensively as a cover crop and as a source of fall and winter pasture. The greater use of legumes, such as cowpeas or soybeans, would improve the condition of the soil and increase the nitrogen content. Application of 160 to 240 pounds per acre of the 16 per cent acid phosphate would probably be profitable for wheat under ordinary conditions.

DEKALB SILTY CLAY LOAM.

The Dekalb silty clay loam consists of a brown or grayish-brown silt loam, about 2 inches deep, over yellowish-brown or brownish-yellow silty clay loam, passing at 5 to 8 inches into a subsoil of bright-yellow or yellow friable silty clay which becomes paler yellow in the lower subsoil. The parent shales are frequently encountered at 18 to 25 inches below the surface and may outcrop on the steeper slopes. Small patches of Dekalb loam and silt loam too small to be separated are included. The type is derived from the heavy shales of the Conemaugh and Monongahela formations, which in places contain thin beds of limestone.

This type is rather extensive over the hilly or rolling plateau extending north and northeast from Thomas and Davis to the county line. A small area is mapped in the St. George district on a ridge northwest of Fairview Church, overlooking Mill Run.

The topography is rolling to hilly and steep, with the rougher slopes being composed of Dekalb stony silt loam or Rough stony land. The drainage is well established, but the run-off is not usually excessive, except on the steeper slopes that have been farmed and allowed to pass through the winter uncovered, under which condition erosion begins and gullies are formed.

A small part of the type has been cleared and put into cultivation. Most of it is held in large tracts by lumber and coal companies who have removed all of the merchantable timber, but have made practically no attempt to clear off the brush and tree tops. Much of it has been burned over and now supports a growth of ferns, briars, and some "fire cherry" bushes. Originally it supported a valuable growth of hemlock, spruce, some beech, hickory, chestnut, and various oaks. It produces excellent grass sod, including some bluegrass.

The high elevation makes the production of corn for grain almost impossible in the plateau region, but oats, buckwheat, grass, and potatoes yield large returns. The soil seems particularly well adapted to potatoes, which thrive under the climatic conditions, and yield from 75 to 200 bushels per acre. Little lime or fertilizer is used. Oats yield 25 to 50 bushels, and buckwheat 20 to 30 bushels per acre. The heavy production of grasses makes this land profitable for grazing. On the less well drained areas poverty grass grows rank, and if cut before it becomes too woody, makes fairly good winter roughage for cattle. The soil is plowed in the winter or early spring and is subjected to freezing and thawing. Its heavy nature makes cultivation rather difficult, and if the land is broken when wet it tends to clod. The seed bed must be carefully prepared and clods broken up if a good crop is to be expected.

Land of this type for agriculture ranges in price from \$20 to \$40 an acre, but most of it is underlain with coal and commands much higher prices.

This soil is adapted to cattle raising, as the rainfall, which is heavier than in other parts of the county, is well distributed, and grasses do very well, the pastures, too, lasting well through the season. Where applications of manure together with lime and some phosphatic fertilizer have been made heavy crops of oats and buckwheat, followed by large yields of timothy and clover, have been obtained. The growing of potatoes should be increased upon this soil, particularly in its largest development near Davis and Thomas, where markets and railroad facilities are convenient. Liberal applications of manure, the growing of legumes, and the turning under of green crops or heavy grass sod will improve the tilth and render cultivation much easier. The soil is strong and durable, and if properly handled should be one of the most productive in Tucker County.

UPSHUR STONY SILT LOAM.

The Upshur stony silt loam consists of reddish chocolate brown silt loam, grading at 8 to 12 inches into Indian-red silty clay loam. In places some fine sand is noticeable in the subsoil and fragments of slabby fine-grained gray sandstone are scattered over the surface and through the soil. The bedrock lies commonly at depths of 2 to 3 feet below the surface. In some places the wash from Dekalb soils lying at higher elevations has somewhat influenced the surface soil.

This type is best developed along the west and south slopes of Backbone Mountain, in the basin of Ellick Run, and on the slopes north of Dry Fork near Richford. Smaller areas are mapped in the northwestern part of the county in the vicinity of Limestone Mountain, Auvil, and Hannahsville. It generally occurs on hill slopes whose crests and upper slopes are covered with Upshur silt loam or silty clay loam. The topography is usually steep and drainage good.

Much of this type remains in virgin or second-growth forest. Cleared land is usually devoted to pasture and sustains an excellent stand of bluegrass and other grasses. When the stone fragments are removed from the surface and the soil put into cultivation it produces yields of the general crops somewhat smaller than those obtained on the stone-free soil. It is rather difficult to farm, owing to its steep topography and large quantity of stones. This type is best adapted to pasture or forest, and this fact seems to be well recognized by most farmers.

UPSHUR SILT LOAM.

The Upshur silt loam is a reddish chocolate brown silt loam, 8 to 10 inches deep, over a subsoil of Indian-red silty clay or silty clay loam, which normally contains large quantities of Indian-red shale chips, the quantity increasing with depth. In places the unweathered shale beds are encountered at depths of 24 to 30 inches.

Included with this type, particularly in the vicinity of Cortland and Cosner Schools in Canaan Valley, are small areas of a loam texture. A few small and irregular areas in which the surface layer, a few inches thick, has been influenced somewhat by wash from the Dekalb soils at higher levels are also included.

The Upshur silt loam is derived from the Mauch Chunk and Catskill formations and is developed to a considerable extent in the Canaan Valley, on the slopes on both sides of Dry Fork and Red Creek, the west

face of Backbone Mountain, on the ridges in the northwestern part of the county east and west of Limestone Mountain, north and east of Pifer Mountain, and on the east face of Laurel Ridge in the western part of the county. The topography varies from gently rolling hill crests and low ridges to rather steep hill sides and lower slopes. The drainage is well developed.

About three-fourths of the type is cleared and in cultivation or grass. The rest supports a growth of oaks, chestnut, maple, tulip poplar, beech, and grapevine. Most of the timber of value has been cut.

This type is recognized as one of the best and most productive of the upland soils, particularly for the production of general farm crops, such as corn, oats, wheat, and buckwheat. The mowings of timothy and clover produce from 1 ton to 1½ tons per acre. About one-half of the type is in pasture. Cattle and sheep thrive on the bluegrass which this soil supports. Corn yields range from 25 to 50 bushels per acre, oats 30 to 60 bushels, wheat 12 to 18 bushels, and buckwheat 20 to 30 bushels per acre. As most of the type occurs on well-rounded and fairly smooth hill crests and ridges, up-to-date farm equipment can be used and progressive methods are followed. The soil is easily plowed and cultivated. Farm buildings are large and well built and the houses are painted. As much of the type lies close to outcroppings of limestone, the use of burnt lime is rather common. Some fertilizer, chiefly acid phosphate, is applied to wheat. What little manure is made is applied to the corn land. A rotation of corn, wheat, oats, and grass is followed by the more progressive farmers.

Where this type occurs in large areas conveniently situated with respect to roads and towns, it ranges in price from \$30 to \$60 an acre.

By applying lime either in the burned or finely ground form and organic matter either in the form of barnyard manure or of green-manure crops, the tilth and productiveness of this soil can be increased. Phosphatic fertilizers have proved beneficial, particularly on the small grains. In other sections of the State large peach orchards are located on this soil type. The use of clovers, cowpeas, or soybeans is recommended for this soil to improve its physical condition and increase its content of nitrogen and organic matter.

The type includes areas in which soil derived from limestone is present in places. The soil of this variation is derived chiefly from the Mauch Chunk red shales, but is modified to some extent by material from the Greenbrier limestone. Generally the limestone is so covered up by detritus from the Mauch Chunk, which occurs above it, that its outcrop is entirely buried and therefore only slightly influences the surface soil.

The soil in these areas is a rich-brown mellow silt loam, underlain at 8 to 10 inches by a purplish-red or light-brown, moderately stiff clay, which passes into a purplish-red rather plastic clay extending to depths of 3 feet or more. In places where the limestone is near the surface the lower subsoil is a yellow silty clay.

This variation occurs in the Canaan Valley, on the west and south slopes of Backbone Mountain and at intervals on each side of Dry Fork from Hendricks to Jenningston and on the slopes north of Red Creek. Other areas are on shoulders about midway up the slopes of Limestone Mountain. In the Canaan Valley sink holes are common. This variation occupies positions varying from low gently rolling

ridges, such as those in Canaan Valley, to steep hillsides and slopes in the areas mapped in other parts of the county. Drainage is well established but usually not excessive.

This variation is recognized as the best of the upland soils. Most of it is either in cultivation or grass. The uncleared land supports a forest growth similar to that on the typical soil.

Corn does not mature in the Canaan Valley, but in other sections of the county yields as high as 75 to 100 bushels per acre have been produced, with yields ordinarily ranging from 40 to 60 bushels. Oats yield 35 to 50 bushels per acre, wheat 15 to 20 bushels, and buckwheat 20 to 35 bushels per acre. This soil is well adapted to alfalfa, and the few patches grown have been very productive and profitable. Excellent hay, consisting of the common mixture of clover and timothy, is produced at the rate of 1½ to 2 tons per acre. Heavy bluegrass sod makes this a very fine grazing soil. Fruit is grown in home orchards. Little fertilizer is used at present.

This soil ranges in price from \$30 to \$80 an acre, depending upon its extent and location.

Although influenced to some extent by lime, this soil responds immediately to applications of burnt lime or crushed limestone. Fairly heavy applications of phosphatic fertilizers have been profitable with the small grains. A few farmers have been plowing under heavy clover sod or other legumes, with excellent increase in yields. The general use of cowpeas and soybeans as a means of soil improvement and maintenance and applications of manure and some lime would increase the fertility of this soil. Alfalfa or melilotus should produce well. In other sections of the State this soil has proved well adapted to apples and peaches.

Upshur silt loam, valley phase.—The valley phase of the Upshur silt loam, which occurs in the Canaan Valley, is identical in general character to the typical soil, but differs somewhat in mode of formation. It occupies low ridges or benches at the base of upland slopes, from which its soil materials have been derived by creep and wash. It is not very extensive. The methods used and the yields are about the same as on the typical soil, except that owing to the short season corn can not be grown with any certainty of maturing before the fall frosts. The soil is particularly adapted to oats, buckwheat, and grass, and supports an excellent bluegrass sod.

UPSHUR SILTY CLAY LOAM.

The Upshur silty clay loam is a light reddish chocolate brown silty clay loam 8 to 10 inches deep, passing into an Indian-red stiff clay. In the subsoil some fragments of Indian-red shale and shale of other colors, which weather to yellowish material, are encountered. When dry the soil is brittle and the surface cracks, but in a wet condition it is sticky and plastic. This type is derived mainly from the Indian-red shale of the Mauch Chunk formation, beds of which often lie within 3 feet of the surface. Where influenced by wash from higher elevations composed of sandstone and shale the surface is brown or yellowish brown. A few stony areas are included.

This type occurs chiefly on the slopes of the mountains which inclose Canaan Valley. Other areas are mapped on Shavers Moun-

tain overlooking Dry Fork and on the east slopes of Laurel Ridge along the Barbour and Preston County lines. The topography is typically steep. Drainage is well developed, and in places the run-off is excessive and rapid, eroding and gullyng the fields unprotected by a winter cover crop or where the grass cover has been allowed to become thin.

Only a small part of the type is cleared and in cultivation, the greater part consisting of cut-over land. Much of it has grown up in wild-cherry thickets. The timber growth includes soft and hard maple, beech, basswood, wild cherry, hemlock, and spruce. Most of it is devoted to pasture and supports an excellent growth of bluegrass, which is native to this soil. In some parts of the Canaan Valley timothy, reedtop, clover, and bluegrass seeded in cut-over areas of this type have produced a fine growth without further attention. Such land is used for pasture, about 3 acres being allowed to one steer.

Like the silt loam type, this is recognized as a strong soil. Outside of Canaan Valley excellent yields of general crops are obtained. Oats produce 30 to 60 bushels per acre, but the straw is much longer than that produced on the Upshur silt loam type, with a tendency to lodge. Corn yields 30 to 65 bushels and buckwheat 25 to 35 bushels per acre. Wheat does well where not so exposed that winds remove the protecting blanket of snow during the winter. As long as the bluegrass sod is flourishing and heavy most farmers allow the land to remain in pasture. The soil is cropped and then reseeded to grasses. Its heavy texture and its tendency to clod decrease its use for general crops.

It is plowed in winter or early spring to allow repeated freezing and thawing to assist in pulverizing it, after which it is disked and harrowed to break all remaining clods. If worked when too wet it forms clods. Rather frequent cultivations are necessary to keep the soil from puddling and cracking in dry weather and to prevent the rapid escape of soil moisture. Some acid phosphate is used for the small grains, but only small quantities of barnyard manures are available. These are applied on the corn land.

Although rather highly valued as farm land, so much of this soil occurs on steep slopes, where it is best adapted to grazing, that its selling price is much less than that of the Upshur silt loam, ranging from about \$15 to \$30 an acre.

This soil is not in such urgent need of lime as are the Dekalb soils, but responds to its application in moderate quantities. It is naturally a strong soil, and can easily be maintained in a good state of fertility if properly cared for. The bluegrass sod should be turned under every four or five years, and the field should be rotated in corn, wheat, oats, and clover or some other legume, and reseeded to grass. The use of an occasional legume crop like cowpeas, soybeans, or clover will improve the physical condition of the soil and subsoil and increase the content of organic matter and nitrogen. Alfalfa should produce well on the less exposed slopes. The use of acid phosphate at the rate of 175 to 200 pounds per acre on small grains would increase the grain crop and also improve the subsequent stand of bluegrass for pasture.

LICKDALE SILTY CLAY LOAM.

The Lickdale silty clay loam is a gray silty clay loam which passes at 1 or 2 inches into mottled light-gray and yellow silty clay loam and at 5 to 8 inches into mottled bluish-gray and yellow rather stiff silty clay. The type includes some areas that have a silt loam texture over a heavy silty clay subsoil.

This type is confined chiefly to a few areas on the west side of Pendleton Creek near Thomas and along Beaver Creek east of Davis. One area is mapped along the Cheat River bottoms south of Moss Bridge. It typically occupies lower slopes next to streams or stream bottoms and its drainage is imperfect. The areas near Thomas and Davis are chiefly covered with sphagnum moss, ferns, and grass, although when drained, limed, and manured moderate crops of oats are obtained, and in the area near Moss Bridge fairly good fields of corn and potatoes were seen. This is an unimportant upland soil of small extent and relatively little agricultural value. The better situated areas, when grouped with other upland or bottom soils, sell for \$30 to \$60 an acre.

The type is best suited to grass and small grains in the plateau section and to corn, grass, and oats in areas of lower elevation. For its improvement the first step should be thorough drainage by surface ditches, followed by heavy applications of lime and increasing the supply of organic matter by turning under large quantities of stable manure, green-manure crops, or heavy sod.

LOWELL SILTY CLAY LOAM.

The Lowell silty clay loam consists of a light-brown or yellowish-brown silt loam, 2 or 3 inches deep, grading into yellowish-brown silty clay loam, which passes at 6 to 8 inches into yellow or brownish-yellow, stiff, heavy clay. It is derived directly from the bluish-gray Greenbrier limestone, unweathered beds of which in many places lie within 18 to 24 inches of the surface. Outcrops of the limestone are common and near outcrops the soil is usually rather stony.

As mapped the type includes a variation consisting of grayish-brown or brownish-gray silty clay loam over a yellowish-brown or yellow plastic clay, with bluish-gray and some rusty-brown mottlings in the subsoil. Decomposed yellowish shale and bluish limestone fragments are encountered at about 20 to 24 inches. This variation occupies a few scattered patches just east and north of the Maple Grove School in Canaan Valley. It is poorly drained and is entirely in grass. If larger areas of this variation existed, it would be separated as the Pennington silty clay loam.

The typical soil is most extensive just northeast of Red Creek. Several areas are mapped in Canaan Valley between Buena and Cortland and northeast of Maple Grove School. Other areas occur on the benches overlooking Dry Fork near Mill Run. The topography is gently rolling to rather steep and hilly. Owing to its heavy texture, the soil is rather difficult to cultivate and must be plowed in the proper stage of moisture to prevent formation of clods. Plowing is usually done in the winter or spring to obtain the benefit of the action of freezing and thawing. The soil is recognized as being strong and productive. Bluegrass grows well upon it and most of the type

is in pasture. Oats and buckwheat do well and with grass are the principal crops.

This land is always sold in farms including other types of soil. Its price ranges from \$25 to \$50 an acre.

Applications of manure or turning under of green-manure crops would tend to make this soil more tractable and easier to cultivate. Alfalfa could be grown successfully. The growing of cowpeas or other leguminous crops would tend to loosen the subsoil and increase the supply of nitrogen and organic matter in the soil.

HOLSTON SILT LOAM.

The Holston silt loam is a yellowish-brown to light-brown silt loam, 8 to 10 inches deep, underlain by yellow silty clay loam, passing in a few inches into friable silty clay which becomes somewhat compact at a depth of 24 to 28 inches and contains faint gray and reddish-yellow mottlings in the lower part. In some places the characteristic mottling in the lower subsoil is very faint or is absent. The type includes small areas of loam texture; such areas are found on the terrace near Bretz and in a few places north of Moss Bridge.

The Holston silt loam is developed upon former flood plains or first bottoms of Cheat River which now lie well above overflow as a result of the cutting down of the stream channel. The material has been transported by water largely from the local Dekalb and Upshur uplands. Five distinct terrace levels can be found ranging upward to more than 300 feet above the present river level. Gravel fragments are so numerous in spots or in depressions as to give the soil a stony texture. In places the type occupies benches or shoulders, the slopes below and above which consist of Dekalb soils. Next to the ascending slopes the soil in places consists of a mixture of colluvial wash from the higher Dekalb soils and true Holston material.

This type is best developed around Parsons, at the junction of the Dry Fork and Shavers Fork of Cheat River. A large part of the town is built upon it. Other important areas lie between Moss Bridge and the Horseshoe Bend of Cheat River, just west of the Horseshoe Bend of Cheat River, on Horseshoe Run, and at Auvil and Laneville. Hambleton and Hendricks are built in part upon it. Other small areas occur along the Cheat River and its tributaries. These deposits were generally made where a tributary emptied into Cheat River or at the sharp bends in the river course.

The surface is prevalingly level to gently rolling, in places sloping toward the stream. The drainage is good, and where the type lies at relatively high elevations erosion has cut back into it and exposed the underlying gravel and clay or stratified shales and other rocks upon which the terrace deposits were laid down.

Practically all this soil is cleared and in grass or cultivated fields. On farms which include the Holston silt loam this type usually is the site for the farmhouses and buildings, because of its elevation above the bottoms and its excellent drainage. The few remaining forest areas support a growth chiefly of chestnut, oaks, beech, sycamore, and some poplar.

Corn, oats, and wheat are the chief crops, with the ordinary range in yields from 25 to 40 bushels, 20 to 35 bushels, and 12 to 18 bushels per acre, respectively. Buckwheat is grown and returns 20 to 30

bushels per acre. Potatoes of excellent quality, yielding 100 to 200 bushels per acre, can be grown where the land is manured and fertilized. Hay produces 1 to 1½ tons per acre. Alfalfa has been grown on a few patches and excellent yields obtained, but to this time it has been a crop of little importance. About half of this type is used for mowing lands and pasture. When limed a strong persistent grass sod, including some bluegrass, is obtained. On many farms the type is kept in permanent pasture and the associated bottom land is used for corn, oats, and hay. Most farmers apply some fertilizer in growing the grain crops.

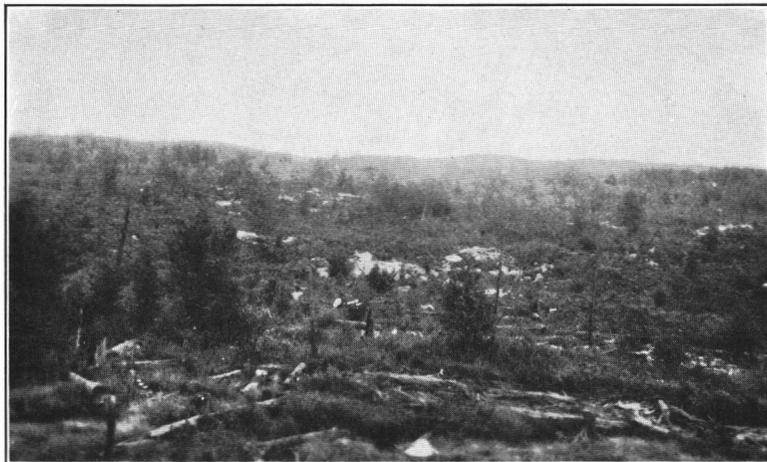
The price of the Holston silt loam varies according to the amount of bottom and hill land included in farms with it, the nearness to roads and towns, and the character of improvements. Near towns it is largely used for building sites and is held at a high price. The agricultural land ranges in price from \$50 to \$100 an acre.

In improving this soil the aim should be to increase the content of organic matter by applications of manure and the more general growing of the legumes. The growing of cowpeas and soybeans is particularly recommended, as they do well upon this soil in other parts of the State, their roots improve the physical condition of the subsoil, and when turned under with the stubble they increase the content of nitrogen and organic matter. The frequent use of rye as a winter pasture and cover crop to be turned under in the spring would also aid in the building up and maintenance of productiveness. In a few places where cattle are fed a fairly good supply of manure is made, but as a general practice they are fed in the open and little manure is available for spreading on the corn land. The use of about 1,000 pounds of burnt lime or from 1 to 2 tons of crushed limestone per acre would produce a stronger sod of hay and pasture grasses. About 200 to 300 pounds of acid phosphate per acre have given good results with the small grains. In growing potatoes a complete fertilizer relatively high in potash, at the rate of about 400 to 500 pounds per acre, probably could be used profitably. In other sections of the State this soil is used in the commercial production of potatoes and vegetables, and where towns, markets, and railroad facilities are convenient it can be profitably used for this purpose in Tucker County. Liming, inoculation, and the application of acid phosphate are necessary to obtain satisfactory stands of alfalfa.

TYLER SILT LOAM.

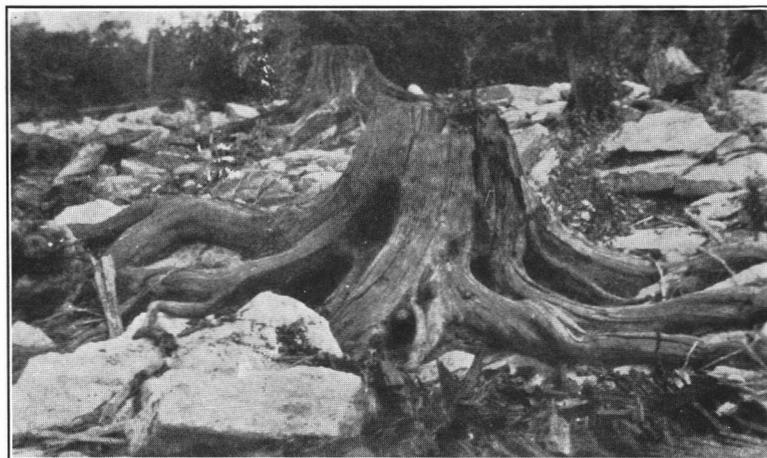
The Tyler silt loam consists of a grayish-brown silt loam passing quickly into mottled gray and yellow silty clay loam and this into mottled light-gray to bluish-gray and yellow heavy silty clay loam or silty clay. The yellow increases with depth and the lower subsoil is plastic and tough. Some patches consist of bluish-gray silty clay loam, with some yellow mottling, underlain at about 12 inches by silty clay mottled bluish gray and yellow, the yellow increasing with depth, and the lower subsoil being plastic.

The type is mapped in a few small areas on the benches north of Moss Bridge and the terrace along Horseshoe Run. It occupies flat, poorly drained areas in the areas of Holston silt loam and occurs at the foot of rises in the terrace or along low depressions or old drainage ways through the terrace. It owes its poor drainage to the



S. 11443

FIG. 1.—ROUGH STONY LAND ON THE PLATEAU NEAR DAVIS.



S. 11451

FIG. 2.—HEMLOCK STUMP ON ROUGH STONY LAND.

The rocks and tree roots were formerly covered with a deep layer of leaf mold, which has been destroyed by fire.

topography and the plastic, almost impervious subsoil. It was deposited in the same way as the Holston soil, but inferior drainage has produced its present mottled condition.

The Tyler silt loam has little agricultural importance. All of it is in pasture or in forest of beech, birch, chestnut, oak, and maple. Its selling price is low and is determined by the timber and the price of the farm land with which it is included. Good drainage through open ditches, heavy applications of lime, and the incorporation of manure or green cover crops would be necessary to bring it into good condition for farming.

MOSHANNON LOAM.

The Moshannon loam is a rich, mellow, light-brown to brown loam with a faint reddish cast, passing at about 12 to 15 inches into friable reddish-brown fine sandy clay loam or clay loam.

In some places, particularly near the stream banks, as along Cheat River below Moss Bridge, there are included areas of fine sandy loam, with loamy sand in the lower part of the 3-foot section. Crops often suffer for lack of moisture on this sandy soil in dry weather. This type also includes some small areas of silt loam and on islands in the river patches of Riverwash, consisting of sand and gravel. Along some of the smaller streams the surface is rather yellowish brown in color, owing to wash from the adjacent Dekalb soils. Such areas would be mapped as Huntington loam if of sufficient extent.

The largest development of the Moshannon loam is in the Cheat River bottoms between Parsons and St. George, including most of the Holly Meadows. It consists of recently deposited alluvial material derived from local Upshur and Dekalb upland soils, the Upshur material giving the slightly reddish color which is characteristic of the Moshannon soils. Important areas also are mapped along some of the streams tributary to Cheat River, such as Horseshoe Run, Shavers Fork, Dry Fork, and Red Creek. Other areas are mapped along the Blackwater River near Davis. In the Canaan Valley this type occurs in many narrow strips bordering the streams, the larger part of the wide flat bottoms consisting of Holly or Dunning soils. The towns of Parsons, Hambleton, St. George, Hendricks, and Jenningsston are built in part on this type. It is rarely overflowed, although since the cutting out of most of the timber the streams have invaded the bottoms more frequently.

The Moshannon loam is the most important bottom soil and one of the most productive soils in Tucker County. It is well drained and easy to plow and cultivate. Practically all of it is cleared and most of it is cultivated. Corn, oats, and hay are the principal crops, although wheat and potatoes also are important. Most farmers crop their bottoms rather regularly to produce feed for their cattle, which they pasture on the adjacent hilly Dekalb slopes or uplands. The surface of the bottoms is level or gently undulating and favorable to the use of improved machinery. Up-to-date methods are employed and the farm buildings are large, conveniently arranged, and usually painted. Fertilizer and lime are in common use. Many farmers haul limestone from Backbone and Limestone Mountains and burn it themselves. Corn yields of 50 to 100 bushels per acre are

reported and the yield of oats ranges ordinarily from 40 to 50 bushels per acre. Wheat returns high yields, normally between 20 and 30 bushels per acre. Potatoes of fine quality yield from 150 to 300 bushels per acre. They must be planted early to avoid the blight, which sometimes is rather destructive. Clover and timothy usually are seeded in the oats or wheat, and yield from 1 to 2 tons of hay per acre. The plowing under of a good clover sod is commonly practiced and serves to maintain and build up the fertility of the land. The price of land of this type ranges from \$75 to \$200 an acre, depending on the nearness to towns.

The increased use of lime, together with liberal applications of phosphatic fertilizers and the use of some legume in the rotation, will aid in improving this soil for the production of general crops. A complete fertilizer, relatively high in potash, applied at the rate of 400 to 600 pounds per acre should prove profitable with potatoes.

MOSHANNON SILT LOAM.

The Moshannon silt loam is a brown mellow silt loam with a faint reddish cast, grading at about 10 to 12 inches into purplish-brown friable silt loam or silty clay loam. In places the subsoil contains some fine sand. Some areas of loam are included in this type and in places along the stream banks the soil is more sandy, approximating a fine sandy loam.

The type is formed of recent alluvium deposited by streams which drain uplands consisting in part of Upshur material. Where the adjacent uplands consist of Upshur soil the surface has a distinct reddish cast. Along some of the smaller streams near Dekalb uplands the type also includes some brown or yellowish-brown silt loam, which would be mapped as Huntington silt loam if in larger areas.

This type is not extensive and is developed principally in the bottoms of Cheat River and its tributaries. Areas of it are mapped on Shavers Fork between Parsons and a point $1\frac{1}{2}$ miles south of Porterwood, on the Left Fork of Clover Run near St. George, in the Cheat River bottoms near Parsons, near Moss Bridge, at Hannahsville, and in the northwestern part of the Canaan Valley.

The surface is level or gently undulating and generally above annual overflow, and drainage is well established. All of the type has been cleared and is devoted principally to corn and grass. In pasture it supports an excellent bluegrass sod. Oats and wheat produce well but have a tendency to lodge. Corn yields from 50 to 100 bushels per acre, wheat 18 to 25 bushels, oats 30 to 50 bushels, and hay $1\frac{1}{2}$ to 2 tons per acre. The hay is generally clover or mixed clover and timothy and some redtop.

The Moshannon silt loam is farmed in much the same way as the Moshannon loam and has about the same agricultural value. As a general rule the silt loam should be used only for corn, potatoes, and hay, as it seems better adapted to these than to the other general crops. Applications of lime and of acid phosphate in liberal quantities should result in larger yields.

A few small areas of Pope silt loam have been included with this type owing to their small extent. The Pope silt loam is a brown or grayish-brown friable silt loam, which at 5 to 8 inches passes into friable yellow silty clay loam. Small fragments of gray sandstone are frequently present in places on the surface and through the soil.

This soil occurs along streams which drain areas of Dekalb soils, mainly along Haddix and Pheasant Runs in the southwestern part of the county. It is generally well drained, except in a few low patches where the soil corresponds to the Atkins soils. Most of it is cleared and is used for grass or corn. The tree growth includes oak, maple, sycamore, beech, and willow. Corn yields 25 to 50 bushels per acre, and hay (mixed timothy, clover, and redtop) produces three-fourths to 1 ton per acre. Oats and wheat are grown to some extent. No manure or fertilizer is used. Applications of lime, the use of manure, and the growing of legumes will increase the productiveness of this land.

ATKINS SILT LOAM.

The Atkins silt loam consists of a brownish-gray to mottled gray and brown silt loam, ranging close to a silty clay loam, passing at about 5 inches into a mottled bluish-gray to yellow silty clay, which becomes somewhat plastic with depth. Patches of loam, along the banks of the streams, and of silty clay loam in the lowest and most poorly drained spots are included.

This type is in first bottoms and is subject to frequent overflow. It occupies poorly drained flats and marshy areas or old ponds and stream margins and channels. It occurs principally along the upper courses of streams that rise on the high rolling plateaus and mountain tops in the eastern part of the county and drain areas of soil derived from gray sandstone and shale. Areas are mapped on the headwaters of Red Creek east of Cabin Mountain, on Beaver Creek and Pendleton Creek near Davis, along North Fork of Blackwater River, along other streams near Thomas and Pierce, on Clay Run northwest of St. George, and on Haddix Run in the southwestern part of the county. The type usually remains wet and seepy throughout the summer, but during very dry summers it bakes hard and cracks. It is characterized by the presence of crawfish holes, from which it derives its local name of "crawfish land."

The Atkins silt loam is largely in grass and pasture. It supports a growth of marsh grasses, sedges, bulrushes, alders, and willow, and in the mountains it is covered principally with mosses, ferns, and poverty grass.

Most of the type lies within large tracts held by lumber and coal companies and is not used agriculturally. The few areas in farms produce fairly good hay. The soil is too wet for corn, and a poor yield is obtained. In other sections of West Virginia where this soil has been thoroughly drained, limed, and fertilized it has proved adapted to truck crops, such as cabbage, onions, and lettuce, although its heavy, wet nature makes it a rather late soil and difficult to handle. Its best use is for hay and pasture land. Where drained and limed, it has yielded 1½ to 2 tons per acre of timothy and redtop hay.

HOLLY SILTY CLAY LOAM.

The Holly silty clay loam is a light-gray to bluish-gray silty clay loam, mottled in places with yellowish-brown or rusty-brown colors, and underlain at about 8 inches by bluish-gray rather stiff silty clay, showing some yellow mottling. As mapped the Holly silty clay loam includes some areas of Holly silt loam, chiefly in the Cheat River bottoms, where it is associated with the lighter textured Moshannon

soils and occupying the low swales or depressions at the back edge of these bottoms at the foot of the terraces and uplands. Some variations also occur in the bottoms of Blackwater River in Canaan Valley, where it is associated with the Dunning soils and areas of Muck. Here a layer about an inch thick of dark-colored decayed organic material is present in places on the surface. Where this type occurs close to uplands consisting of Upshur soils the subsoil sometimes has a salmon-pink cast. In a few places the subsoil consists entirely of bluish-gray clay. The type is locally called "crawfish land."

This soil occurs chiefly in Canaan Valley, where it occupies considerable areas of flat marshy land in the bottoms of Blackwater River. It is formed of alluvial material derived from upland soils of limestone, sandstone, and shale origin. Most of the type has never been brought under cultivation and is covered with a thick growth of marsh grasses, bulrushes, ferns, moss, alder, willow, huckleberry, and willowleaf spirea. All the merchantable timber has been removed. The land is used principally for pasture, although in the best areas marsh grasses and poverty grass, if cut before they become too woody, make a fairly good quality of hay and yield 1 to 1½ tons per acre. Oats have been grown on a few of the best drained areas, with fairly heavy yields, but the crop is late, and the straw is often heavy and lodges. Corn does not do well unless the land is well drained.

In its present condition the best use for this type of land is for grazing cattle and sheep. Before it can be used for cultivated crops it must be thoroughly drained. Open ditches, with the areas between well rounded to aid run-off, will be the best means of accomplishing this. Tile would be very expensive, and it is questionable whether tile drains will function satisfactorily in the heavy plastic subsoil. Straightening and deepening the stream channels would aid greatly in removing the excess water. After drainage is established a heavy application of lime should be made. Fortunately, lime is convenient to most of this type in Canaan Valley and can be obtained at small cost. A mixture of redtop, alsike clover, and timothy produces a heavy yield of excellent hay and furnishes good pasturage. The climate in most of Canaan Valley is adverse to the maturing of corn, but possibly an early maturing variety could be grown successfully. This soil could be well used for growing silage corn, the bottoms being farmed to produce winter feed and the slopes and steep hillsides of the valley utilized for pasture and range. Where moss and ferns are abundant they should be removed before an attempt is made to break the land, as this material decays very slowly and is likely to injure the crop if present in large quantities in the soil. Oats, buckwheat, and rye are recommended for this soil. On one farm in the valley the grasses for pasture are seeded in the cut-over land, without removing the tree tops and débris from lumbering, or the ferns and moss, and produce an excellent growth. The grasses tend to kill out the ferns, and grazing tends to keep the brush and weeds under control. Fires set accidentally or to clear the débris left by lumbermen seem to do little harm to the grass.

DUNNING SILTY CLAY LOAM.

The Dunning silty clay loam is a black silty clay loam rich in organic matter, underlain at 5 or 6 inches by a dark-gray clay which passes into a lighter gray plastic clay and at lower depths into a

yellow plastic clay with a noticeable pinkish cast. In some places, particularly near the areas of Muck, the surface has a layer of peaty muck, 2 to 5 inches thick, underlain either by a bluish-gray or a coffee-colored silty clay loam, which passes downward into a bluish-gray silty clay with yellow mottling. In spots the lower subsoil is a bluish-gray sandy clay or sandy loam. In patches near the stream banks or along old channels the subsurface layer is a fine sandy loam to gray silt loam, usually passing into a clay subsoil. The subsoil varies considerably with its proximity to Dekalb and Upshur soils.

This type is developed in Canaan Valley and along Beaver Creek near Davis. It is low first-bottom land and some of it is under water, owing in part to the nature of the subsoil and the topography and in part to the sluggishness of the streams caused by meandering stream channels. It is covered with a growth of willow, alder, willowleaf spirea, bulrush, fern, and huckleberry, and in many places moss has formed a thick spongy carpet. The virgin forest, which consisted of spruce, hemlock, poplar, and sycamore, has been removed. Locally the type is called swampy land or glade land. Much of it lies within large tracts owned by lumber companies which have but recently cut the timber and now use the land as cattle range. In a few places the débris has been removed, the moss and ferns skinned off, and the land heavily limed. A fair stand of buckwheat was noted on one such area. On another area from 1 to 2½ tons of hay per acre has been cut following heavy applications of lime and manure. A mixture of clover and timothy was used which succeeded in ridding the land of ferns and most of the poverty grass. Oats have yielded 35 to 40 bushels per acre.

The methods of reclaiming and improving this type are about the same as for the Holly silty clay loam. After the débris and moss have been removed, drainage is the first essential. This can best be accomplished by ditching at frequent intervals. Areas that have a mucky surface layer would probably be of value for celery, cauliflower, onions, cabbage, and other truck crops adapted to the cool climate. This land is difficult to break because of the mat of moss and decaying vegetable matter commonly present, which tends to ball up and throw the plow point out of the ground. Most of this work must be done with heavy tools and tractors, and where the ground is soft and very wet it will be extremely difficult. Such work is expensive and so far little of it has been done.

MUCK.

The Muck mapped in Tucker County occurs along the Little Blackwater River in the Canaan Valley in an area about 2½ miles long and from one-fourth to 1 mile wide. In general it consists of a black peaty muck, but some of the less decomposed material has a brownish color to a depth of 3 feet or more. It is burnt-over stump land which is covered with logs, brush, stumps, and débris from lumbering operations. Much of it is wet and marshy and none of it is used except as pasture for beef cattle. Some of it has been seeded to redtop and timothy, and in the more elevated or billowy patches an excellent catch of grass has been obtained.

In order to reclaim this Muck area the channel of the river should be cleared out, deepened, and straightened and frequent laterals cut,

the land thoroughly drained of its excess water, and means provided for the ready run-off of rain water. Owing to its high content of organic matter, this soil should produce heavily of such truck crops as celery, cauliflower, cabbage, and lettuce, which thrive on similar soil in parts of Garrett County, Md., under similar climatic conditions.

ROUGH STONY LAND.

Rough stony land comprises areas which are thickly strewn with large rock fragments, contain much rock outcrop, are rough and broken in topography, and have no present agricultural value, except for some grazing. Rough stony land occupies large areas on the crest and east side of Backbone Mountain. It includes most of McGowan and Green Mountains south of Dry Fork and practically all of Canaan, Mozark, and Brown Mountains, in a large irregular area between the Blackwater River and the Canaan Valley. The slope and crest of Cabin Mountain east of Canaan Valley, including Bald Knob, and Weiss Knob, and most of the slope adjacent to Red Creek, where the Pottsville and Allegheny sandstone and conglomerate are the source of the rock slabs and large fragments, are mapped as Rough stony land. The steep rocky slopes on both sides of Dry Fork and Gladly Fork near Gladwin also are included. Other areas lie in the northern and western parts of the county along the Cheat River, and include much of the top and upper slopes of Laurel Ridge along the western boundary line. Some areas of stony loam and stony silt loam consisting principally of Dekalb material, have not been separated from the Rough stony land, because of their small size.

In many cases the débris, principally rock fragments, carried down the steep slopes from higher levels have completely covered some of the lower lying formations, such as the Mauch Chunk and Greenbrier. Some areas are so deeply buried beneath accumulated rock fragments that they are completely bare of vegetation. Such land occurs through the lower part of the canyon of the Blackwater River near Hendricks. Most of it has been cut over, and fires in the late summer and fall have destroyed most of the scattering trees left by the loggers.

The large areas of Rough stony land in the eastern part of the county originally supported a superb growth of spruce, hemlock, chestnut, pine, oak, and cherry. At present most of it is covered with a thick brushy growth of blackberry, huckleberry, rhododendron, fire cherry, scrub pine, and some seedlings of spruce and hemlock. Large tracts of this type have been purchased by the United States and set aside as a national forest reserve for the purpose of reforesting the denuded lands by keeping out fire to protect the seedlings. Planting and seeding are also resorted to for forest rehabilitation. There is a nursery at Gladwin.

Forestry is the best use to which land of this kind can be put, and if all of the Rough stony land of Tucker County were thus properly utilized, a large and constant supply of timber could be harvested annually after the trees have reached satisfactory size.

A plateau variation of Rough stony land differs from the typical in that it occupies smoother upland or mountain-top country with an undulating to rolling topography (Pl. I, fig. 1). Between the boulders it has much soil material, consisting of loam and fine sandy loam,

underlain at a few inches by yellow-brown, ochereous-yellow, or coffee-brown loam to fine sandy loam, passing into yellow or ochereous-yellow friable fine sandy loam to light loam. In places the coffee-brown layer underlies a light-gray layer of leached soil, representing podsol soil. The brown layer is high in content of organic matter. Numerous large sandstone and conglomerate bowlders are strewn over the surface, but the soil areas support more grass than the steeper areas of Rough stony land. The vegetation includes an abundance of bracken fern, fire cherry, aspen, birch, fireweed, ironwood, blackberry, sphagnum moss, goldenrod, and huckleberry. Practically all the timber has been removed and the land burned over. These fires have destroyed thick layers of leaf mold and moss in which large and valuable trees once flourished. In many places the stumps and roots of larger trees are lying bare over masses of rock, which have been exposed by destruction of the leaf mold that supported the trees (Pl. I, fig. 2). Thus fires at a single stroke have destroyed the forest accumulation of ages, and left very inferior conditions for the development of trees. This land has some value for pasture. Its best use is for forestry, or for forestry and grazing conjointly.

SUMMARY.

Tucker County lies in the northeastern part of West Virginia, touching Maryland. It comprises an area of 421 square miles, or 269,440 acres.

The county lies in the severely dissected part of the Appalachian Plateau. The maximum relief is 2,970 feet, or from 1,450 feet where Cheat River flows out of the county to 4,420 feet on Weiss Knob, near Laneville.

Ninety-eight per cent of the area is drained by Cheat River and its tributaries, the rest by the North Branch Potomac River, and by Brushy Fork, which drains into the Tygart River. Much water power could be developed from the swift mountain streams, particularly the Blackwater River.

The population of Tucker County was 16,791 in 1920, all of which is classed as rural. This is an increase of 4.5 per cent since 1910.

Davis, Thomas, Parsons, Pierce, and Hendricks are the most important towns. The Western Maryland Railway crosses the county and affords fairly good railroad facilities. The Central West Virginia & Southern Railroad extends from Hendricks up Dry Fork to Horton, Randolph County. The wagon roads are built of local shale and sandstone materials and are generally poor or only fair. Pittsburgh and Baltimore are the principal outside markets.

Coal mining and lumbering are the chief industries besides farming.

The climate over the lower ridge and valley sections of the county is moderate and healthful; in the mountain and plateau sections it is cool and invigorating in summer and rather cold in winter. The mean annual temperature is 50.4° F. The mean annual precipitation is 46.86 inches, with a snowfall of 46 inches. These records are from the Weather Bureau station at Parsons, which is at an elevation of 1,650 feet. In the mountain and plateau section heavier rainfall and snow would be recorded, and colder annual means. The average frost-free season is about five months, with a season about two weeks shorter at the higher elevations.

The growing of general crops, including corn, wheat, oats, buckwheat, and hay, and the grazing of cattle constitute the agriculture of Tucker County. Fruits and vegetables are grown to supply home needs, any surplus being disposed of locally. In the rougher hill and mountain sections and in Canaan Valley large areas are devoted to cattle range.

A definite rotation is not generally followed. Fertilizers are used extensively in the better developed sections and some lime is applied.

Most of the farm work is done by the farmer and his family. Extra labor is scarce, owing to the higher wages paid by the coal and lumber companies.

About 35 per cent of the county is in farms, which average 124.5 acres each, of which 49.3 acres are improved. According to the 1920 census, 91 per cent of the farms are operated by owners.

The value of farm land ranges from \$10 to \$25 an acre for hill land up to \$100 to \$150 an acre for the better bottom and terrace farms. The value of all farm property in 1920 was \$3,801 per farm, and the average assessed value of farm land was \$16.25 an acre.

Tucker County lies within the Appalachian Mountains. The soil-forming rock formations which are exposed include gray sandstone, shale, and some limestone of the Carboniferous, and gray and red shale and sandstone of the Devonian eras.

The upland residual soils of Tucker County are included in four series, Dekalb, Lickdale, Upshur, and Lowell soil series.

The Dekalb series consists of a grayish to yellowish-brown surface soil over a yellow subsoil. It is derived from gray shale and sandstone. The silt loam, stony silt loam, stony loam, silty clay loam, and the loam with a valley phase are mapped. These soils, which are by far the most extensive in the county (excluding Rough stony land), are generally deficient in lime and organic matter and are not considered strong soils. They are used for general crops and grass.

The Lickdale silty clay loam is a poorly drained grayish or mottled gray and yellow soil with a mottled bluish-gray and yellow subsoil. It occupies the lower parts of slopes, in close association with the Dekalb soils, and is derived from similar materials. This type is devoted chiefly to grazing and meadow.

The Upshur soils are derived chiefly from red shales and sandstones and from shales that are more or less calcareous; in places they are modified by material from the Greenbrier limestone. The soils are Indian red or brownish red, with Indian-red or brownish-red subsoil. The silt loam, with a valley phase, the stony silt loam and silty clay loam are mapped in Tucker County. They are recognized as the strongest of the upland soils, are well adapted to general crops, particularly to hay and grass, and are largely devoted to pasture because of the heavy bluegrass sod they support.

The Lowell series is derived from the Greenbrier limestone. It includes soils with light-brown to yellowish surface soils and a yellowish-brown subsoil. The silty clay loam, the only type mapped, is devoted chiefly to oats, buckwheat, and meadow and supports a strong bluegrass pasture.

The terrace soils are classed in the Holston and Tyler series. These soils were formed from old-alluvial deposits brought down from uplands composed chiefly of Dekalb and Upshur soils. They

occur on five terrace levels, ranging from 50 feet to over 300 feet above the stream level.

The Holston silt loam is a yellowish-brown soil with a yellow or yellowish-brown subsoil and is devoted largely to general farming. Much of it is used as sites for towns or farm buildings, as it is all above overflow.

The Tyler silt loam occupies the low poorly drained areas in the Holston silt loam and is characterized by a grayish-brown to gray surface soil and a mottled bluish-gray and yellow subsoil. It is devoted chiefly to grass.

The first-bottom or recent-alluvial soils include the Moshannon, Pope, Atkins, Holly, and Dunning series, and Muck.

The Moshannon soils are typically brown or reddish brown, with an Indian reddish brown subsoil, the color being due to the influence of the red Upshur soils of the uplands. They are adapted to corn, wheat, oats, and grass, and are almost entirely cleared and in cultivation. Farms consisting of Moshannon loam and silt loam are the best and most productive in Tucker County. The Holly Meadows, one of the best agricultural sections in the county, are composed principally of Moshannon loam.

The Atkins silt loam is a grayish soil over a mottled gray and yellow plastic subsoil. It has imperfect drainage and is used for grazing.

The Holly silty clay loam has a light-gray surface soil and a bluish-gray or mottled yellowish-brown and rusty-brown subsoil. It consists of alluvial material from upland soils of limestone, sandstone, and shale origin. It is poorly drained and is used chiefly for hay and pasture.

The Dunning silty clay loam type is a black silty clay loam, rich in organic matter, over a bluish-gray subsoil mottled with yellow and yellowish brown. Much of it is unused owing to its marshy condition, the rest being chiefly in grass and pasture.

The Muck area mapped in Canaan Valley consists of a black peaty muck which extends practically unchanged to a depth of 3 feet or more. It has been recently cut over, is mostly wet and marshy, and is used only for pasture.

Rough stony land includes areas of rough, steep, and stony mountain tops, stony plains, and rock cliffs, which have little or no agricultural value, except that some of the more rolling plateau sections produce sufficient grass to be of some grazing value. Its best use is for forest, and large areas have been acquired by the United States Government for reforestation.



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