

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Pocahontas County, West Virginia

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and

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Bureau of Chemistry and Soils

In cooperation with the
**West Virginia Geological Survey and the
West Virginia Agricultural Experiment Station**

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SOIL SURVEY OF POCAHONTAS COUNTY, WEST VIRGINIA

By B. H. WILLIAMS, United States Department of Agriculture, in Charge, and
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COUNTY SURVEYED

Pocahontas County lies somewhat below the center of the State on the eastern side of West Virginia (fig. 1). The Virginia State line forms the eastern boundary.

The county is irregular in outline. Its maximum length is nearly 60 miles in a northeast-southwest direction, and its width is less than half this distance, narrowing to about 12 miles toward the northern end. The total area is 904 square miles, or 578,560 acres.

The county extends along the border of two major physiographic provinces, the Appalachian Plateaus on the west and the so-called ridge and valley province on the east. Greenbrier River is now taken as a rough boundary line between the two provinces and divides the county into two nearly equal parts.

That portion lying in the Appalachian Plateaus province, or more specifically the Allegheny Plateau, is well dissected. The rocks covering this area are of Carboniferous age. Sandstone, limestones, shales, and conglomerates are found, but sandstone predominates. The rock strata over most of the plateau lie nearly horizontal. This gives rise to large areas of soils of a single type. More than half of the plateau section is more than 3,000 feet above sea level, and much of it is above 4,000 feet. The highest point, 4,842 feet, is Bald Knob on Back Allegheny Mountain. The higher areas are rather level in many places and are underlain with either resistant sandstone or conglomerate. Numerous glades, such as the Cranberry Glades northwest of Hillsboro, are on these flat elevated areas. These glades are at an elevation of 3,400 feet and are about 500 acres in extent. The largest comparatively flat area is that

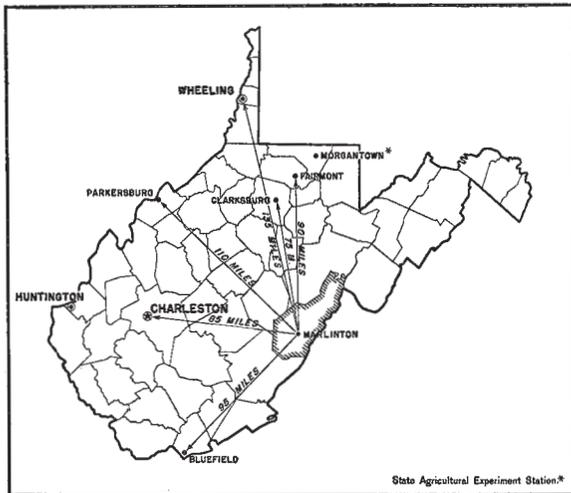


FIGURE 1.—Sketch map showing location of Pocahontas County, W. Va.

known as Little Levels in the vicinity of Hillsboro. In the northern part of the county Greenbrier limestone outcrops in a narrow band along the western side of Greenbrier Valley, and southwest of Marlinton it widens out to form the Little Levels. Formation of this level land has been possible because of the great thickness of limestone overlying resistant sandstone and the slight slope of the land in the opposite direction from the drainage. Many sinkholes are in this section, and many of the small streams disappear from view to emerge nearer Greenbrier River. In most places the lower parts of these so-called lost streams are entrenched in the resistant Pocono sandstone which underlies the limestone. The average elevation of Little Levels is about 2,400 feet, which is not too high for the maturing of most agricultural crops grown in West Virginia.

The western or plateau part of the county has a dendritic type of drainage, the streams following the general dip of the rock formations to the north and west. Those flowing northward are Elk River and Shavers Fork of Cheat River; those to the westward, Gauley, Williams, Cranberry, and Cherry Rivers. These streams all have precipitous or V-shaped valley slopes, rising 1,000 to 2,000 feet to the smoother plateau remnants.

The eastern part of the county lying in the ridge and valley province presents a series of parallel ridges and valleys extending in a northeast-southwest direction. Here the rocks have been highly folded and in some areas shattered. Although they are Paleozoic sedimentaries, these rocks are older than those in the western part. They consist largely of stratified sandstones and shales, but an up-thrust of limestone is exposed through the center of this province from the southern boundary of the county to a point just east of Green Bank. No single stream extends entirely through the valleys, although in general the valleys are continuous. The largest body of comparatively level land in the eastern part is in the vicinity of Green Bank. This area, unlike Little Levels, is not in a limestone belt. Stream erosion has leveled the steeply dipping shales, and a mantle of alluvial soil containing well-rounded stream gravels and small boulders covers the area. Several terraces have been formed. The highest distinct terrace is about 200 feet above the stream bottom. Apparently stream diversion has taken place here, as a stream capable of forming such a wide flat must have been larger than Deer Creek, the stream that now drains the area. The several square miles of terrace and bottom lands along Knapp Creek are almost continuous and average about one-half mile in width, whereas the alluvial belt along nearly all other streams is narrow and discontinuous but widens on some of the bends and at stream junctions.

In the ridge and valley province, the elevation of the ridges ranges from 3,000 to 4,500 feet and that of the valleys from 2,000 to 3,000 feet. For the most part these valleys are narrow and rise in a series of steeply rounded hills to the main mountaintops. Narrow V-shaped gaps have been cut from one valley to another where the streams pass through. This gives a decidedly trellislike arrangement to the drainage system of the eastern part of the county, with Greenbrier River as the master stream, flowing southward.

Pocahontas County is virtually a "birthplace" of rivers, as all drainage waters of the county are formed within its boundaries and

flow outward. It has a maximum range in elevation of 2,666 feet and the highest average elevation of any county in West Virginia. The lowest point, where Greenbrier River enters Greenbrier County, is at an elevation only slightly below 2,000 feet. The streams are all swift and for the most part are still actively cutting downward.

Of the small water-power developments once fairly numerous along the small spring-fed mountain streams, only two are now in operation. Possibilities for large-scale water-power development are not very good because of the rapid fall and comparative swiftness of streams. Reservoirs placed at advantageous points along some of the larger streams would aid materially in controlling swiftly moving flood waters that often cause heavy damage on the lower rivers.

Originally all the county was covered with a dense and vigorous growth of hardwoods and conifers, the distribution of which was determined to a large extent by the climate and rainfall and to a lesser extent by the soils and topography. The conifers are confined largely to the acid or highly acid soils derived from noncalcareous rocks, and almost pure stands of hardwoods grow on soils derived from limestone.

White pine trees seem to reach their best development in the narrow valleys and on the lower slopes of the ridges in the eastern part of the county. In many places the forests are pure white pine or white pine with only a few hardwoods, principally white oak. As elevations increase, the white pine gives way to white oak and red oak, with some pitch pine and chestnut oak on the more exposed ridge points. On still higher elevations the white oak becomes less evident, and chestnut oak and hickory increase on the shallow or more droughty soils, with red oak and chestnut predominating, and some beech, sugar maple, and other hardwoods grow on the better soils. Along all the shaded draws some white pine and hemlock grow. Black locust, dogwood, birch, and serviceberry, together with an undergrowth of laurel, huckleberry, and brambles, grow at nearly all elevations. The predominant trees on the limestone belt west of Greenbrier River are white oak, red oak, and sugar maple, with some black locust, black walnut, hickory, and other hardwoods. The small flats and upper steep slopes to almost the main plateau level have a dominant growth of red oak, chestnut, and beech, together with some birch, sugar maple, hickory, and Appalachian cherry. On the high plateau levels in the western part of the county and on most of the somewhat lower elevations in the northern part, red spruce is the predominant tree, hemlock trees are fairly numerous, and balsam fir grows in small isolated areas. This might be considered, therefore, a coniferous belt. Considerable beech, birch, linden, ash, and Appalachian and fire cherries grow in fairly large stands, however, or are interspersed with the conifers, with beech probably as the outstanding hardwood.

The coniferous belt seems largely determined by peculiar climatic conditions in that part of the county and in similar country to the north and west. Temperatures average 10° lower throughout the year than in the ridge and valley section to the east, and the rainfall is from 20 to 100 percent heavier than the rainfall east of the Allegheny Mountains.

Climatic conditions also determine the outline of a definite Podzol soil development. This belt of conifers and Podzol soils is representative of the tree growth and soil development generally found much farther north, in the Great Lakes region, New England, and southern Canada.

Early settlers in establishing homes in the lowland and valley areas cleared most of these soils of forest, using what was needed for local buildings and burning the remainder. Early commercial lumbering was confined to the lower mountain slopes and to sections accessible to the larger streams that could be utilized in rafting logs down to points to which railroads had penetrated or at which sawmills were situated. It was not until about the turn of the present century, when the first railroad was laid in the county, that the large-scale lumbering operations began that have removed much of the excellent stands of virgin timber from the vast rough mountain sections.

Most of the large lumber companies that operated for a decade or more have cut out their holdings and have abandoned their sawmills or moved them away. Plants now operating have sufficient holdings of timber to carry them another 10 or more years, and it may be possible to cut second-growth timber when the virgin supply is exhausted.

Forest fires following lumbering operations destroyed much valuable young and second-growth timber and practically prevented reproduction of trees in the coniferous belt. As a result of burning and of injudicious cutting, probably 50 percent of cut-over lands have been rendered almost valueless for timber production for a long time to come.

Large areas in the northern part of the county that once supported dense stands of spruce and hardwoods were so severely burned that much of the land now supports only a stunted brushy growth of hardwoods, fern, and brambles and in the many open places a native grass, locally termed "moonshine" grass, which supplies only fair summer grazing for sheep and cattle. This area is now included in the Monongahela National Forest and is given fire protection. Beginnings have been made on an extensive tree-planting program for a future supply of timber and for watershed protection. An experimental planting of Norway pine and European larch in this section, made by one of the lumber companies more than 20 years ago, indicates the possibilities of reforestation.

Federal, State, and local agencies and the larger lumber companies, in cooperation for fire prevention and suppression, have materially lessened the losses of timber from fire in recent years. Further expansion of these conservation policies will greatly enhance the value of the rough mountainous section as a recreational area.

Early clearings for pasture, especially on soils derived from limestone, with little or no seeding, were rapidly covered with bluegrass, whereas the more acid soils grew up largely to moonshine and other native grasses. Later seeding with clover has further increased the value of these pastures.

The early settlers crossed the mountains, followed the stream valleys, and cleared and opened up the bottom lands and terraces and

adjacent smoother limestone land. Because of its smooth relief and its productivity, this land was best suited to farming. Later, the adjacent uplands were cleared for farming or pasture as needed. Settlers from Virginia, Maryland, and Pennsylvania, pushing westward to seek new homes, cheaper land, and better opportunities, were the first to come into this section. Until about 1900 the population was made up largely of descendants of these early settlers. With the advent of the railroad at this time, subsequent lumbering operations, and related developments, the population almost doubled by 1910, and many persons of foreign birth or extraction settled in the county.

Pocahontas County was formed by an act of the Virginia Legislature in 1821, while West Virginia was still a part of the State of Virginia. It was formed from parts of Bath, Pendleton, and Randolph Counties and at that time contained 820 square miles.

Marlin and Sewell's early explorations in this section led them to locate at the present site of Marlinton, or nearby on the bottom lands of Greenbrier River, in 1749. The population of the area now included in Pocahontas County was 153 in 1800.

Late killing frosts in the spring and early killing frosts in the fall made farming a precarious source of subsistence to early settlers. As late as 1810, the fact that corn would ripen on Marlin's Bottoms sufficiently to make meal was of great interest to surrounding settlers. Cultivating patches of buckwheat, corn, beans, and potatoes comprised most of the pioneer farming enterprise for supplementing supplies of game and fish. Farm implements were home-made and crude.

In the early settlements, practically all farming was done by hand. After the settlements became reasonably secure from Indian raids, livestock was brought in, and the land was broken by horse and ox teams.

Early travel was over Indian and game trails which usually followed the lower mountain passes and more favorable approaches. These were eventually widened to sled and wagon roads. The turnpike from Warm Springs Va., to Huntersville, the first road to connect with outside settlements, was completed about 1838. The turnpike from Staunton, Va., to Parkersburg was completed 2 or 3 years later. The Greenbrier Railroad, now a branch of the Chesapeake & Ohio Railway, was built in 1900.

According to the 1930 census, Pocahontas County has a population of 14,555, all classed as rural. Small industrial and trading centers along the railroads, stream valleys, and limestone lowlands are the most densely populated sections. Throughout much of the ridge and mountain country, settlements are widely scattered, and the population is sparse. The high plateau region and a large part of the Allegheny Mountains, an area comprising nearly one-fourth of the county, contain hardly a farmstead. The small number of inhabitants here occupy temporary lumber camps or small mining camps.

Marlinton, the county seat, with a population of 1,586, is the most important town. The branch of the Chesapeake & Ohio Railway leading from Ronceverte in Greenbrier County to Durbin passes through it. It is near the center of the best developed farming sec-

tion of the county and is an important shipping point for farm and forest products and products of local industry. Cass, with a population of 708, is farther north on the same railroad and is the location of large sawmills and wood-processing plants and of a pulp and paper company. Cass is dependent largely on its timber products and serves only the immediate surrounding community as a trading and shipping point. Durbin, the third largest town, has a population of 498. It is the northern terminus of the Chesapeake & Ohio Railway and the southern terminus of a branch of the Western Maryland Railroad extending from Elkins in Randolph County. Spruce and Slaty Fork, primarily lumbering towns, in the northwest part, are served by a Western Maryland Railway freight line that extends into the counties to the west, joining the Elkins to Durbin branch in Randolph County. This line is engaged principally in the removal of coal and timber and in bringing in supplies for these industries. Logging railroads of the pulp and paper company operating from Cass to Spruce and into the western part of the county, aid in the removal of timber to the processing plants at Cass. Similar railroads extending along the stream valleys from the west and south aid in the removal of timber from these sections. Thornwood, Green Bank, Dunmore, Frost, and Huntersville are important local trading points in the eastern part of the county, and Hillsboro and Lobelia serve the southern part. Numerous local stations and sidings along the Chesapeake & Ohio Railway serve as loading points for livestock. Most of the trading points off the railroads are on or near improved State highways and receive many of their supplies by motortrucks from outside centers. These trucks often pick up a load of farm products on return trips.

Hard-surfaced State highways traverse most of the main valleys, and good connecting county roads follow many of the other valleys. Roads into the more isolated communities are not kept in good repair and at times are impassable to motor vehicles. Federal Forest Service roads constructed in the Monongahela National Forest in the northern part of the county in connection with the program for reforestation, fire suppression, and recreation furnish improved outlets to a number of isolated farmsteads. Daily bus service can be had both north and south from Marlinton to connecting interstate lines. Daily, except Sunday, passenger service is maintained on both the Western Maryland and the Chesapeake & Ohio. Most communities have local telephone service; Marlinton, Cass, and Durbin have telegraph service.

Daily, except Sunday, postal service reaches all parts of the county. Churches and schools are established in all communities. Most of the towns and larger villages have good consolidated high schools or junior high schools to which bus transportation is furnished by the county school system. The length of the school term ranges from 7 to 9 months.

Industrial development has been based largely on the utilization of natural resources, that is, the manufacture of lumber and timber products. Tanneries at Marlinton and Durbin were so located that they might be near the source of supply of tanbark from hemlock and chestnut oak. Most of the larger sawmills market a large part

of their products as finished building material. Much of the more valuable walnut, maple, and wild cherry, however, is shipped to the cabinet and furniture plants in the large centers of population for final processing. Wood to be made into paper is prepared for pulping and then shipped to Luke, Md., for manufacture. Small portable sawmills and local finishing plants supply lumber for local construction.

CLIMATE

Because of the wide range in elevation and the varied directions at which the mountains and valleys lie, climatic differences within the county are great. Through the western and northern parts, the winters are cold, and the summers are cool with relatively few hot days; the lower Greenbrier River Valley and the ridge and valley country to the east have less severe winters and considerably higher summer temperatures. With a few exceptions, the nights are cool. During the period of the present survey, results of killing frosts were observed in a few places as late as June 20, and considerable frost damage to tender vegetation was observed even in July and August. Fog along the larger stream valleys in spring and fall often prevents the severe frost damage that occurs in the adjacent uplands. The direction of the prevailing air currents and their modification by physiography often give a temperature variation of as much as 10° within a distance of 1 mile.

According to the Weather Bureau station at Marlinton, situated at an elevation of 2,131 feet, the average annual rainfall is 47.26 inches, with average depth of snow 33.7 inches, and the mean temperature is 48.1° F. This, however, is not representative of conditions in the plateau country to the north and west. The Pickens station in Randolph County to the northwest is more indicative of this region; it shows an average annual rainfall of more than 60 inches and a snowfall of 100 inches.

The rainfall is well distributed through the year. It is greatest during the summer, when needed for growing crops and pasture, and least in fall and winter. The heaviest snowfall is usually in January and February.

The average frost-free period, reported at Marlinton, is 4½ months, between May 16 and October 1. The latest killing frost reported was June 17, and the earliest, September 6.

The climate of this region is continental, with prevailing winds from the west during most of the year. Table 1, compiled from the records of the Weather Bureau station at Marlinton, gives the more important climatic data.

TABLE 1.—Normal monthly, seasonal, and annual temperature and precipitation at Marlinton, Pocahontas County, W. Va.

[Elevation, 2,131 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1930)	Total amount for the wettest year (1918)	Snow, average depth
	° F.	° F.	° F.	Inches	Inches	Inches	Inches
December.....	29.4	67	-24	3.77	3.25	5.18	6.9
January.....	28.0	79	-27	3.92	2.24	6.44	9.0
February.....	31.8	71	-23	3.50	2.54	2.98	9.3
Winter.....	29.7	79	-27	11.19	8.03	14.60	25.2
March.....	37.9	85	-2	4.40	3.45	6.52	5.2
April.....	46.8	93	14	3.52	4.16	6.50	1.7
May.....	57.0	96	20	4.06	2.80	4.38	(¹)
Spring.....	47.2	96	-2	11.98	10.41	17.40	6.9
June.....	64.3	100	30	4.83	2.44	10.11	.0
July.....	67.6	94	40	5.03	.86	4.62	.0
August.....	66.2	98	40	4.98	2.67	5.60	.0
Summer.....	66.0	100	30	14.84	5.97	20.33	.0
September.....	61.2	90	28	3.09	1.34	4.73	.0
October.....	49.6	83	10	3.11	1.30	4.64	.2
November.....	37.6	82	2	3.05	1.67	1.92	1.4
Fall.....	49.5	90	2	9.25	4.31	11.29	1.6
Year.....	48.1	100	-27	47.26	28.72	63.62	33.7

¹ Trace.

AGRICULTURE

Agriculture was the chief pursuit of the early settlers of this county. Because travel was difficult and transportation facilities were meager, the settlers were compelled to be practically self-sustaining. Gardening, together with the growing of small patches of buckwheat, corn, beans, and potatoes, largely constituted the early farming enterprises. Later, cattle, sheep, and hogs were introduced principally for milk, wool, and meat to supplement the supply of wild game and fish that was an important source of food and clothing. Trapping furnished furs and skins that could be traded for the few supplies not produced at home. The bottom lands were generally devoted to grain and hay, and the adjacent slopes were cleared and used for pasture.

The land has always been farmed, for the most part, in small tracts by the owners. Practically no slaves were owned in the area, and the freeing of them after the Civil War did not affect agriculture.

The river and creek bottoms, cleared by the pioneers, and the smoother uplands, which were early brought into cultivation, are still farmed and constitute the most fertile soils. As livestock raising developed, extensive areas of ridge and mountain lands were cleared, most of which were used for pasture. Subsistence crops were grown on the smoother areas.

Between 1880 and 1890 the production of all grains and crops increased materially. The total acreage in all grains has remained

fairly constant since 1890, but acreages in certain crops have fluctuated considerably. Corn has been in the lead at all times followed by either wheat or oats. Hay increased from 10,817 acres in 1879 to 15,138 acres in 1889 and has increased very little since, but the acre yield has more than doubled. Since 1900 the total number of cattle and hogs has dropped off slightly, but the number of sheep raised and the production of wool, dairy products, poultry, and eggs have increased considerably. The acreage occupied by potatoes and garden crops, most of which are grown for home and local use, fluctuates with local demand.

The acreage of the principal crops in stated years is given in table 2, and the number and value of livestock are given in table 3.

TABLE 2.—Acreage of principal crops in Pocahontas County, W. Va., in stated years

Crop	1879	1889	1899	1909	1919	1929	1934
	<i>Acres</i>						
Corn.....	3,519	4,513	5,787	5,094	4,884	4,242	5,391
Oats.....	1,889	3,160	2,002	1,516	2,683	2,662	2,451
Wheat.....	2,891	3,330	4,102	1,439	3,960	1,313	2,022
Buckwheat.....	566	624	578	891	656	634	(1)
Potatoes.....		274	309	658	588	640	1,389
Hay.....	10,817	15,138	13,897	17,798	17,425	18,059	17,882
Timothy and timothy and clover mixed.....				13,744	13,787	14,225	12,995
Clover.....			37	60	228	333	50
Alfalfa.....				1	12	43	50
Other cultivated grasses.....			13,834	3,711	614	3,020	
Wild grass.....				196	2,480	290	4,396
Grains cut for hay.....			26	50	237	14	184
Legumes cut for hay.....					57	128	207
	<i>Trees</i>						
Apples.....		38,065	61,014	58,162	71,608	32,853	51,265
Peaches.....		4,857	13,283	5,844	13,695	7,377	3,753
Pears.....		167	1,048	1,274	2,403	1,700	1,706
Plums and prunes.....		154	1,240	1,284	2,646	1,239	1,165
Cherries.....		1,214	3,200	1,622	1,643	1,107	852

¹ Not available.
² All hay and sorghums for forage.
³ Wild hay and other grasses.

TABLE 3.—Number and value of livestock on farms in Pocahontas County, W. Va., in stated years

	1880		1890		1900 ¹		1910 ¹		1920		1930		1935	
	Num-ber	Dol-lars ²	Num-ber	Dol-lars ²	Num-ber	Dol-lars	Num-ber	Dol-lars	Num-ber	Dol-lars	Num-ber	Dol-lars	Num-ber	Dol-lars ²
Cattle.....	9,207	12,217	13,322	(?)	13,627	361,005	13,272	762,894	2,238	638,653	12,951			
Sheep.....	14,707	25,146	33,062	(?)	41,695	176,854	35,110	316,640	52,918	466,914	42,324			
Horses.....	1,672	2,347	2,799	(?)	3,176	346,190	2,919	335,804	1,962	174,922	1,822			
Swine.....	5,313	4,684	6,324	(?)	5,791	32,798	4,837	49,228	4,142	43,401	3,347			
Mules.....	91	135	121	(?)	115	12,305	77	8,170	90	8,417	88			
Goats.....			2	(?)	170	572	223	1,250	211	1,018	453			
Poultry.....	16,486	43,600	30,246	10,001	36,783	18,131	47,124	49,228	42,727	37,172	44,598			

¹ Includes livestock not on farms or ranges.
² Not available.

Hay and forage crops occupy about twice the acreage of all other crops combined. Practically all of these crops are consumed on the farms, a small amount being sold locally. The larger part of the hay crop is composed of mixed timothy and clover, with a small acreage of each grown separately. Small acreages are devoted to alfalfa and soybeans. Considerable grain feeds and concentrates

are shipped in. Production of wheat for flour is far below local consumption. The making of maple sugar, once developed to the extent that it formed a valuable addition to the income on many farms, has now become almost a negligible industry. Almost 100,000 acres are devoted to pasture, or about three times the amount in all crops.

Table 4 gives the value of all agricultural products of the county as reported by the 1930 census.

TABLE 4.—*Value of all agricultural and livestock products by classes in Pocahontas County, W. Va., in 1929 and value of domestic animals in 1930*

Crop	Value	Livestock and livestock products	Value
Cereals.....	\$283, 955	Domestic animals.....	\$1, 333, 325
Other grains and seeds.....	84	Bees and honey.....	10, 589
Hay and forage.....	307, 754	Dairy products sold and butter churned.....	106, 980
Vegetables.....	203, 160	Poultry raised.....	90, 495
Fruits and nuts.....	31, 616	Eggs produced.....	98, 613
All other field crops.....	5, 136	Wool and mohair.....	65, 091
Forest products.....	110, 006		
		Total.....	1, 703, 093
Total.....	947, 711	Total agricultural products.....	2, 650, 804

The use of commercial fertilizer and lime has become general in the last 20 years; however, few farms receive applications consistently from year to year or in a large quantity in any one year. The use of lime in connection with legumes is recognized by most farmers as the most economical method of improving land and increasing crop yields. Most of the agricultural lime comes from local limestone which is burned on the farms. Kilns are built from alternate layers of limestone and coal, and methods of covering and firing are similar to those used in burning charcoal. If coal is obtainable nearby, agricultural lime can be produced on the farm more cheaply than it can be purchased from commercial producers.

In 1929, the number of farms reporting the use of fertilizer, including commercial fertilizer and lime, was 800, or 66.6 percent of all farms; the expenditure reported was \$27,690, or \$34.61 per farm reporting its use. Superphosphate (16 or 20 percent) is the principal fertilizer used. Some muriate of potash and nitrate of soda are used by a few farmers. Some ready-mixed fertilizers are used for potatoes or special crops; 4-8-7 and 4-12-10¹ mixtures are most commonly recommended for potatoes.

Between 1880 and 1910 the number of farms steadily increased from 682 to 1,198, the latter figure being only 3 below that given by the 1930 census report. As the size of the farms has decreased slightly in the last 50 years, the total amount of land in farms has remained fairly constant. In 1935 there were 1,409 farms with an average size of 162.3 acres and comprising 39.5 percent of the total area of the county. Of this amount 18.8 percent or 30.4 acres of each farm was classed as improved land, including cropland and plowable pasture.

The percentages of farms operated by owners, tenants, and managers, respectively, were 86.0, 12.9, and 1.1 in 1935. There is no

¹ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

established system for tenant farming, as some tenants pay a cash rent, some operate on a share-crop basis, and others are allowed the use of a certain acreage of land in lieu of payment for performing certain duties or labor for the landowners.

Farm labor is paid, in general, by the day, as most of the work is seasonal. Where cattle are fed in winter in connection with other farming operations, laborers are paid by the month, and when they have families they are allowed to produce subsistence crops. In 1929, 477 farms reported an expenditure of \$70,709 for labor, or \$148.23 a farm. The rate of pay is generally low. Farm work is of a general character and reaches the peak during haying season. Work is exchanged among owners of small farms during the harvest.

Farmhouses on the better smooth-land farms and more extensive grazing farms are well built and modern. On the smaller farms and in the rough and more remote mountain sections they are smaller but generally well built, and most of them receive a coat of paint. Many of the houses occupied by temporary tenants and transient labor are of poor construction and not well kept. Barns are adequate for taking care of work animals and for storing grain and part of the hay. Most of the hay, however, is stacked in the fields and either fed on the ground or hauled to feeding barns or sheds which are generally provided as winter protection for livestock. Farm implements on the larger smooth-land farms are of the modern tractor-drawn or horse-drawn types commonly kept on farms of medium size where corn, small grain, and hay are produced. A large part of the cultivated crops is in small acreages, and the use of modern implements is limited. Practically all work animals are good-grade draft horses.

The cattle are principally good grades of the Hereford, Short-horn, and Aberdeen Angus breeds. Sheep are good grades of the dual-purpose or meat-producing breeds, as most of the revenue comes from the sale of lambs. Purebred rams are added to many flocks to improve lambs and wool. Hogs, raised principally for home use and local sale, are of improved native stock that has been crossed with the heavier market breeds. Not enough hogs are produced to supply the local demand for fresh meat.

Poor transportation facilities, long distances from markets, and the need for a cash income forced the farmers of this section in early days to turn to the production of beef. Even now, with railroad shipping available, it remains the largest source of income. Formerly all cattle, when ready for sale, were driven overland to outside markets, principally Pittsburgh, Baltimore, and Clarksburg. Many were sold as feeders in the Shenandoah and Potomac Valleys to the east and were later marketed from there.

Practically all cattle sold are grass fattened. This is because extensive areas are suitable only for grazing and the amount of land suitable for grain production is limited. Animals are winter fed only enough to bring them through without loss of weight or with only moderate gains to larger animals. They are returned then to pasture for the final grazing season.

Dairying is carried on principally to supply whole milk for local use. Many of the dairy products consumed in the county are shipped in.

Sheep, formerly raised for the production of wool, are now raised principally for the sale of lambs. With improved transportation facilities the number of sheep has increased rapidly. Nearly every farm, regardless of size, maintains a flock. On many of the small farms and in the ridge country where grass becomes short in summer, a large part of the cash income is derived from the sale of lambs and wool.

The production of poultry and eggs is wholly a side line to general or livestock farming. Varying numbers of poultry are produced on nearly all farms. There is little uniformity in breeds on most farms. Most of the poultry and eggs are exchanged at local trading points for goods, where they are again bartered or paid for in cash by truck haulers from outside towns that bring in wholesale supplies. During the height of the season, trucks make special rounds of the trading points and more thickly settled farming communities to pick up loads of poultry and eggs.

Farming methods and management are governed largely by the steepness of the land and the size of the farms. On the smooth or rolling land, farm machinery and power equipment can be employed in preparing, planting, cultivating, and harvesting, but on the smaller patch farms and on steep or stony lands, much of the work is done by hand. The adaptations and limitations of the soils to crops have been recognized by the farmers and have been heeded to a great extent, although general farm crops are grown on almost all soils where climatic conditions will allow.

Corn is usually planted after a crop of hay, buckwheat, or oats or on land that has been grazed. The land is usually plowed in the fall to allow freezing and thawing to pulverize the soil, and the seedbed is prepared in spring by disking or harrowing to the desired smoothness. Corn is usually drilled in with single-row planters, but in small fields and on rough ground it is dropped in the open furrow by hand. Any fertilizer used is applied at planting time. Manure is applied before the land is plowed. Corn is cultivated to keep down weeds and is hoed and thinned by hand when there is need. The crop is cut by hand and shocked in rows to allow disking for wheat. The part of the crop used for silage is cut in September.

Wheat usually is sown with a drill, the fertilizer being applied at the time of planting. If lime is to be applied, it is worked into the soil before planting time. Timothy is sown with the wheat, but clover is not seeded until the following spring. Wheat is harvested with a binder, except where the steepness, stoniness, or small size of the fields necessitates the use of a cradle. If a good stand of timothy and clover is obtained after wheat, the field may be kept in grass for 2 or 3 years, or until the yield declines or the field is infested with weeds, when the land is plowed again for grain crops.

On most farms no definite crop rotation is followed, although the crops usually are planted in the following order: Corn, wheat, and grass. Hay is harvested in August, and most of it is stacked in the field. It is seldom baled. If sold, it is sold loose by the ton or by the stack, usually to nearby farms.

On high mountain elevations and in localities where the seasons are too short or too cold to grow corn and wheat successfully, buckwheat

and oats take their place in the rotation system. Buckwheat is usually planted in late June or early July on freshly turned sod land, followed by oats in the spring. The oats act as a nurse crop for timothy and clover in establishing hay meadows. Rye sometimes takes the place of oats here, being sown together with timothy in the fall after buckwheat is harvested. Buckwheat is harvested largely by hand. The grain is used both for livestock and for human consumption. When the crop of oats is very good, it is harvested with a binder or cradle for grain. Otherwise, it is mowed before it is thoroughly ripened and is fed as hay.

Permanent pastures on limestone land have remained excellent since their earliest establishment. Those on thin lands or acid soils become short in dry seasons and as a result of overgrazing are often invaded by weeds and undesirable grasses. Little is done to maintain or improve such pastures.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures such as those in road or railroad cuts are studied. Each excavation exposes a series of distinct soil layers or horizons called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil² and its content of lime and salts are determined by simple tests. The drainage, both internal and external, and other external features, such as the relief or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, special emphasis being given to those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. Upon the basis of these characteristics soils are grouped into mapping units. The three principal units are: (1) Series, (2) type, and (3) phase. In places, two or more of these principal units may be in such intimate or mixed pattern that they cannot be clearly shown separately on a map, but must be mapped as (4) a complex. Areas of land, such as coastal beach or bare rocky mountain sides, that have no true soil are called (5) miscellaneous land types.

The most important of these groups is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus the series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including

² The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the "pH value." A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first found. Thus Upshur, Hagerstown, and Monongahela are names of soil series.

Within a soil series are one or more soil types, defined according to the texture of the upper portion of the soil. Thus the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Monongahela silt loam and Monongahela loam are soil types within the Monongahela series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping and because of its specific character is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a subgroup of soils within the type which differ from the type in some minor soil characteristic that may, nevertheless, have an important practical significance. Differences in relief, stoniness, and degree of accelerated erosion are frequently shown as phases. Thus, for example, within the normal range of relief for a soil type, there may be portions which are adapted to the use of machinery and the growth of cultivated crops and other portions which are not. Even though there may be no important differences in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such an instance the more sloping portions of the soil type may be separated on the map as a sloping or hilly phase. Similarly, soils having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types, phases, complexes, and miscellaneous land types, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS ^a

Pocahontas County is in a region of heavy rainfall, about 50 inches a year. The mean annual temperature is about 48° F. in the lowlands and valley and ridge belts. The rainfall is somewhat heavier and the temperature is lower in the high western plateau section and in the northern part of the county. The soils have developed under a forest covering of both conifers and hardwoods.

All of the soils are podzolic or leached to a greater or less extent, having undergone such development as has taken place in an acid

^a In several places the soils of Pocahontas County do not join exactly with those of Randolph and Pendleton Counties, W. Va. This is due to a better understanding in the mapping of soils, more detailed mapping of textural differences, and revision of the Dekalb series. Leetonia stony silt loam and Leetonia stony loam in Pocahontas County join Leetonia stony loam in Randolph County. In other places Leetonia stony silt loam in Pocahontas County, joined by Dekalb stony loam in Randolph County and Leetonia gravelly silt loam in Pocahontas County, is joined by Dekalb silt loam and Dekalb stony fine sandy loam in Pendleton County.

medium. This is true not only of the extensive soils derived from rock containing little or no lime but of those derived from rock with a high content of lime. Leaching of carbonates from soils developed from limestone practically keeps pace with rock weathering, allowing no opportunity for carbonate accumulation. The more gentle relief and cooler climate favor development of the true Podzol profile on the high plateaus. On the other hand, because of the heavy rainfall and of the ruggedness of the slopes throughout much of the area, the surface material is washed away before it can become highly acid. Many of the soils therefore remain in a youthful condition and partake of the character of the rocks from which the soil material has been derived. In detail, therefore, the soils within the broad limits of their podzolic character differ from place to place in accordance with the local character of the underlying rock.

Many of the soils occur as long irregular and broken bands of different widths, paralleling the ridge tops, mountaintops, and stream valleys. Others occur as widely scattered areas ranging in size from 10 acres to more than a square mile. Still others, where the underlying rocks are uniform, cover many square miles. Only the soils which have the more favorable relief, contain the largest amount of plant nutrients, or are the easiest to cultivate are farmed.

Less than 20 percent of the land is cleared and used for crops and pasture. Of this area, a little more than one-fourth, or from 5 to 7 percent of the total area, is used for grain, hay, and other crops. Nearly all the extensive areas of rough and steep mountain lands are held as Federal and State forest reserves, or by large lumber and land companies as a source of lumber and other forest products. Timbered land is also included with nearly all farms of any appreciable size. Such timbered tracts are utilized for summer browse range for sheep or as a source of wood for fuel and for sale as local building and fencing materials. Timber is also sold for paper and other forest products to local buyers, who deliver it to the manufacturers or consumers. The future value of about 75 percent of the land in Pocahontas County is dependent directly or indirectly on timber growth.

The agriculture is typical of many of the more remote sections of the central Appalachian Mountains. Many of the farming operations are based on or centered around livestock raising, including the raising of sheep and cattle. A direct relationship exists between the crops grown and their yields and the several types of soils. In order to bring out this relationship the land has been divided into two broad groups, namely, agricultural soils, and forest soils and miscellaneous land types.

In the following pages the soils of Pocahontas County are described in detail, and their agricultural importance is discussed. The accompanying soil map shows their distribution and location, and table 5 gives their acreage and proportionate extent.

TABLE 5.—*Acreage and proportionate extent of the soils mapped in Pocahontas County, W. Va.*

Soil type	Acres	Per-cent	Soil type	Acres	Per-cent
Clymer silt loam.....	24,640	4.3	Lindside silt loam.....	2,880	0.5
Clymer loam.....	2,112	.4	Atkins silty clay loam.....	2,240	.4
Dekalb gravelly loam.....	4,480	.8	Melvin silty clay loam.....	1,152	.2
Leetonia fine sandy loam.....	2,240	.4	Lowell and Hagerstown stony silty clay loam.....	19,968	3.4
Leetonia gravelly silt loam.....	1,280	.2	Upshur stony silt loam.....	55,424	9.6
Berks shaly silt loam.....	16,576	2.9	Meigs stony loam (Dekalb-Upshur complex).....	9,408	1.6
Lehew gravelly loam.....	640	.1	Hagerstown stony silt loam.....	960	.2
Lowell silt loam.....	4,544	.8	Dunmore stony loam.....	3,840	.7
Upshur silt loam.....	5,440	.9	Dekalb stony silt loam.....	69,824	12.1
Upshur gravelly loam, colluvial phase.....	1,856	.3	Dekalb stony loam.....	42,560	7.3
Hagerstown silt loam.....	4,032	.7	Dekalb stony loam.....	21,504	3.7
Westmoreland silt loam.....	2,880	.5	Dekalb stony fine sandy loam.....	26,432	4.6
Meigs silt loam (Dekalb-Upshur complex).....	3,456	.6	Leetonia stony loam.....	12,096	2.1
Dunmore cherty loam.....	4,032	.7	Leetonia stony fine sandy loam.....	4,480	.8
Monongahela loam.....	3,456	.6	Lehew stony loam.....	13,184	2.3
Monongahela silt loam.....	2,112	.4	Elliber stony loam.....	4,352	.7
Huntington loam.....	4,032	.7	Rough stony land.....	180,864	31.2
Moshannon gravelly loam.....	4,864	.8	Peat.....	832	.1
Pope silt loam.....	9,408	1.6			
Pope gravelly fine sandy loam.....	2,752	.5	Total.....	578,560	
Pope fine sandy loam.....	1,728	.3			

AGRICULTURAL SOILS

The soils of the group classified as agricultural fall into two general subgroups, according to characteristics and usage—soils suitable for crops and soils suitable for pasture.

The first subgroup includes: (1) Soils that have a smooth surface, are alluvial in origin, and are largely free from stone; and (2) soils of the uplands that have a relief ranging from gently rolling to hilly and that are residual or are derived from the weathering of underlying rock, fragments of which may be scattered over the surface and through the soils but not in sufficient quantities to interfere materially with cultivation. The alluvial soils have light-brown, brown, or yellowish-brown surface soils with little textural or color change throughout the profile. The soils developed from residual materials are mainly light colored; their surface soils are gray, yellow, light brown, or brown, and their subsoils are yellow, brown, and red clay or clay loam, or they retain the color of the underlying rock.

The soils of the second subgroup, like the soils of the uplands suitable for crops, are developed from residual materials, principally from calcareous rock. They are characterized by sharp relief and by large quantities of stone on their surfaces and through the soils. They are suitable mainly for pasture.

SOILS SUITABLE FOR CROPS

The first subgroup of agricultural soils is designated as soils suitable for crops, because nearly all the cultivated crops and hay are produced on these soils. All crops suited to the climate are grown on all these soils. Some of the more extensive soils return the lowest yields and are the least farmed, whereas some of the least extensive

soils return the highest yields and are all farmed. Of the two classes of soils included in this subgroup, the alluvial soils as a whole are the most productive, but those derived from weathered limestone are as productive as the best alluvial soils or bottom lands. Nearly all of the alluvial soils and those derived from limestone have been cleared, whereas the soils developed from sandstones and shales, because of their low inherent fertility, their low crop yields, and their tendency to erode badly, contain considerable areas left in timber.

The alluvial soils of this group include Huntington loam, Pope gravelly fine sandy loam, Pope fine sandy loam, Pope silt loam, Moshannon gravelly loam, Lindside silt loam, Atkins silty clay loam, and Melvin silty clay loam on first bottoms and Monongahela silt loam and Monongahela loam on terraces or second bottoms.

Dekalb gravelly loam, the colluvial phase of Upshur gravelly loam, Clymer loam, Clymer silt loam, Leetonia gravelly silt loam, Leetonia fine sandy loam, Berks shaly silt loam, Lehew gravelly loam, Dunmore cherty loam, Meigs silt loam (Dekalb-Upshur complex), Upshur silt loam, Lowell silt loam, Westmoreland silt loam, and Hagerstown silt loam are the soils of the upland or residual material group, which are suitable for crops. Except for small widely scattered areas through the mountains and high uplands, these soils are along the stream valleys or on the immediately adjacent lowlands, ridges, and lower mountain slopes. Not only do the soils of this subgroup produce nearly all of the crops, but furnish nearly as large an acreage for grazing as for crops.

Clymer silt loam.—Clymer silt loam is the most extensive of the soils suitable for crops but returns the lowest average yields of the various crops. Although this soil is fairly productive when first brought into cultivation, yields drop off rapidly as the available supply of humus and nitrates from the forest litter is exhausted.

The surface soil to plow depth, from 3 to 6 inches, is grayish-yellow or light brownish-yellow gravelly silt loam. The upper subsoil layer, to a depth ranging from 12 to 15 inches is pale-yellow friable silt loam with somewhat less gravel than the surface soil. The lower subsoil layer, to a depth ranging from 20 to 34 inches, where partly weathered shale and sandstone is present, is light brownish-yellow friable silty clay loam containing some unweathered parent material. The gravel content of the soil is small and consists of small platy and angular fine-grained sandstone fragments that are more resistant to weathering than the softer shale from which most of the soil material is derived.

This soil is almost entirely in the eastern part of the county, in long narrow belts, immediately adjacent to the stream bottoms or on nearby lowland ridges and lower mountain slopes. Its relief is rolling to hilly. Surface drainage is excessive, and internal drainage is good. On some of the steeper slopes, soil erosion almost keeps pace with rock weathering, resulting in a shallow soil, or a profile ranging from 12 to 15 inches in thickness. These included shallow soils have a 2- to 3-inch grayish-yellow surface soil over a yellow or pale-yellow silt loam subsoil.

Only about 10 or 15 percent of this land is cleared and is used in about equal proportions for crops and pasture. Nearly all of the

wooded land has been cut over, and all of that included in farms is used in connection with pasture or for browse range for sheep and cattle.

Corn yields from 15 to 25 bushels an acre, wheat 10 to 15 bushels, oats 20 to 30 bushels, and buckwheat 15 to 25 bushels. Hay yields, principally timothy, are generally below 1 ton an acre. Applications of lime result in better stands of clover and an increase in hay yields. The increased humus and nitrate supply from the residue of clover on the land is reflected in better development and increased yields of subsequent crops of grain.

Clymer loam.—Clymer loam occupies smooth gently rounded benchlike ridge-top remnants of what was once nearly level land and is now thoroughly dissected by small drains, lying from 400 to 500 feet above and along the west side of Greenbrier River, through the central-southern part of the county. The soil is derived from comparatively soft rocks that are underlain by nearly horizontal hard resistant sandstone that maintains the level remnants of the old land surface or peneplain. Very few or no rock fragments of the parent material occur in this soil, as complete weathering of the rock has been favored by the smooth surface throughout a long period of time. For the same reason, this soil has a deeper and more mature profile than most soils of the county derived from noncalcareous sandstones and shales, such as Dekalb gravelly loam and the stony types of Dekalb soils. Leetonia fine sandy loam, developed under similar conditions and on the same kind of surface as Clymer loam, but from coarser sandstone, shows a similar depth and maturity of profile.

In cultivated fields the surface soil to plow depth, from 5 to 8 inches, is light-brown or yellowish-brown friable loam, which changes abruptly to yellow friable heavy loam or silt loam that extends to a depth ranging from 12 to 15 inches, where it, in turn, changes somewhat abruptly into yellow friable silty clay loam and again at a depth of about 24 inches into yellow or brownish-yellow clay. This material extends downward to disintegrated rock or incompletely weathered loamy soil material at a depth ranging from 28 to 40 inches. Where the underlying material is weathered to a depth exceeding 30 or 32 inches, it becomes mottled with gray, orange, and brown. Near the outer edges of areas of this soil, where the land begins to slope more sharply, the depth of the soil profile is not more than 24 inches, and the subsoil is brownish-yellow heavy silt loam or silty clay loam. A few small areas of heavy loam or silt loam are included with this soil on the map.

As much of this soil is near or adjoins soils derived from limestone, it probably receives some lime from drainage waters from the limestone lands. This may account, in a measure, for the higher yields obtained on this soil than on Dekalb gravelly loam and on Clymer silt loam. The higher yields may also be explained, however, by the greater reserve supply of moisture and the more favorable surface and subsurface features that allow less erosion and leaching of plant nutrients.

Nearly all of this soil is cleared and planted to hay and grain crops. A small acreage is maintained in pasture in the system of crop rotation. On some farms all the plowable land consists of this soil. Corn yields 25 to 40 bushels an acre, wheat 12 to 20 bushels,

oats 25 to 45 bushels, buckwheat 20 to 35 bushels, and hay, mixed timothy and clover, 1 to 1½ tons an acre.

This land is easily cultivated and readily responds to a program of land improvement. Much of it has had one or more applications of burnt lime, at a rate ranging from 1,000 to 2,000 pounds an acre, which, together with an occasional application of barnyard manure and the plowing under of the residue of clover, has built it up to a high state of fertility. Yields are only slightly below those obtained on the nearby Lowell and Hagerstown silt loam soils, which are derived from limestone and considered the best upland soils of the county.

Dekalb gravelly loam.—Dekalb gravelly loam occurs mainly as a chain of small areas up to 300 acres in extent, occupying the smooth crests and upper slopes of ridges paralleling Greenbrier River on the west side, extending from near Durbin to the southern boundary of the county. It represents the smoother and less stony parts of larger surrounding areas of Dekalb stony loam.

The surface soil to a depth of 4 to 6 inches is grayish-yellow or grayish-brown gravelly friable loam changing abruptly to pale-yellow friable heavy loam which extends to a depth ranging from 12 to 14 inches. This material grades into yellow or light brownish-yellow friable silt loam which extends to the partly weathered fine-grained sandstone lying at a depth ranging from 24 to 36 inches.

Leetonia fine sandy loam.—Leetonia fine sandy loam, like Clymer loam, occupies somewhat flat areas near Greenbrier River, but at slightly lower elevations. The main bodies are mapped east of Ed-ray. The only other area of any appreciable size is on the nearly flat crest of Droop Mountain near the southern boundary. The soil is somewhat deeper than Clymer loam and very much deeper than Dekalb gravelly loam or Clymer silt loam.

The surface soil to a depth ranging from 4 to 6 inches is gray-brown loose or friable fine sandy loam which changes abruptly to yellow friable heavy fine sandy loam extending to a depth of about 14 inches below the surface. This, in turn, grades into yellow heavy friable loam or light fine sandy clay, which becomes heavier below 30 inches and extends to rotten rock at a depth ranging from 36 to 48 inches. Some gray and brown mottlings usually occur in the lower part of the subsoil of the more deeply weathered areas.

About 40 percent of this soil is cleared and planted to corn, buckwheat, potatoes, and some wheat and hay. The remainder supports an excellent second growth of the once heavy stand of hardwoods, of which red oak was the dominant tree. The farms on this soil are small; some contain only a few acres. They are owned by individuals that depend largely on public work or day labor for their cash income. The crops grown are principally for home consumption.

Little or no care is taken to maintain the fertility of the soil or to improve the land. Yields are for the most part only fair. Corn produces from 15 to 25 bushels an acre, buckwheat 15 to 30 bushels, wheat 10 to 15 bushels, and potatoes about 100 bushels an acre. Some fields which have been limed and receive applications of commercial fertilizer return yields considerably above the average.

Leetonia gravelly silt loam.—Leetonia gravelly silt loam occupies an area of about 1,000 acres on Alleghany Mountain in the north-eastern part of the county and two small areas on Cranberry Mountain in the western part. It occupies positions of relatively smooth relief at elevations ranging from 3,500 to more than 4,000 feet and differs from the surrounding soil mainly in having smaller and fewer rock fragments on the surface and throughout the soil. It differs from Dekalb gravelly loam and Clymer silt loam, developed from the same parent material at lower elevations, in that it has accumulated a 4- to 12-inch surface layer of duff, or forest litter, and the surface soil, instead of being grayish- or yellowish-brown, is dark-brown or coffee-brown silt loam to a depth of from 5 to 7 inches, where it passes abruptly into brownish-yellow friable silty clay loam. The pale-yellow upper subsoil layer of the Dekalb and Clymer soils at lower elevations also is absent.

After the heavy growth of timber was removed, principally spruce and hemlock, forest fires destroyed nearly all second-growth wood, and this soil is now supporting a dense sod of moonshine grass and fern. Some small areas have been planted to buckwheat, oats, and potatoes. Grain yields are generally low, and potatoes yield up to 150 bushels an acre. Some wild grass is cut for hay. In cultivated fields the organic residue of the 5- to 7-inch surface soil is soon dissipated, leaving the soil yellowish brown instead of dark brown as in the virgin soil.

Berks shaly silt loam.—Berks shaly silt loam is derived from weathered dark- and light-colored fine-grained laminated shales that are found only in the lower positions of the narrow valleys in the eastern part of the county. The streams here are entrenched in the shale beds, and Berks shaly silt loam occupies almost continuous belts, from one-fourth to one-half mile wide, on the immediately adjacent low rounded hills and lower mountain slopes. It lies on about the same level as, or just below, Clymer silt loam, which it adjoins in many places. The parent material of these two soils is closely related. The shale from which Clymer silt loam is derived, however, is more thickly stratified, and some thin strata of fine-grained sandstone are distributed through it.

Berks shaly silt loam differs from Clymer silt loam principally in that it is somewhat more brown throughout the soil profile, and, instead of angular rock fragments, an abundance of unweathered shale chips and fragments are scattered over the surface and through the soil. Weathering of the parent material has taken place to a greater depth, probably because of a generally more favorable relief, which lessens somewhat the effect of erosion.

Cultivated fields to a depth of 5 or 6 inches are light-brown or yellowish-brown friable silt loam that changes abruptly to brownish-yellow friable silt loam which continues downward to about 15 or 16 inches where it grades into brownish-yellow silty clay loam. At a depth ranging from 24 to 30 inches this material passes into the incompletely weathered gray, red, and rust-brown mottled shaly clay material. On the steep short slopes of the short lateral drains the partly weathered shale is only a few inches below the surface or outcrops in places.

Only about 10 percent of this land is cleared. Small grains, principally oats, together with some corn, buckwheat, and potatoes, occupy the largest acreage. Hay and temporary pasture occupy about half of the cleared land. The forested parts are covered largely with a brushy or small second growth of the original forest of hardwoods and white pine. Some timber for sale and for local use is taken from the better growths.

Crop yields, on the average, are low; oats seldom yield more than 30 bushels an acre, corn yields from 15 to 30 bushels an acre, wheat 10 to 15 bushels, buckwheat 15 to 20 bushels, and potatoes 100 to 150 bushels. Hay, principally timothy, produces one-half to three-fourths ton an acre. The higher yields are obtained where an application of 200 to 500 pounds an acre of a high-grade commercial fertilizer is made. The 2-12-2, 4-12-4, and 4-16-4 mixtures are most commonly used for grains and the 4-8-7 and 4-12-10 mixtures for potatoes. Applications of one-half to 1 ton an acre of burnt lime usually insure good growth of clover that will increase hay yields as much as 100 percent.

Lehew gravelly loam.—Lehew gravelly loam occupies only a few small areas widely scattered through the sections east of or adjacent to Greenbrier River. On the farms on which it occurs, however, it constitutes all or nearly all of the smooth lands used for cultivated crops and hay. It is derived from weathered reddish-brown or Indian-red noncalcareous shales and sandstones of the Catskill formation. In general appearance it closely resembles Upshur silt loam, which is derived from a mixture of red calcareous shale and limestone. In productivity it ranks lower than Upshur silt loam and about the same as Dekalb gravelly loam and Clymer silt loam, with which it is associated.

The surface soil to a depth of 5 or 6 inches is chocolate-brown friable gravelly loam. The subsoil is Indian-red friable heavy loam or silt loam with little or no textural or structural change. Disintegrated parent rock is reached at a depth ranging from 26 to 34 inches.

All of this soil is cleared and used for buckwheat, oats, rye, potatoes, hay, and a small amount of corn. Potatoes do well. With applications of 400 pounds an acre of a 4-8-7 or similar fertilizer they yield 200 bushels an acre.

Lowell silt loam.—Lowell silt loam is a light-colored stone-free soil with a smooth surface, derived largely from nearly pure limestone. It is developed only on the larger exposures of Greenbrier limestone as numerous small areas in a belt extending southwestward from Cass through the central part of the county. Several relatively large areas are mapped southwest of Marlinton and in the vicinity of Hillsboro.

Lowell silt loam is an outstanding soil from the standpoint of productivity and ease of cultivation. It is one of the several related soils which form the section near Hillsboro known as Little Levels. This is one of the most highly developed farming sections of the county.

All of this soil is cleared, and nearly all is planted to corn, wheat, and hay. Some of the small patches and areas that are surrounded

by Lowell and Hagerstown stony silty clay loam are included in pastures and produce good bluegrass.

The surface soil of Lowell silt loam to a depth of 6 inches is light-brown or yellowish-brown friable silt loam that changes rather abruptly to brownish-yellow friable silt loam or heavy silt loam. This material gradually becomes heavier with depth until at 18 or 20 inches below the surface it is yellow or brownish-yellow stiff silty clay loam. At a depth ranging from 26 to 28 inches, this, in turn, grades into stiff clay which is about the same color, with some faint mottlings of gray and pale yellow, as the overlying layer and which is plastic when wet and hard when dry. Below a depth of about 36 inches it passes into dull brownish-yellow stiff hard or plastic clay that continues to limestone bedrock lying from 38 to 42 inches below the surface. In places, the rocks underlying the limestone formations from which this soil is derived are red and impart a light-red or pink color to the lower part of the subsoil.

In normal years, corn yields from 30 to 50 bushels an acre, wheat 15 to 25 bushels, and mixed timothy and clover about 1½ tons of hay. A second cutting of clover of nearly 1 ton an acre can be had sometimes in favorable years, but it is more often pastured off. A very limited acreage of alfalfa is planted on this land, which in two or three cuttings produces about 2 or 2½ tons an acre.

Although this soil is derived from limestone, the surface soil gives an acid reaction. Beneficial effects, including increased crop yields, can be had from the application of 1,000 pounds an acre of burnt lime; especially is this noticeable in clover. Manure and superphosphate or a complete fertilizer high in phosphate is recommended for land to be planted to wheat.

Upshur silt loam.—Upshur silt loam, although limited in total acreage, is an important soil for hay and oats through the high-lying central and west-central parts where large areas of the surrounding soils are steep and stony and suited only to pasture. To a lesser extent it is associated with the Lowell soils that occupy the broader and more nearly level lowland areas, and here are planted the same crops—corn, wheat, and hay—as are grown on Lowell silt loam. Upshur silt loam is derived from Indian-red shales that contain considerable lime. Surface drainage is generally not excessive, as the land occupies the smoother rounded ridge tops, the benchlike middle slopes, and the less steep lower slopes near small streams. Its friable subsoil allows good internal drainage.

The surface soil to a depth of 6 or 8 inches is chocolate-brown or dark reddish-brown friable silt loam which changes abruptly to Indian-red heavy silt loam or silty clay loam, that extends down to about 30 inches or more. Below is loose partly weathered Indian-red shale which overlies bed shale at a depth ranging from 3 to 4 feet below the surface. Some of the included soils have a small amount of shale chips and small rock fragments scattered over the surface.

Nearly all of this land is cleared, and most of it is planted to crops. On the higher lying parts, hay and oats are the main crops; some potatoes are grown as a cash crop and yield as high as 150 bushels an acre with no fertilization. On the lower elevations corn and wheat yield only slightly lower than on the best crop soils of the

area. Areas used for permanent pasture support an excellent stand of native grasses and bluegrass, probably with moonshine grass predominating.

Upshur gravelly loam, colluvial phase.—The colluvial phase of Upshur gravelly loam is developed on the tongue of colluvial material dumped along the edge of the valley floor where streams having a strong gradient emerge from a section dominantly of Upshur material. These deposits range from 10 to 40 feet in thickness and consist of a heterogeneous mass of gravel, cobbles, and soil material having Upshur characteristics. This soil is similar to Upshur silt loam except that it is developed on deep material whereas Upshur silt loam is derived from red calcareous shales weathered in place and the solum rarely exceeds 2 feet in depth.

In places this phase is more nearly an alluvial-fan phase of Moshannon gravelly loam. All of it, however, lies far above possible overflow and must be handled as an upland soil. The surface is smooth to gently sloping, affording ample drainage.

The soil is brown gravelly or cobbly loam to a depth ranging from 6 to 10 inches, passing into reddish-brown firm but friable heavy loam or silt loam containing some gravel. At a depth ranging from 30 to 36 inches this grades into a mass of gravel, stone, and earth material similar to the Upshur soils in color and composition, which presents in places a rough assortment but is not stratified.

This phase has less of the deep Indian-red color than the normal Upshur soils because of a slight admixture, in places, of other materials common to nearly all colluvial soils.

Upshur gravelly loam, colluvial phase, is not an extensive soil. Narrow strips are developed near Old Field Fork and Big Spring Fork of Elk River. The largest and most typical areas are in Pleasant Valley. A body of this soil north of Edray consists largely of talus and outwash material from Dekalb, Upshur, and Lowell soils.

The land is nearly all cleared and is used for pasture, hay, wheat, corn, and oats. Yields are fairly good on this soil, which rates in productivity slightly above Moshannon gravelly loam and slightly below Upshur silt loam. It is used to a marked degree for road locations, home sites, schools, churches, and other buildings.

Hagerstown silt loam.—The development of the soil profile of Hagerstown silt loam shows the soil to be somewhat more mature than many of the surrounding soils. The brown surface soil color and the red or reddish-brown subsoil color are due to the more complete weathering and oxidation of the iron salts of the soil and their subsequent accumulation in the subsoil. The depth of the soil over bed-rock ranges from 4 to 6 feet, which is, on the average, about 1 foot greater than that of Upshur silt loam or Lowell silt loam. Small areas of both these soils that are too intricately associated to be separated into their several types are mapped with Hagerstown silt loam.

Hagerstown silt loam is developed largely on the Little Levels in the immediate vicinity of Hillsboro. Its surface is undulating to gently rolling. Through the numerous sinkholes and underground channels most of the surface drainage waters find their way to nearby Greenbrier River.

The soil is developed from and largely underlain by limestone. The Indian-red material of the included small areas of Upshur silt loam comes from impure limestone and red shales. The surface soil is brown, light-brown, and reddish-brown silt loam to a depth ranging from 6 to 8 inches, where it passes into heavy silt loam. The inclusions of Lowell silt loam are generally somewhat lighter in color in the surface soil. At a depth of about 15 inches the heavy silt loam grades into a yellowish-brown, brown, or reddish-brown silty clay loam subsoil which is stiff and somewhat plastic when wet. This material, in turn, at a depth ranging from 24 to 28 inches grades into stiff yellowish-brown or yellowish-red clay that extends to a depth of 4 feet or more. At a depth of about 30 inches, faint mottlings of gray, yellow, and brown appear; these increase with depth.

Although of limited extent, Hagerstown silt loam is the outstanding upland soil of the county. Because of its favorable relief, the absence of stones, and the ease with which it can be cultivated, this soil comprises some of the best farms.

It is given over largely to the production of corn, wheat, and hay. Farms on this soil are the only ones in the county that fatten cattle for market. Corn yields from 35 to 60 bushels an acre, wheat 17 to 35 bushels, and hay nearly 2 tons. The best yields usually are obtained where applications of lime, manure, and commercial fertilizers have been made.

Westmoreland silt loam.—The surface soil of Westmoreland silt loam to a depth of 7 or 8 inches is light-brown or yellowish-brown friable silt loam which changes abruptly to yellowish-brown friable light silty clay loam. This material continues downward to a depth of about 30 inches, where it passes into dull brownish-yellow heavy silt loam containing some mottlings below 36 inches. It rests on unweathered parent rock 40 or more inches beneath the surface.

The soil is developed from calcareous gray shale, fine-grained sandstone, and impure limestone, that are intermediate between the lower massive limestones which gave rise to the parent material of the Lowell and Hagerstown soils and the higher Indian-red shale and sandstones on which the Upshur soils are developed.

As a whole, this soil is deeper than Clymer loam and Clymer silt loam and is about as deep as Lowell silt loam and Upshur silt loam. It is slightly more brown throughout the profile than the Clymer soils. Where it joins with the Upshur soils some inclusions are made of reddish soils which, if they had been more extensive, would have been separated as Meigs silt loam.

Westmoreland silt loam lies principally in the lower hilly sections of the southwestern part in the vicinity of Lobelia, and a few smaller areas are scattered throughout the western half. All of it is naturally well drained. It has been eroded very little, because the slopes have been in pasture grasses.

Nearly all of the land is cleared, and the smoother areas, or about 50 percent, are used for hay, corn, small grains, buckwheat, and some potatoes. The remaining steeper portions are in permanent pasture, supporting a fair to good sod of bluegrass and native grasses. This is considered one of the best soils in the county for the production of pasture grasses. Corn yields 20 to 40 bushels

an acre, wheat 10 to 20 bushels, oats 25 to 35 bushels, buckwheat 20 to 25 bushels, and hay about 1 ton.

Meigs silt loam (Dekalb-Upshur complex).—Meigs silt loam (Dekalb-Upshur complex), as the name implies, is a composite soil, or complex, and includes areas of Dekalb silt loam and Upshur silt loam which are too small to be separated into their respective types. It is in part developed on rocks that contain some lime. Bodies ranging from 20 to 100 acres are widely scattered through the western half of the county. This soil occupies somewhat flat and sloping benches of the higher mountain slopes, stream divides, and ridge tops, associated with the Dekalb, Upshur, Lowell, Hagerstown, and Westmoreland soils. A few larger areas near Lobelia are on moderately steep slopes. Narrow strips occur around the edges of the lowland limestone soils.

In cultivated fields the surface soil is mixed grayish-yellow, brown, and red silt loam. In some places it may be observed that the weathered Indian-red silty clay or clay of the Upshur material underlies the surface soil developed from impure limestone. In other places an entire profile is that of typical Upshur silt loam, and in still other places, perhaps not more than 200 feet distant, typical Dekalb silt loam may be developed. The soil in areas where the Dekalb material is dominant is usually somewhat lighter in texture than in areas where the soil is more representative of the Lowell or Upshur soils. A small amount of chert gravel is on the surface and through the soil where the parent material is weathered in part from the cherty limestone that occurs as the lower part of the massive limestone formations.

Nearly all this soil is cleared. About 75 percent is used for hay, corn, wheat, buckwheat, oats, and potatoes. The remainder is in permanent pasture.

Crop yields average somewhat higher than on the Dekalb soils, probably about equal to those on Upshur silt loam, and not quite so high as on Lowell silt loam and Hagerstown silt loam.

Dunmore cherty loam.—Dunmore cherty loam is only in the eastern part, extending southwestward from Green Bank along a steeply folded limestone exposure to the Greenbrier County line. Its parent material is weathered from both relatively pure and siliceous limestone and in part from sandstone. It is best developed in an area of ridges and low rolling hills between Green Bank and Dunmore, and west of Frost. It is similar to Westmoreland silt loam in surface appearance but is more brown in the subsoil. The buff subsoil underlying much of it is very similar to the Hagerstown stony silt loam subsoil and, in turn, is underlain by nearly pure limestone. The principal difference between Dunmore cherty loam and Hagerstown stony silt loam is that the latter contains little or no siliceous material and is reddish brown on the surface. In general the subsoil of Dunmore cherty loam is more friable than that underlying either the Lowell or Hagerstown soils, which are developed from limestones.

The surface soil of Dunmore cherty loam to a depth of 5 inches is yellowish-brown or light-brown friable gravelly loam that changes abruptly to yellow or pale-yellow friable loam or silt loam, which, at a depth of about 12 inches below the surface, grades abruptly into buff, brownish-yellow, or yellowish-brown friable or stiff silty clay

loam. At a depth of about 30 inches this material, in turn, grades into yellowish-brown or brownish-yellow stiff silty clay or clay, slightly mottled with gray and dark brown, which rests on bedrock at a depth ranging from 3 to 4 feet beneath the surface.

The gravel content of the soil consists of small fragments of sandstone, chert, and in places platy fragments of limestone. Limestone also outcrops in a few places. Around these outcrops the surface soil is more brown and is more nearly a silt loam, the upper subsoil layer is buff or reddish-yellow silty clay loam, and the lower subsoil layer is reddish-brown rather stiff clay. Such areas, had they been of greater extent, would have been mapped as Hagerstown silt loam. In places the surface soils are fairly sandy, being a light loam or heavy fine sandy loam.

Practically all of this soil is cleared. About 50 percent is maintained as permanent pasture and constitutes some of the best grazing land in the eastern part of the county. The remaining 50 percent is about equally divided among small grain, hay, and other crops. In the vicinity of Dunmore, a considerable acreage of potatoes is grown as a cash crop on this soil. With applications ranging from 300 to 500 pounds to the acre of commercial fertilizer carrying a high proportion of potash, yields of 200 to 250 bushels of potatoes an acre are obtained. Corn yields from 25 to 40 bushels an acre, oats 30 to 40 bushels, wheat 15 to 25 bushels, buckwheat 20 to 30 bushels, and hay 1 to 1½ tons.

Monongahela loam.—Monongahela loam represents old alluvium washed from areas of Dekalb soils and redeposited along streams draining the Dekalb, Leetonia, and Clymer uplands. It lies well above overflow, on stream terraces, or second bottoms. The surface appearance of the soil is very similar to that of the surrounding smoother Dekalb soils and Berks shaly silt loam. The subsoil, however, has an outstanding difference. Monongahela loam, because of its smooth surface and the length of time it has lain in place, has developed a compact and relatively impervious mottled lower subsoil layer. Some smooth water-rounded gravel and stone occur on the surface and through the soil. The Dekalb soils, on the other hand, have friable open unmottled subsoils containing unweathered fragments of the underlying parent rock. Beds of rounded gravel and large stone underlie Monongahela loam where the alluvium reaches depths greater than 4 or 5 feet. Monongahela loam is inherently more productive than most of the Dekalb soils because of its greater depth of profile. The one large area mapped at Arbovale represents probably half the soil of this type in Pocahontas County. Smaller areas are mapped at other points along Deer Creek and along Knapp and Sitlington Creeks.

In cultivated fields the surface soil to a depth of 6 or 8 inches is yellowish-brown friable loam which changes abruptly to yellow or pale-yellow friable loam. This material gradually becomes heavier with depth until at a depth ranging from 12 to 15 inches it passes into yellow or brownish-yellow slightly compact silt loam which, in turn, at a depth of about 20 inches passes abruptly into hard compact brownish-yellow silt loam that is highly mottled with gray and rust brown. At a depth of 3 feet or more it becomes less compact and lighter in color and passes into the stratified alluvium of sand, silt,

and clay. A small area of Monongahela silt loam $1\frac{1}{2}$ miles south of Boyer and another 2 miles west of Green Bank are included with Monongahela loam on the map. The surface soil in the area west of Green Bank is gray, and the subsoil is poorly drained.

The slope of the land is sufficient to remove excess rainfall from this soil, but the compact subsoil slows internal drainage, causing the soil to warm more slowly in the spring than soils having more open subsoils. In dry years the upward movement of soil moisture is slower, causing crops to burn severely. Most of the soil is rather highly acid and requires applications of about 1 ton an acre of burnt lime to correct acidity and allow the best development of most crops.

Nearly all of the soil is cleared and is used for pasture and general crops. Where the soil has been limed, yields up to 2 tons an acre of clover and timothy hay are harvested. As a grain soil it is better adapted to wheat, giving yields ranging from 15 to 25 bushels an acre. Corn yields from 20 to 40 bushels an acre. Some potatoes grown for market, in the vicinities of Dunmore and Green Bank, with applications of 400 to 600 pounds of high-grade commercial fertilizer, yield about 200 bushels an acre. Much of this soil, however, has had little or no care in maintaining or building up its fertility, and crop yields are below the average for the type.

Monongahela silt loam.—Monongahela silt loam throughout the soil profile is very much the same as Monongahela loam in color. It differs mainly in texture, and the compactness and mottling in the subsoil, although present, are less evident. Like Monongahela loam, it is a stream-terrace soil, but it is found along streams that receive some of their drainage waters from uplands derived principally from limestone. The largest areas are along Greenbrier River southward from Cass. As a whole, the surface soil and the subsoil are probably a little more brown, have better internal drainage, and are not quite so acid.

The surface soil to a depth of 6 or 7 inches is light-brown or grayish-brown friable loam which changes abruptly to yellowish-brown friable heavy loam or silt loam, that extends to a depth of about 20 inches. At this depth the lower subsoil layer in places continues to become heavier in texture and lighter brown with additional depth; in other places the texture of the subsoil remains the same and the color becomes light brownish yellow or yellow. The underlying stratified beds of sand, clay, and gravel are reached at a depth ranging from 38 to 50 inches. In most of the flatter and lower lying areas of this soil, gray mottlings appear below a depth of 36 inches. An area mapped west of Clover Lick has a good silt loam surface soil, a clay loam upper subsoil layer, and a clay lower subsoil layer. A fairly large area at Stony Bottom, which consists in part of gently sloping talus material, has many large stones scattered over the surface. This area is indicated on the map by the conventional stone symbols.

All of this soil is cleared, and probably 75 percent of it is planted to corn and sown to wheat, oats, and hay. The remainder is used for permanent pasture. Where the fertility is maintained or increased by the use of lime, manure, and commercial fertilizer, crop

yields are good, and corn produces 40 or more bushels an acre, wheat about 20 bushels, oats from 30 to 40 bushels, and hay about 1½ tons. Probably half of the cropped land, however, receives very little care, and crop yields are considerably lower.

Huntington loam.—Huntington loam is an alluvial soil and is developed from recently deposited material washed from uplands where many of the soils are developed on limestone. It occurs on the first bottoms of Greenbrier River below Raywood and along Knapp Creek. It is subject to inundation with each successive high overflow. It is a young soil; that is, it shows little or no textural or color change from the surface downward. Because of the large number of different soils from which the material is derived, it bears little resemblance to any particular upland soil.

The 8- to 10-inch surface soil is brown or dark-brown mellow friable loam. To a depth ranging from 20 to 24 inches the upper subsoil layer is generally brown or light-brown loam. In places the lower subsoil layer remains nearly the same in color and texture; in other places it gradually changes to brown silt loam or heavy silt loam; and in still others it becomes light-brown friable fine sandy loam. Usually, below a depth ranging from 40 to 50 inches, stratified water-soaked sand, silt, and gravel beds are present.

Some areas of this soil mapped along Knapp Creek are more nearly silt loam than loam. Near stream banks where the flood waters are swift-flowing, the surface soil and subsoil are light-brown loamy sand or fine sand. Water-rounded gravel is scattered over the surface and through the soil in most places. A few areas of gravelly soils on narrow bottoms or along old cut-off channels, which would have been separated as a different type had they been more extensive, are indicated by gravel symbols.

Nearly all of this land is cleared, and approximately 50 percent is used for corn. It probably has the highest inherent fertility of any soil in the county and is the most easily cultivated. The earliest farms were on this soil and also grew mostly corn. A limited acreage of small grain and hay is grown on it, and a few small fields near Marlinton and Dunmore are planted to potatoes. Excellent permanent pastures are established on many of the elongated narrow strips that occur in many places. Marlinton and a number of the small towns and villages along the Chesapeake & Ohio Railway and Greenbrier River are situated on this soil, and nearly every family living here has an excellent home garden.

Normally, corn produces from 35 to 50 bushels an acre, wheat 15 to 25 bushels, and mixed clover and timothy hay about 2 tons. Potatoes yield without fertilizer about 150 bushels an acre and when fertilized about 250 bushels. Much of this soil has been impoverished by continuous corn production until yields have been materially reduced. Maintenance of corn yields requires an interval of at least 2 years between probably 2 successive years of cropping in corn and at least one crop of clover or clover residue plowed under during the rest period from corn.

Moshannon gravelly loam.—Moshannon gravelly loam is alluvial or first-bottom soil washed from the extensive areas of Upshur and associated soils in the western part of the county and redeposited along the small streams that drain these soils. Like Huntington

loam, it is a young soil, but unlike Huntington loam, it is closely related to the parent upland soil. The entire profile color is similar to that of the Upshur soils from which most of this alluvial soil is washed. As many of the streams are swift-flowing, the surface soil and subsoil are not very uniform in texture.

The surface soil to a depth of 6 or 8 inches is chocolate reddish-brown friable gravelly loam that grades into Indian-red or Indian reddish-brown loam. The upper subsoil layer, at a depth ranging from 16 to 20 inches, passes into Indian-red silt loam, loam, or fine sandy loam which usually contains more gravel and rounded rock than the upper subsoil layer. Bedded gravel usually lies at a depth ranging from 30 to 40 inches below the surface. The soil along Stamping Creek and some along Hills Creek is so stony that it would have been separated on the map as a stony type had it been more extensive. Such areas are indicated by stone symbols. Some of the narrow strips mapped along small streams in the vicinity of Lobelia, and around the sinkholes into which these small streams disappear, are in reality Moshannon silt loam and are practically free from gravel.

Nearly all of Moshannon gravelly loam is cleared except along the lower parts of Elk and Williams Rivers. Most of this soil is used for permanent pasture because of the difficulty of cultivating the small and gravelly areas. Plowing would also subject much of the soil to considerable damage by swift-moving flood waters. Near Lobelia, Hillsboro, and Slaty Fork, however, small areas of the best of this land are farmed, principally to corn and hay, yields of which are nearly as good as on Huntington loam.

Pope silt loam.—Pope silt loam is a first-bottom soil subject to overflow. It lies along the small streams which receive drainage waters from the heavier textured soils of the uplands, underlain by acid shales and fine-grained sandstones. Lime or limestone soil has had little or no influence on this soil. The uplands from which this soil is washed are lighter colored than the brown and red limestone uplands from which Huntington loam is washed, and Pope silt loam is therefore lighter colored. It occurs only in the narrow valleys as elongated strips which are in most places less than one-fourth mile wide. Stream channels give adequate surface drainage, but the water table is high in most places, as indicated by some mottlings in the lower part of the subsoil.

The surface soil to a depth of 6 or 8 inches is light-brown friable silt loam which passes directly into light yellowish-brown or brownish-yellow friable heavy silt loam. The lower subsoil layer, beginning at a depth ranging from 20 to 26 inches, is in most places brownish-yellow and somewhat lighter in texture than the upper subsoil layer. Below a depth of 30 inches it contains some gray and brown mottlings. Stratified sand, clay, and gravel are reached at a depth ranging from 36 to 48 inches. The soil along a number of the small drainageways from Allegheny Mountain has considerable gravel over the surface and through the soil. Such areas are not of sufficient extent to be separated and are indicated on the map by gravel symbols. Other small areas along Douthat Creek near Minnehaha Springs and at the headwaters of Knapp Creek near Frost are above normal or even high

overflow waters, but because their soil profiles are essentially the same they are included on the map.

Pope silt loam comprises most of the smooth land on many small farms in the narrow valleys. Considerable hay and corn are grown, together with some wheat, oats, and buckwheat. Hay and pasture occupy more than half of the approximately 80 percent of this land which is cleared. Crop yields average about one-third lower on this than on Huntington loam. Liming is necessary for good stands and for good yields of clover for hay. Some fertilization with superphosphate or with a complete fertilizer high in phosphate materially increases yields of small grains.

Corn yields from 20 to 40 bushels an acre, wheat 12 to 18 bushels, oats 25 to 40 bushels, buckwheat 15 to 30 bushels, and hay about 1 ton. Much of the pasture is hay meadows which are grazed 1 or 2 years before being used again for grain.

Pope gravelly fine sandy loam.—Pope gravelly fine sandy loam is a first-bottom soil mapped only along Sitlington Creek, North Fork Deer Creek, and East Fork Greenbrier River, which have their headwaters high on Allegheny Mountain where some of the lighter textured or sandy Dekalb soils occur. Some wash from the reddish-brown or Indian-red soils of the Lehew uplands imparts a brown color to this soil and gives it a profile color almost as brown as that of Huntington loam. It contains less organic matter and has a greater abundance of gravel on or near the surface than Huntington loam. Crop yields are lower, averaging about the same as on Pope silt loam. Nearly half of this soil is maintained in permanent pasture because of the slight depth to bedded gravel or its tendency when plowed to wash severely from swift-moving overflow waters.

The 8-inch surface soil is brown mellow friable gravelly fine sandy loam which passes abruptly into light-brown or yellowish-brown loose or friable very gravelly fine sandy loam extending to bedded gravel at a depth ranging from 20 to 48 inches. The deeper and less gravelly areas of this soil give good yields of corn, hay, and small grains. Pastures become short during dry seasons. Lime and fertilizer increase all crop yields.

Pope fine sandy loam.—The soil profile of Pope fine sandy loam is similar to or identical with that of Pope gravelly fine sandy loam, except that the former carries little or no gravel except in spots.

Pope fine sandy loam occurs on the bottoms of Greenbrier River as far south as Raywood, on East Fork Greenbrier River below Thornwood, and on West Fork Greenbrier River below Olive.

It is a soil of small extent, but it is fairly important to the sections in which it is located. It is used for the same crops as Pope gravelly fine sandy loam but is considered slightly better, as it occupies somewhat larger and more uniform units better suited for field use.

Lindside silt loam.—Lindside silt loam might be termed a soil having a mottled subsoil, or an imperfectly drained subsoil phase of Huntington silt loam. It is associated with Huntington loam on the wider areas of first bottoms or occurs along the narrow first bottoms of small streams that receive considerable of their drainage waters from upland soil developed wholly or in part from weathered limestone.

Seepage waters from the hills, shallow drainage channels, and the nearly flat surface of this soil give it a high water table for most of the year, that is, the subsoil is saturated at a depth ranging from 2 to 3 feet for long periods.

The surface soil to a depth of 8 inches is brown mellow friable silt loam that passes abruptly into light-brown friable silt loam extending to 18 or 20 inches below the surface. The subsoil shows some faint markings or mottling of gray below a depth of 12 inches, and below this to a depth of 3 or more feet it is grayish-brown heavy silt loam or silty clay loam, intensely mottled with gray and rust brown and containing various amounts of soft dark-brown iron concretions. Where this soil is associated with Moshannon gravelly loam or where it is influenced by wash from the Upshur soils, the surface soil and upper subsoil layer are dark brown or reddish brown.

As a whole, this soil is better adapted to hay and corn than to wheat and oats, but wheat and oats are grown extensively. On many farms this soil represents nearly all of the cultivated land. If the removal of excess water is facilitated by judiciously placed open ditches, crops develop fairly normally. Yields of grain crops average probably a little higher than on the Pope soils and a little lower than on Huntington loam. Hay yields, however, are just as good as or even better than on either of the other two soils, especially on land that has been limed. Corn on the best land yields up to 50 bushels an acre, hay 1½ tons, wheat from 15 to 25 bushels, and oats 25 to 40 bushels. Some small fields of potatoes that receive applications of a high phosphate and potash commercial fertilizer yield about 200 bushels an acre.

Atkins silty clay loam.—Atkins silty clay loam is one of the less extensive farming soils. It represents the wet or poorly drained spots of first-bottom soil associated with the Pope soils, principally Pope silt loam, or occupies narrow seepy alluvial strips near the heads of streams which drain chiefly Dekalb uplands.

The surface soil to a depth of about 6 inches is brownish-gray granular silty clay loam which passes abruptly into gray, yellow, and orange marbled stiff plastic silty clay. At a depth ranging from 20 to 28 inches this passes into gray plastic clay, mottled with orange and yellow, which extends to a depth of 3 or more feet.

Some small spots of Pope silt loam and of muck and swampy soils at the headwaters of Greenbrier River are included with Atkins silty clay loam on the map.

Where this soil is associated with the better drained bottom lands it is usually cleared for pasture or hay and produces an abundant growth of coarse wild grasses. Areas that have been drained by a good system of open ditches or by tile return good yields of corn and timothy. These artificially drained areas after receiving heavy applications of lime give excellent yields of clover and timothy hay.

Melvin silty clay loam.—Melvin silty clay loam, a soil very similar to Atkins silty clay loam in occurrence, profile color, and structure, is associated with Huntington loam and Lindsides silt loam or is mapped in wet depressed catch basins in the limestone uplands. Since most of the material making up this soil is washed from limestone uplands, the soil is probably not quite so acid as Atkins silty

clay loam and under similar management produces slightly higher crop yields.

The surface soil is dark-gray or brownish-gray granular or friable silty clay loam to a depth of 6 or 8 inches, where it passes abruptly into gray plastic silty clay or clay, streaked or mottled with pale yellow and rust brown. At a depth ranging from 24 to 28 inches, this grades into gray or grayish-yellow plastic clay, highly mottled with yellow, orange, and rust brown, which continues to a depth ranging from 3 to 4 feet. In the lime-sink depressions near Hillsboro the soil remains saturated for long periods because of slow drainage into underground channels.

Nearly all of this soil is cleared and is used for pasture and hay. On a few small areas where drainage conditions have been improved, good crops of corn are produced. Little or no lime is required to produce fair to good crops of timothy and clover hay.

SOILS SUITABLE FOR PASTURE

Soils suitable for pasture include large areas of steep and stony soils in the western half of the county and smaller areas in a belt extending in a northeast-southwest direction through a greater part of the central section of the eastern half. These soils are developed from residual material, for the most part limestone or rock containing much lime which has weathered in place. Their steepness and stoniness make them unsuited to growing crops. Although as stony and steep as an almost equal area classed as forest soils, these soils are especially adapted to the growing of high-quality pasture grasses because of the influence of lime from the parent rock. Little or no seeding is necessary to establish pastures on many of these soils. Partly cleared land grew up to bluegrass without seeding. Later seedings of clover and other good grasses added to the value of pastures.

Pastures are difficult to establish and maintain on soils of similar relief and stoniness, derived from noncalcareous shale and sandstone, and the grasses are generally sparse and of poor quality. Such pastures are unprofitable; consequently, only a very small proportion of these soils have been brought into pasture.

The soils classified as suitable for pasture are: Lowell and Hagerstown stony silty clay loam, Upshur stony silt loam, Meigs stony loam (DeKalb-Upshur complex), Hagerstown stony silt loam, and Dunmore stony loam. They have brown or reddish-brown surface soils and yellow, brown, or Indian-red silty clay loam or clay subsoils.

Lowell and Hagerstown stony silty clay loam.—Lowell and Hagerstown stony silty clay loam occupies extensive irregular areas along the larger exposures of massive limestone in the central-southern part of the county and smaller areas and elongated belts along the middle and lower slopes of Cheat and Back Allegheny Mountains and the lower slopes of Elk River Valley in the northern part. The main differences between this soil and Lowell silt loam are the admixture of Hagerstown soil, a rugged relief, and the high content of stone. In the vicinity of Hillsboro where Lowell and Hagerstown stony silty clay loam is associated with Lowell silt loam, Hagerstown silt loam, and related soils, the surface is not so steep.

The amount of loose stone on the surface is not so great, but ledges of the underlying parent limestone outcrop in many places. The soil in this location is also more nearly related to the soils of the Hagerstown series. Small areas of rough stony land on steeper slopes are also included.

In areas where the soil more closely resembles soils of the Lowell series the surface soil to a depth of 5 or 6 inches is brown or light-brown friable silty clay loam which passes abruptly into yellow or light brownish-yellow friable or stiff silty clay loam. At a depth ranging from 14 to 18 inches this grades into stiff silty clay or clay, which is plastic when wet. At a depth of 26 or 28 inches, this, in turn, passes into dull brownish-yellow stiff impervious clay, mottled with gray, brown, and rust brown, which extends to bedrock that lies from 30 to 48 inches below the surface. Near the ledges of limestone outcrop the soils are shallower.

Areas of soil more nearly related to soils of the Hagerstown series have a surface soil from 5 to 7 inches thick of brown mellow silt loam or silty clay loam, underlain by pale yellowish-brown or light-brown friable silt loam or silty clay loam. At a depth ranging from 10 to 12 inches this grades into reddish-brown silty clay loam or silty clay, having somewhat of a small nut structure. This extends to a depth ranging from 3 to 5 feet. Limestone rocks protrude from the surface in places.

All of the Lowell and Hagerstown stony silty clay loam is cleared. Most of it supports a pure sod of bluegrass, and the remainder supports largely a mixed sod of bluegrass and clover or of bluegrass, clover, redtop, and native grasses, principally moonshine grass. It furnishes excellent grazing for 6 to 8 months of the year with an additional 1 or 2 months of late-fall and early-winter grazing during the more open seasons. Some small patches of included Lowell silt loam or Lowell silty clay loam, and the less stony parts are maintained as hay meadows to supply winter feed for cattle and sheep grazed on this land. Often some cattle and sheep are kept on the lower pastures for a greater part of the winter when snowfall is light; they require little feed to winter through in good condition.

Upshur stony silt loam.—Upshur stony silt loam occupies the largest acreage of any soil suitable for pasture. It occurs in almost unbroken large irregular areas in the west-central part on the higher elevations and lies in a continuous unbroken belt about one-half mile wide along the middle slope of Back Allegheny and Shavers Mountains for their entire length through the county. One outlying area of importance is near Blister Swamp at the headwaters of East Fork Greenbrier River. Most of the soil is on steep upper and middle mountain slopes; the rest is on somewhat flat benchlike areas 100 or more acres in extent and on rounded knobs and ridge tops. A considerable portion of it lies at elevations of 4,000 to 4,500 feet above sea level, and nearly all of it is at elevations greater than those of Lowell and Hagerstown stony silty clay loam, with which it is associated.

In pastures the surface soil to a depth of 5 or 6 inches is dark chocolate-brown or reddish-brown friable silt loam which passes abruptly into Indian-red heavy friable silt loam. This material

gradually becomes heavier with depth and at a depth ranging from 10 to 15 inches it passes into Indian-red granular or friable silty clay loam. This rests on partly weathered Indian-red shale or brownish-red and gray limestone at a depth ranging from 2 to 4 feet. Numerous red shale chips, fragments, and large blocks of red and brown sandstone are scattered over the surface and embedded in the soil. Heavy outcropping ledges of these rocks and of siliceous limestone are common. Near Lowell and Hagerstown stony silty clay loam, Upshur stony silt loam overlies bedded gray limestone, and ledges and blocks of limestone outcrop or protrude above the surface. Where it joins the gray and yellow Dekalb soils the rocks giving rise to Upshur stony silt loam are lighter in color and often more sandy, imparting to the included soils a reddish-brown color and in places a loamy texture. Also included with this soil are many small strips and spots of less stony Upshur silty clay loam developed largely from thick beds of fine-grained Indian-red shale.

About 75 percent of this soil is cleared or partly cleared and is used principally for grazing. Only occasional small patches of the less stony parts or patches from which the larger stones have been removed are planted to corn, oats, or hay. Pastures are not so uniformly good as on Lowell and Hagerstown stony silty clay loam, although a large proportion of Upshur stony silt loam furnishes just as good grazing. The amount of lime in the parent rock and the quality of grass produced are closely related. Soil developed from rock low in lime generally supports a good sod of moonshine grass, together with some bluegrass. This type of pasture does not produce so much or such high quality grass as the all-bluegrass or the mixed bluegrass-and-clover sod.

Because of higher elevations and the considerable distance of pastures from many of the home farms, the grazing season on the whole is a few weeks shorter than on Lowell and Hagerstown stony silty clay loam. There is an opportunity for further extension of grazing lands on the uncleared portions of this soil.

Some of the fairly large timbered areas still support excellent virgin hardwood timber, principally red oak, beech, and sugar maple.

Meigs stony loam (Dekalb-Upshur complex).—Meigs stony loam (Dekalb-Upshur complex) is a composite soil of Dekalb stony loam and Upshur stony loam too closely associated or mixed to be separated into their respective types. It is derived from both calcareous and noncalcareous rocks, but the larger portion is only weakly influenced by lime. Colluvial mixing and shifting of the soil material account for much of the blending of these soils, which gives a brown or Indian reddish-brown color to both surface soil and subsoil. The overlapping of gray and Indian-red rock formations in places has resulted in the development of a Dekalb-like surface soil over the Upshur-like subsoil, and vice versa.

This soil is widely scattered through the western part of the county in association with the Upshur, Lowell, and Westmoreland soils, being more common where these soils are in contact with the Dekalb soils. It occurs mainly on somewhat flat areas, on benchlike shoulders of mountain slopes, and near the foot of steep mountain slopes, in irregular areas ranging from 10 acres to nearly a square mile in extent.

About 50 percent of this soil is cleared and included with the surrounding pasture farms. It supports a fair to good sod, principally of moonshine grass, together with some of the better grasses. In carrying capacity, it ranks, as a whole, about the lowest among the soils suitable for pasture.

Hagerstown stony silt loam.—Hagerstown stony silt loam comprises the smallest acreage of the soils suitable for pasture. It is developed only along the limestone exposure extending from just south of Green Bank to the gap cut through this formation by Knapp Creek east of Marlinton. It occupies a few small areas, some areas up to 100 acres in extent, and some nearly 200 acres in extent, the largest lying about 1 mile west of Frost. It lies on sloping or steeply sloping hillsides where surface drainage is rapid and erosion is active when the land is closely grazed.

The 6- or 7-inch topsoil is brown or reddish-brown mellow silt loam which changes abruptly to buff or yellowish-brown coarsely granular stiff silty clay loam. At a depth ranging from 15 to 18 inches, this passes into light reddish-brown stiff clay loam which extends to the underlying bedded limestone at a depth ranging from 24 to 36 inches. Flattish and blocky limestone fragments are abundant over the surface, together with some outcropping ledges of the underlying limestone. In places are chert and siliceous rock fragments which have gravitated from the higher lying areas of Dunmore stony loam and Elliber stony loam.

All of this soil is cleared and in permanent pasture, largely bluegrass. Pastures furnish good grazing for 7 or 8 months of the year except during hot dry spells, when they burn badly and become short.

The outcropping ledges of limestone at several points furnish a source of agricultural lime for surrounding farms.

Dunmore stony loam.—Dunmore stony loam is confined to the same limits as Hagerstown stony silt loam, on the mountain ridge extending southward from Green Bank. It occupies the steeper and more broken parts in the same localities with Dunmore cherty loam, from which it differs principally in its slightly sharper relief and an increase of stone on and through the soil. It is derived from siliceous and nearly pure limestone and some sandstone.

The topmost 3 to 5 inches is brown, light-brown, or yellowish-brown friable loam which changes abruptly to buff or light brownish-yellow friable heavy loam. At a depth of 10 or 12 inches the lower subsoil layer is yellow or yellowish-brown friable clay loam or silty clay loam, which extends to the underlying bedrock lying at a depth ranging from 30 to 40 inches. The rock consists of angular sandstone fragments up to a foot in diameter and of chert gravel, together with some platy limestone fragments and outcrops of limestone. Where the limestone outcrops are abundant, the surrounding surface soil is more brown, the upper subsoil layer is buff, and the lower subsoil layer is brown or reddish yellow. At other places on narrow ridge divides and small rounded knobs, the surface soil is more sandy, and in places it is brownish-yellow fine sandy loam to a depth of 3 to 5 inches; such light-textured spots contain few or no limestone outcrops.

Approximately 75 or 80 percent of this soil is cleared or partly cleared, nearly all of which is in permanent pasture. A few small fields from which the larger stones have been removed are planted to corn, buckwheat, rye, and potatoes. Most of the soil supports a good to excellent bluegrass sod, together with some moonshine and other native grasses. The carrying capacity of pastures is not quite so high as on some of the heavier limestone pasture lands. Sods on Dunmore stony loam withstand dry seasons better than sods on Hagerstown stony silt loam.

FOREST SOILS AND MISCELLANEOUS LAND TYPES

The forest soils and miscellaneous land types include about 65 percent of the total land area of the county. Except for a very limited acreage of dark-colored wet soil classed as peat, they have light-colored surface soils, with light-colored subsoils that are very little heavier than the surface soils. In general these soils are rough, steep, and stony, and some large fairly level areas are literally strewn with rock fragments and massive boulders. Nearly all of these soils are derived from lime-free rocks and are acid to highly acid in the surface soil.

In this group are included Dekalb stony silt loam, Dekalb stony loam, Dekalb stony fine sandy loam, Leetonia stony silt loam, Leetonia stony loam, Leetonia stony fine sandy loam, Lehev stony loam, and Elliber stony loam, together with the undifferentiated classifications of rough stony land and peat. These soils have been classed as forest soils not because they are the best timber-producing soils, but because they are suitable mainly or solely for growing timber. Some of them, however, are best suited or occupy positions or elevations suited only for the growing and best development of certain species of trees. Originally the best agricultural lands supported the best stands of trees.

A large part of the area occupied by this group of soils is held as State or national forests or in large tracts by lumber companies. A number of the lumber companies have exhausted their supply of trees and have shut down their plants or moved to other sections, whereas others are still operating. The remaining stands of virgin timber are rapidly being cut. On some of these holdings where judicious cutting has been practiced and forest fires have been kept down, young and second-growth trees will supply an additional harvest when the virgin supply is gone.

State and Federal holdings are lands acquired after lumbering operations were completed and are now held as demonstration areas and game refuges. Areas on which forest fires followed timber cutting and destroyed reproduction are being reforested by the United States Forest Service with the original species of trees or with new desirable species. Federal holdings are being extended to include adjacent lands that have little organized protection from forest fires.

Dekalb stony silt loam.—Dekalb stony silt loam occupies broad and almost continuous areas on the parallel mountain ranges of the eastern half of the county and outlying smaller irregular areas in the western part.

Beneath the 1- or 2-inch well-decomposed forest litter, the topmost 2 inches of soil is yellowish-gray or light grayish-brown friable silt loam which changes abruptly to yellow or pale-yellow friable silt loam. At a depth ranging from 8 to 12 inches this material abruptly passes into brownish-yellow friable silty clay loam or light silty clay loam, which continues to the disintegrated bedrock of sandstone and shale, lying from 24 to 40 inches beneath the surface.

Because of its steepness and its generally high stone content, only small areas of this soil are cleared and used for pasture. An occasional small patch of oats, buckwheat, and hay is grown when the larger stones have been removed. Some small areas of Dekalb gravelly silt loam are included in places where it was not feasible to separate these soils.

Dekalb stony silt loam once supported a fair to good stand of timber, principally hardwoods. The quality of timber, however, was not considered by lumbermen to be so good as on some of the other soils in this section. White oak, red oak, chestnut oak, and hickory are the dominant trees, together with some chestnut, dogwood, soft maple, black locust, and other hardwoods. Pitch pine is fairly abundant on the shallow soils of exposed ridge points, and good stands of white pine and hemlock occupy the lower slopes and shaded draws. Laurel, huckleberry, and brambles, together with hardwood brush, form a rather dense undergrowth.

Nearly all the merchantable timber has been removed, and the land now supports a brushy or good second growth of the original forest, some of which furnishes a limited supply of lumber for local use.

Dekalb stony loam.—Dekalb stony loam differs mainly from Dekalb stony silt loam in texture. It is developed from rock containing a higher proportion of sand. The soil profile, on the average, is just a little deeper; and, as a whole, the timber grown on the soil is larger and of better quality.

Dekalb stony loam occurs in close association with the heavier Dekalb stony silt loam, principally near or along the crest of Allegheny Mountain and on the steep ridges and breaks adjacent to Greenbrier River.

The surface soil beneath an inch or two of dark-brown loamy leaf-mold is grayish-brown or light yellowish-brown friable loam to a depth of 3 to 5 inches where it abruptly changes to yellow friable heavy loam. At a depth ranging from 12 to 15 inches this grades into light brownish-yellow friable silt loam which extends to bedrock at a depth ranging from 3 to 4 feet.

An area on the lower slope of Beaver Lick Mountain near Beaver Creek School is largely colluvial material which has gravitated from higher elevations and which for the most part overlies bedded shale. In places the shale beds are within 3 feet of the surface. Where the accumulated soil is 3 or more feet deep, the lower subsoil layer is dull brownish-yellow silt loam mottled with gray and brown.

Small areas on the less stony parts of Allegheny Mountain have been cleared or partly cleared for pasture. Most of the land supports a fair to good stand of moonshine grass, together with some bluegrass, white clover, and other grasses.

Most of the large timber has been removed, and the soil now supports a good second growth of the original tree species.

Dekalb stony fine sandy loam.—Dekalb stony fine sandy loam is widely scattered through the eastern and southern parts of the county. The largest areas are developed on Browns, Brushy, Beaver Lick, Pyle, Buckley, and Droop Mountains. A number of elongated irregular areas are along the crest of Allegheny Mountain. The soil is derived from massive or thick bedded sandstone and largely occupies steeply sloping ridges and mountain crests. The area on Droop Mountain is relatively smooth. This soil is about the same color as the other types of closely associated Dekalb soils, but it is decidedly more sandy through the entire profile. As a whole, the soil is also deeper than most of them; its depth is about equal to that of Leetonia fine sandy loam.

Beneath about 2 inches of dark-brown well-decomposed forest litter is a 3- to 5-inch layer of grayish-brown friable or loose fine sandy loam. This is underlain by yellow friable fine sandy loam which continues to a depth ranging from 18 to 24 inches with very little change in color or texture. Below this, the subsoil is very variable; it is bright-yellow fine sandy loam extending to bedrock loamy fine sand of the same color, or brownish-yellow friable loam which grades into silt loam in the lower part. Bedrock lies at a depth ranging from 3 to 4½ feet below the surface.

Most of the soil remains in second growth of the original species of hardwoods. A fairly large acreage of the smoother parts on Browns Mountain, however, has been cleared and included with the surrounding pastures. Here its close association with soils developed in part from limestone and the probable inclusion of some areas which have a Dekalb stony fine sandy loam surface soil over a subsoil developed from calcareous rocks, give it a value for pasture almost equal to that of the adjacent Dunmore stony loam. The areas in pasture have a light-brown fine sandy loam surface soil, a yellow friable fine sandy loam upper subsoil layer, and a brownish-yellow friable loam or silt loam lower subsoil layer. Some small areas on Allegheny Mountain are cleared or partly cleared and used for summer sheep range.

Leetonia stony silt loam.—Leetonia stony silt loam is confined largely to the higher elevations or to the extreme northern and western parts, in a belt of higher rainfall and lower temperatures than is common to most of the county. Climatic conditions under which this soil is developed are common only to parts of the higher elevations in this section or to sections farther north in the United States or in Canada. Such conditions are favorable to the development of a certain kind of coniferous forest, which results in the dominance of spruce and hemlock on this soil.

Cold winters and cool short summers slow bacterial action and the rate of oxidation of the duff, or forest litter, on this soil, thereby allowing a much deeper accumulation of duff on the surface than on Dekalb stony silt loam at lower elevations. Originally the accumulated layer was at least a foot thick in places, with probably an average thickness of 6 inches. Forest fires following timber cutting, as well as more direct sunlight on the soil, have reduced most of this layer to a thickness ranging from 2 to 4 inches.

Beneath the forest litter is a thin layer of gray or grayish-brown silt loam, ranging from a mere film to not more than 1 inch thick, which passes abruptly into coffee-brown or light coffee-brown heavy silt loam extending from 3 to 4 inches below the duff layer. Below the layer of heavy silt loam is a 6- to 8-inch layer of brownish-yellow friable silt loam which passes into yellow friable silt loam or heavy silt loam. Bedrock lies from 30 inches to 4 feet beneath the surface.

The once dense and vigorous stands of conifers and mixed hardwoods have all been removed from the large areas of this soil in the northern and eastern parts of the county, and much of this area has been severely burned and the reproduction of conifers thus largely destroyed. Fern, bracken, and brambles, together with laurel, huckleberry, and brushy hardwoods of the original growth, cover the soil. The virgin timber on the comparatively small areas in the extreme western part is being taken out rapidly at this time. The Federal Government is reforesting its holdings on the more denuded areas.

Leetonia stony loam.—Podzol development has advanced further in Leetonia stony loam than in Leetonia stony silt loam; that is, the topmost inch or two of the mineral soil is definitely a leached gray layer underlain by the well-defined coffee-brown layer. Leetonia stony loam occurs in relatively large but not continuous areas in association with Leetonia stony silt loam and in a few areas in the southwestern part of the county.

Beneath the topmost 3 or 4 inches of partly weathered duff is a 1- to 1½-inch layer of gray or brownish-gray leached friable or loose loam. This is underlain by light coffee-brown friable loam to a depth of 5 or 7 inches. Below is brownish-yellow friable loam, which at a depth of about 15 inches abruptly passes into yellow friable loam extending downward to bedrock lying at a depth ranging from 30 to 40 inches below the surface.

Much of this soil supports a brushy growth of the original hardwoods that formed a mixed stand with the conifers. Where the land has not been burned over, some good young spruce and hemlock are rapidly developing. Small areas west of Lobelia and part of the fairly large area mapped on Cranberry Mountain have been cleared for pasture. Moonshine grass, together with some bluegrass, gives fair to good grazing during summer months.

Leetonia stony fine sandy loam.—Leetonia stony fine sandy loam occurs principally in relatively small areas along the crest of Allegheny Mountain in the northern part of the county. One large flat area lies just south of Blister Swamp. A few small areas are northwest of Marlinton and on Droop Mountain.

This soil is representative of the gray or true Podzol soils of the North.

The surface soil beneath the duff, or forest litter, is, to a depth of 3 inches, gray loose loamy fine sand underlain by a 2- or 3-inch layer of coffee-brown heavy loam or silt loam. Below is brownish-yellow friable loam or fine sandy loam, which becomes lighter in both color and texture with depth and rests on bedrock at a depth ranging from 28 to 40 inches.

One small area 4 miles northwest of Marlinton that has been cleared and established in pasture sod is dark-gray loamy fine sand in the topmost 1 inch, changing abruptly to very light gray loose

loamy fine sand that extends to a depth of 4 inches. The underlying coffee-brown loam layer is 2 inches thick, and below it is yellow friable fine sandy loam extending to bedrock which lies at a depth of 36 inches below the surface.

Burning over following the removal of timber has destroyed most of the conifer and hardwood growth and the accumulated forest litter. The result has been a more rapid oxidation of the accumulating residue from the ferns, blackberry briars, and hardwood brush that occupy most of the land. Some mixing of the decomposed organic matter with the surface soil imparts to the usual very light colored surface layer a dark-gray color.

Lehew stony loam.—Lehew stony loam is derived from brown and Indian-red noncalcareous shale and sandstone of the Catskill formation. In general appearance the soil is very similar to Upshur stony silt loam that develops from calcareous Indian-red rock and limestone. Its physical characteristics, however, are more nearly like those of the surrounding Dekalb soils. It occupies rather large and fairly continuous areas through the northeastern and south-central parts of the county and many small outlying areas.

The surface soil beneath a 1- or 2-inch layer of brown loamy leaf-mold is dark chocolate-brown friable loam which, at a depth ranging from 6 to 8 inches, passes into dark Indian-red friable loam or heavy loam that rests on bedrock at a depth ranging from 30 to 40 inches. In many places, however, the soil is Indian-red friable silt loam below a depth of 15 or 18 inches.

Only an occasional small patch of this soil has been cleared and included with pasture. Along Allegheny Mountain some old irregular cuttings have opened up the timber enough to allow some grasses to come in, and these areas are grazed by sheep during the summer. Generally, timber growth, principally hardwood, is a little more vigorous on this soil than on surrounding Dekalb soils. Around the headwaters of Greenbrier River, spruce and hemlock are the dominant trees. Here some of the severely burned areas have partly grown up to grass which, together with browse, furnishes fair summer range for cattle and sheep.

Elliber stony loam.—Elliber stony loam occurs only as narrow continuous or broken bands along both sides of the steeply folded mountain range extending southwest from Green Bank to the southern boundary of the county and is principally on narrow and sharp or steeply sloping ridges paralleling the mountain crest. It is developed from chert beds and cherty limestone exposed along the two slopes of this mountain range. The soil is extremely gravelly and stony. More than 50 percent of the soil mass is made up of different-sized angular white, gray, brown, and red fragments and blocks of chert.

The surface layer consists of dark-gray or nearly black very gravelly loamy humus ranging from 2 to more than 3 inches in thickness overlying gray or grayish-yellow very gravelly loam extending to a depth ranging from 12 to 18 inches. Below this is yellow or brownish-yellow very gravelly heavy loam which extends to disintegrated chert beds at a depth ranging from 30 to 48 inches. Some angular fragments and blocks of sandstone are also scattered over the surface where the stony Dekalb soils lie at higher elevations.

This soil closely resembles Elliber gravelly loam, mapped in the counties farther north and east in West Virginia, which is developed over cherty limestone. The open porous structure and high gravel content allow extreme leaching to considerable depths; consequently the soil is of little value agriculturally even on the smoother areas. Only a very small acreage is cleared and included with surrounding pastures. A few patches approaching the physical characteristics of Dunmore cherty loam, with which this soil is associated, are planted to general crops and potatoes. Tree growth on it is about the same as on the adjacent Dekalb soils.

Rough stony land.—Rough stony land is an undifferentiated classification, largely Leetonia material. It occupies nearly all of the high plateau area in the extreme western part of the county and all the crests and upper slopes of Cheat and Back Allegheny Mountains. Numerous large and small areas are widely scattered through nearly all parts. More than 31 percent of the entire land area falls into this classification. The high plateau sections constitute some of the more gentle relief of the uplands but are the most stony. The surface is literally strewn with boulders of sandstone and large blocks of conglomerate, some of which weigh hundreds of tons. The escarpments and steep slopes along the plateau rim are a mass of rockslides and massive blocks of stone that have broken from the cap rock that forms the plateau level. The widely scattered smaller areas are largely on the steeper and higher ridge and mountain slopes or on the scarplike slopes adjacent to streams. These areas have numerous heavy outcropping ledges of underlying rock and an abundance of loose rock and boulders scattered over the surface. Along Greenbrier River and in places on Allegheny Mountain the soil material between the rocks is made up in part from rocks that give rise to the Lehew soils, and in many other places it consists of Dekalb material.

On the high plateaus of rough stony land, spruce, hemlock, and birch are the dominant trees. Even on the rougher parts there are good stands of vigorous trees. The moss and duff covering over the large boulders allows young trees to take root and grow, and the roots extend over the sides of the boulders into the rock crevices and soil material below, where they find sufficient moisture and plant nutrients to develop normally. On the lower parts and steep slopes, hardwoods, principally oaks, predominate, with red oak more abundant on the more favorable locations and chestnut oak largely occupying the more droughty parts. Here trees develop normally for the most part, but in many places the growth is stunted, scrubby, and of poor quality.

Some small moss and peat swamplike areas on the plateau and small patches of stony soils are included, which might have been separated had the surrounding areas had a greater economic value.

Peat.—Peat is limited to two fairly large areas and three smaller ones, of which the largest is Cranberry Glades near the head of Cranberry River and the second largest is Blister Swamp at the head of East Fork Greenbrier River.

These peat areas are poorly drained or permanently wet situations or basins which have a considerable depth of accumulated muck and peat. Fires have destroyed most of the trees in Blister Swamp. A

few of the once dense stands of balsam fir, common to only a few limited areas in West Virginia, now remain. Cranberry Glades supports mainly a type of tree and moss growth common to the peat bogs of the North, together with some spruce near the edges.

MORPHOLOGY AND GENESIS OF SOILS

Pocahontas County lies along the eastern border of West Virginia and constitutes a part of two major physiographic regions, the ridge and valley province and the Appalachian Plateaus province. The area is included in that broad region of soils, lying westward from the middle Atlantic coast, designated as the Gray-Brown Podzolic soil region. The lighter textured soils of the plateau region belong with the true Podzols, the main body of which lies in the northern humid part of the United States. These soils in forested places have well-defined gray layers under the covering of raw humus and are underlain by a coffee-brown B horizon. The associated heavier textured soils have a very thin or imperfectly developed gray layer but a well-defined coffee-brown horizon.

All soils of the area might be classed as light colored and, with the exception of two large and a few small glades, have good to excellent drainage. The soils having the smoothest relief, regardless of their underlying geologic formation, elevation, or climate are the most mature soils. The soils on rugged areas or steep slopes are immature.

In the ridge and lowland belts, beneath the shallow covering of forest litter, well-decomposed organic matter is mixed with the soil to a depth ranging from 1 to 3 inches, imparting to it a brown or dark grayish-brown color, but, when the land is cleared and cultivated, this dark surface layer quickly disappears. When pasture sod is established without plowing of the soil, the dark layer is preserved to some extent, and proper pasturing may even increase its thickness. On the high plateaus and in the northern part of the county, conditions favor the development of a duff or raw humus layer which does not mix to any appreciable extent with the surface layer of mineral soil. The surface layer of soil in this section, therefore, is decidedly gray.

The forest consists of both conifers and hardwoods. The conifers, spruce and hemlock, are confined largely to the plateaus and to areas of Podzol soils, which are also areas of heavier rainfall and lower temperatures. The hardwoods are dominant in the ridge and valley province and on the limestone lowlands. A good stand of white pine occupies some of the narrow eastern valleys.

On the Lowell, Westmoreland, Dunmore, and Hagerstown soils, all derived from limestone, few if any conifers grow; sugar maple and red oak are the dominant trees, with white oak, beech, locust, and hickory fairly abundant. The Upshur soils, derived mainly from calcareous shales, support largely the same forest cover, with the addition of some spruce and hemlock on the higher elevations. On the soils derived from sandstone and shale, oaks predominate, with red oak and white oak more abundant on the deeper soils or more favorable situations and chestnut oak more abundant on the shallow, rocky, or droughty soils. Some hickory, soft maple,

locust, and other hardwoods, together with some pitch pine, are associated with the oaks.

The parent material from which the soils of Pocahontas County are derived includes a wide range of geologic formations, some of which are intricately mixed. The parent materials consist of non-calcareous fine-grained thinly stratified shales, shales of thicker stratification, interstratified shale and thinly bedded fine-grained sandstone, thinly to thickly bedded sandstone, massive sandstone conglomerate, calcareous shale, interstratified shale and impure limestone, cherty limestone, and comparatively pure thick massive limestone. The sandstone and shale range from dark gray through different shades of brown and red. Soils from the red shales and sandstones largely retain the color of the parent material, and those from the light-colored rocks are yellow or brownish yellow. Most of the limestones are gray or dark gray, and they weather to yellow, brownish-yellow, brown, and some reddish soil material. The higher elevation, colder climate, and shorter summers of this section do not allow the complete oxidation of iron salts in the soils, which develops the red color characteristic of the subsoils of limestone lands to the east in Virginia. Only on the flatter areas where the limestone has weathered to depths greater than 4 feet and the soil has lain for a long time is there any appreciable amount of red developed in the subsoil.

The major limestone exposures occupy mainly a lowland belt in the central and south-central parts west of Greenbrier River. It is on this lowland belt that soils of the greatest depth are found. The gray-sandstone and shale-ridge section in the eastern part and the steep mountain slopes of red shales and sandstones adjacent to the limestone lowlands are areas of young or immature soils. Soils on the plateaus, even though they are not developed to any great depth, show the leaching in the surface soil that accompanies the development of the true Podzol.

The alluvial soils for the most part are young and partake of the characteristics of the rocks of the uplands from which they are washed. Monongahela loam, washed largely from Dekalb uplands, is developed from old alluvium occupying high terrace positions and shows a well-developed profile. The following profile is disclosed in an area of this soil 4 miles east of Dunmore:

- A₁. 0 to 6 inches, yellowish-brown friable loam.
- A₂. 6 to 15 inches, pale-yellow friable loam.
- B₁. 15 to 22 inches, yellow slightly compact silt loam, faintly mottled with gray.
- B₂. 22 to 40 inches, yellowish-brown compact and somewhat tough light silty clay loam, highly mottled with gray and rust brown.

In most places at a depth of about 40 inches below the surface the B₂ layer passes into the more friable stratified alluvial parent material that contains some water-rounded gravel and large stones, with bedded gravel and cobble underlying where the deposit is more than 4 or 5 feet thick.

The most mature profile in soils derived from limestone is found in Hagerstown silt loam. This soil is developed in an area known as Little Levels in the vicinity of Hillsboro. The surface is undulating to gently rolling and is drained largely through underground

passages and sinkholes in the underlying limestone. One mile northwest of Hillsboro the following profile is shown:

- A₁. 0 to 7 inches, brown friable silt loam.
- A₂. 7 to 15 inches, yellowish-brown friable silt loam.
- B₁. 15 to 24 inches, reddish-brown heavy silt loam or silty clay loam.
- B₂. 24 to 34 inches, reddish-brown fairly stiff clay.
- B₃. 34 to 40 inches, reddish-brown stiff heavy clay containing some mottlings of yellow and orange.

Lowell and Hagerstown stony silty clay loam, occupying areas of more pronounced relief than Hagerstown silt loam, is not developed so deeply and has numerous ledges of the parent material outcropping in it, together with considerable loose limestone fragments and boulders scattered over the surface and embedded in the soil.

Upshur silt loam, developed from the Indian-red shales and sandstones and brown siliceous limestones, occupies the smoother parts and the higher upland areas adjacent to the limestone exposures, and some areas are on the lower levels associated with the smooth limestone lands. A smooth area in hay meadow on the lower slopes of Gibson Knob shows the following profile:

- A₁. 0 to 2 inches, dark chocolate-brown friable silt loam.
- A₂. 2 to 10 inches, Indian-red friable heavy silt loam.
- B. 10 to 38 inches, Indian-red friable silty clay loam.
- C. 38 to 44 inches, loose disintegrated partly weathered Indian-red shale.

This represents the smoother parts and deeper profile of the extensive areas of Indian-red soils in the west-central part of the county. The steep and stony parts are classed as Upshur stony silt loam. Numerous outcrops of Indian-red parent material and loose fragments and boulders of these are scattered over the surface. The Upshur soils show little evidence of soil development other than a slight movement downward of the clay particles.

Westmoreland silt loam and Meigs silt loam (Dekalb-Upshur complex), composite soils, the former a mixture of Dekalb and Lowell-like materials and the latter a mixture of Upshur and Dekalb materials, show about the same stage of development as the surrounding soils of which they are a part. Westmoreland silt loam is a little more friable in the subsoil than Lowell silt loam. The stony loam type of Meigs is a blending of Dekalb stony loam and Upshur stony loam. Its physical properties and development are about the same as those of Dekalb stony loam.

The remaining soil types that are in part developed from weathered limestone are Dunmore cherty loam, Dunmore stony loam, and Elliber stony loam. The last is developed largely from weathered chert beds containing little or no lime carbonate or cherty limestone. Because of its extremely high gravel content and open structure, which subject it to severe leaching, it bears some resemblance to the Clarks-ville soils as mapped farther south, but the thick mat of organic material on the surface precludes its association with these soils. The Dunmore soils are developed from weathered siliceous limestone and nearly pure limestone. They are brown in the surface soils and have light-colored loam upper subsoil layers and heavier yellow lower subsoil layers.

Dekalb stony fine sandy loam, Dekalb stony loam, Dekalb stony silt loam, Dekalb gravelly loam, and Berks shaly silt loam are Gray-

Brown Podzolic soils on hilly to mountainous uplands, weathered from noncalcareous sandstones and shales. They are shallow light-colored immature soils similar to soils mapped in Ohio and Pennsylvania as Muskingum soils, except that the soils of this county have a thicker mat of raw humus on the surface.

Because of high rainfall, the sharp angle at which the rocks lie, and the steepness of slopes on which they occur, erosion almost keeps pace with rock weathering and keeps the soils in a youthful state. The several types of Dekalb soils differ little except in texture, relief, and the amount of stone on the surface. The textural differences are determined by the texture of the underlying rocks from which they are weathered.

Clymer loam and Leetonia fine sandy loam occur largely in the lowlands having nearly flat relief, and the underlying rocks are in an almost horizontal position. Because of the smooth surface of these soils erosion is not so active as on most of the Dekalb soils. Because they have lain a longer time in place and the movement of water through their subsoils is slower, they have reached a fair state of maturity and are mottled in the lower part of the subsoil. They are similar to the Tilsit soils mapped in the southeastern part of West Virginia. A profile of Clymer loam, somewhat deeper than the typical, 2 miles northeast of Marlinton is as follows:

- A₀. 0 to 1 inch, well-decomposed organic matter.
- A₁. 1 to 5 inches, grayish-brown friable loam.
- A₂. 5 to 14 inches, yellow friable silt loam.
- B₁. 14 to 24 inches, yellow friable silty clay loam.
- B₂. 24 to 33 inches, yellow heavy clay faintly mottled with gray.
- B₃. 33 to 40 inches, brownish-yellow heavy clay mottled with gray, orange, and brown.

Shallower and more typical profiles of this soil are not quite so heavy, nor are they so definitely mottled.

Lehew stony loam and Lehew gravelly loam have dark-brown surface soils and Indian-red friable loam or silt loam subsoils. They occur on the Appalachian ridges in association with the Dekalb soils and are derived from Indian-red noncalcareous shales and sandstones of the Catskill formation. The subsoil retains the color of the parent rock and shows little profile development. The same factors of slope, erosion, and dip of rock operates to keep them young as they do in the Dekalb soils.

The Podzols are mapped in the Leetonia series and are the Podzol equivalents of the young or immature Dekalb soils. They are: Leetonia stony fine sandy loam, Leetonia stony loam, Leetonia stony silt loam, Leetonia fine sandy loam, and Leetonia gravelly silt loam.

The once thick duff or raw humus layer accumulated on these soils has been destroyed largely by forest fires. Nearly all of the area on which the best developed Podzols are found was covered with a conifer forest. Slashings from timber cutting of these forests were highly inflammable and, when fires were once started, became hot enough to burn nearly all the forest litter down to the mineral soil. Recent accumulations of duff from the fern, blackberry, and brushy growth, together with the charred remains of the former accumulations, average not more than 3 inches in thickness and are fairly well decomposed because of the more direct sunlight on the soil to stimulate bacterial action.

Leetonia stony fine sandy loam, because of the light texture and more thorough leaching, has the best developed Podzol profile. On a gently sloping area in the extreme northern part of the county, it shows the following profile:

A₀ and A₁. 0 to 2 inches, brown loamy duff.

A₂. 2 to 5 inches, gray, loose loamy fine sand or fine sandy loam.

B₁. 5 to 7 inches, coffee-brown loam or silt loam.

B₂. 7 to 28 inches, brownish-yellow friable loam, becoming somewhat lighter in both color and texture below a depth of 20 inches.

The gray layer in Leetonia stony loam is not more than 2 inches thick, whereas it is as much as 5 inches thick in Leetonia fine sandy loam. On the heavier textured Leetonia stony silt loam, the gray layer ranges from a mere film to not more than 1 inch thick. The brown or coffee-brown layers, however, average about the same in all types.

The soil between the rocks of the large areas of rough stony land mapped on the high plateaus is highly podzolized. Very little of this has been burned over, and much of it is in virgin timber of spruce and hemlock, together with some hardwoods. The duff layer ranges from 6 inches to more than a foot in thickness. Even most of the rocks that have little or no soil covering have a rather thick duff layer. Areas of rough stony land on steep slopes show little or no development of soil between the rocks.

The soils on first bottoms are all young soils, as the material has been deposited only recently, and most of them receive a fresh deposit of alluvium with each successive overflow. Little change takes place in texture or color from the surface downward. For the most part they are well drained, but small areas which are imperfectly drained or poorly drained are mapped. The well-drained soils are Huntington loam, Pope gravelly fine sandy loam, Pope silt loam, Pope fine sandy loam, and Moshannon gravelly loam. The one type of imperfectly drained soil is Lindside silt loam. The poorly drained soils are represented by Melvin silty clay loam and Atkins silty clay loam.

Huntington loam has a dark-brown surface soil and a brown subsoil, which may or may not be of heavier texture. Stratified sand and gravel underlie it at a depth ranging from 3 to 4 feet. It is material washed from uplands and redeposited along the streams that receive much of their drainage from areas of limestone land.

Pope gravelly fine sandy loam, Pope fine sandy loam, and Pope silt loam represent material washed from Dekalb uplands and redeposited along streams draining these soils. The Pope soils have light-brown surface soils and yellowish-brown friable subsoils that are usually somewhat heavier than the surface soils. Pope silt loam in most areas shows some gray and brown mottlings below a depth of 30 inches.

Moshannon gravelly loam represents wash from Upshur soils, and the entire profile shows the reddish or Indian-red color of the uplands. Gravel beds underlie it at a depth ranging from 2 to 3 feet.

Lindside silt loam is essentially an imperfectly drained Huntington soil. It occupies slight depressions in Huntington loam or narrow bottoms along streams draining limestone uplands. The surface soil is dark brown, the upper subsoil layer is light-brown friable

silt loam, faintly mottled with gray, and the lower subsoil layer is grayish-brown silty clay loam mottled with gray and rust brown. The water table is high during most of the year.

The poorly drained Melvin silty clay loam and Atkins silty clay loam have almost identical profile characteristics. Their surface soils are gray and their subsoils are heavy plastic gray clay highly mottled with yellow and brown. Melvin silty clay loam is somewhat darker in the surface soil and more productive when drained for farming purposes. It represents wet areas in soils washed from limestone uplands, whereas Atkins silty clay loam represents wet areas in soils washed from noncalcareous shale and sandstone.

Peat is in depressed or poorly drained areas in the uplands. Most of it constitutes moss peat bogs and muck soils. Some conifers, spruce, and balsam fir grow on the muck soils. A water-loving brushy growth covers most of it, and deep beds of moss grow under the trees.

The extensive areas of stony soils developed from noncalcareous sandstones and shales and the miscellaneous land types, rough stony land and peat, are grouped as forest soils.

SUMMARY

Pocahontas County lies within the Appalachian Mountains, and is about equally divided between the Appalachian Plateaus proper on the west and the Appalachian ridge and valley province on the east. Greenbrier River forms a rough boundary line between these two outstanding physiographic features. The ridge belt is characterized by northeast-southwest mountain ridges, separated by hilly lowlands, with generally narrow and nearly level flood-plain areas along the larger streams. The western or plateau region has been deeply dissected by streams, leaving rather large areas between, which retain the original plateau features.

Both calcareous and noncalcareous rocks are present. They consist of massive nearly pure limestone, impure limestone, and calcareous shale; stratified sandstone and shales; and massive conglomerate sandstone. The major limestone exposures are west of Greenbrier River.

The dominant soils are noncalcareous, leached, and podzolic. Because of the rugged relief and the imperfect stage of development of many of the soils, leaching has not been excessive. In considerable areas of less pronounced relief, however, at high elevations, the leaching or podzolic processes are much more in evidence, especially in soils derived from calcareous rocks where the lime carbonate has been nearly or wholly removed. Because of development under forest cover these soils all have a low content of organic matter. The alluvial soils, of which the proportional total area is small, are productive.

The dominant upland soils are members of the Clymer, Leetonia, Dekalb, Berks, and Lehew series and are derived from noncalcareous rocks. The Meigs, Elliber, Westmoreland, Dunmore, and Upshur soils are developed from rocks of low lime content or from composite formations of both calcareous and noncalcareous rocks. The Lowell and Hagerstown soils are developed from relatively pure limestone.

The alluvial soils are dominantly members of the Monongahela, Huntington, Moshannon, and Pope series, with smaller areas of related soils.

Only about one-fourth of the total area of the county has been cleared or partly cleared of forests and is used for crops or pasture. Much of the area of upland soils is used for pasture because of the rough relief and stoniness. About 50 percent of the plowable lands are similarly used because the high elevations entail frost danger to crops, because such use is necessary in the scheme of crop and pasture rotation, or because early spring pastures are desired near the valley homesteads. The best pastures are on soils derived from calcareous rocks. Even on most of the upland farms there is sufficient smooth land for the production of the required crops of grain and hay, used largely in wintering livestock.

The best soils for grain are the alluvial soils or the smooth soils derived from limestone. These are present in narrow belts only along parts of larger streams or where comparatively large areas of limestone are exposed, as in the vicinities of Marlinton and Hillsboro. Farms containing important areas of these soils raise considerable numbers of cattle which are wintered, returned to pasture, and sold the following fall as grass-fed cattle. Many cattle change hands between the grazing and feeding periods.

The climatic and soil environment of the county is favorable to the production of a wide range of grain, grass, legume, vegetable, and fruit crops. The limiting factors are rough relief and high elevation. Crops requiring longer growing seasons and higher temperatures must be confined to the valleys and lower elevations. Quick-maturing crops and those adapted to a cool climate do well at all elevations. Most farms, however, are so situated that farming operations are based largely on a self-sustaining agriculture and the production of livestock and livestock feeds. Necessarily, operators of farms used exclusively for summer range are not interested in the production of crops other than for their own use.

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Areas surveyed in West Virginia shown by shading. Detailed surveys shown by northeast-southwest hatching.

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