

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF MONTGOMERY COUNTY, VIRGINIA.

BY

R. A. WINSTON AND ORA LEE, JR.

[Advance Sheets—Field Operations of the Bureau of Soils, 1907.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.

1908.

[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

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

U. S. DEPARTMENT OF AGRICULTURE,

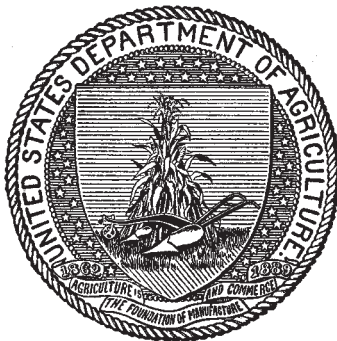
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., May 19, 1908.

SIR: A soil survey of Montgomery County, Va., was made during the summer and fall of 1907 at the request of and in cooperation with the Virginia Agricultural Experiment Station. This work was desired for the purpose of determining and mapping the various types of soil of the county and studying their crop adaptabilities. I have the honor to transmit herewith the report and map covering this work and to recommend their publication as advance sheets of the Field Operations of the Bureau of Soils for 1907, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

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MAP.

Soil map, Montgomery County sheet, Virginia.

SOIL SURVEY OF MONTGOMERY COUNTY, VIRGINIA.

By R. A. WINSTON and ORA LEE, Jr.

DESCRIPTION OF THE AREA.

Montgomery County is situated in southwest Virginia, in the second tier of counties from the West Virginia line. It comprises an area of 251,776 acres, or about 393 square miles, and is included between 37° and $37^{\circ} 20' 20''$ north latitude and $80^{\circ} 10'$ and $80^{\circ} 40'$ west

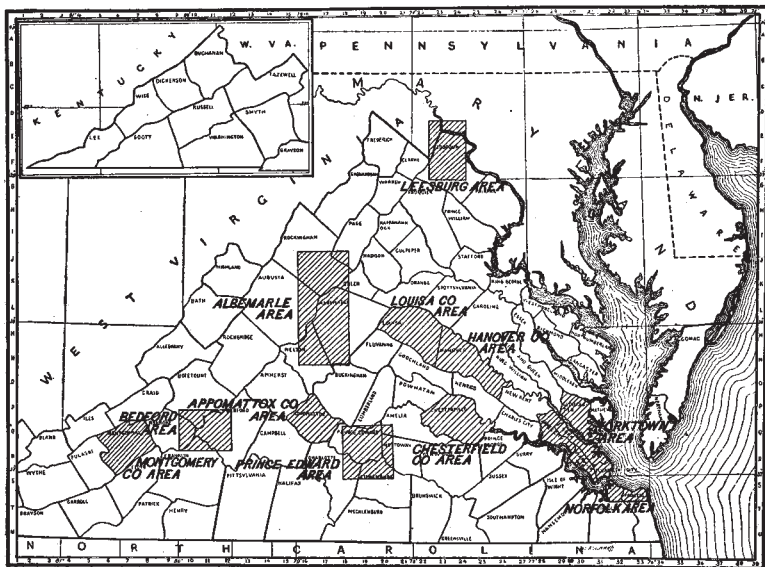


FIG. 1.—Sketch map showing location of the Montgomery County area, Virginia.

longitude. In shape it is roughly a parallelogram, with its longest dimension running northeast and southwest. It is bounded by Giles and Craig counties on the north, by Roanoke and Floyd counties on the east, by Floyd County and Little River on the south, and by Little and New rivers on the west, which rivers in this position constitute the eastern boundary of Pulaski County. Christiansburg, now a thriving town of about 1,000 inhabitants, near the center of the area, was laid out in 1790 and made the county seat, which distinction the town still holds.

While the area surveyed is primarily an agricultural district, the timber of this and adjoining counties supports various lumbering enterprises. Building stone, drawn from the limestone and sandstone formations, is found in abundance. Brickkilns, canning factories, and limekilns are successfully conducted in various sections of the county. Coal mining has been developed to some extent and a good grade of semianthracite coal is mined. The company located at Prices Mountain is the most extensive mining concern. Smaller operations are carried on along Brush Mountain, with the chief output in this section at Prices Forks.

Mineral waters containing sulphur, lithium, magnesium, and arsenic in chemical combination are found in abundance in the county, and many of the springs do a large commercial business on account of the medicinal value of their waters.

The turnpike roads of the county are in fairly good condition, especially the shale roads. There are probably from 30 to 40 miles of macadamized roadways in the area. There is an unlimited supply of road material at hand for use in extending this work.

The greater part of Montgomery County lies within what is known as the "Valley of Southwest Virginia," which is continuous with the great limestone belt, or limestone valley, extending from New York to Alabama. The county is characterized for the most part by a strong surface relief, especially in the northern and eastern parts, where mountain ridges and steep, broken areas abound. The topography of the southern portion is somewhat less severe, consisting of the rolling valley type, which in the extreme southern section runs into the dissected upland known as the Floyd-Carroll-Grayson plateau. The western and central parts of the area where the surface is hilly to rolling have the slightest relief of the county. Elevations above sea level vary from 1,200 to 3,500 feet with an average of 2,250 feet. The general direction of the mountain ranges, ridges, and hills is northeast to southwest.

The two principal drainage lines of the county are Little and New rivers and tributaries in the south and west, respectively, ultimately finding their way into the Gulf of Mexico, and the North and South forks of the Roanoke River with their tributaries, in the east, flowing into the Atlantic. The divide, or watershed, separating these two drainage systems extends across the center of the county in a general north and south direction.

The present population of Montgomery County is made up chiefly of descendants of the first settlers of Virginia, but many homeseekers and investors, attracted by the natural resources of the county, emigrated from the adjoining States. The population of the county is 16,000, of which 13,000 are white, and it is fairly well distributed.

General agriculture, dairying, and cattle and sheep raising being the chief factors in the county's prosperity, the limestone valley lands in the central and western parts of the county, the shale lands in the south, and the bottom or valley lands along the larger rivers and tributaries are the most thickly settled. There are areas in this general division, however, which are so far distant from market centers and so handicapped by the lack of transportation facilities that development has been greatly retarded.

The northern and eastern sections of the county are so broken by mountain ridges which preclude any cultivation that settlement is necessarily confined largely to the narrow valleys. In the eastern part of the county settlement is mainly along the North and South forks of the Roanoke River.

CLIMATE.

The climatic conditions of Montgomery County are quite typical of the middle east mountain section. The winters are usually about four months long, January and February, the coldest months, having a temperature of about 31° F. The summers are ordinarily warm and delightful. During the summer's heat thunderstorms are very frequent. The nights of late spring and early summer are generally quite cold, and the frosts of early May sometimes touch the fruit blossoms, although orchards are seldom injured in this way.

The rainfall is well distributed throughout the year, and especially so throughout the growing season, June, July, and August having the greatest precipitation. Occasionally the late spring rains retard the planting of crops, though the growing season is sufficiently long to overcome the setback.

The following table, compiled from the records of the Weather Bureau station located at Blacksburg, gives the normal monthly and annual temperature and precipitation:

Normal monthly and annual temperature and precipitation.

Month.	Blacksburg.		Month.	Blacksburg.	
	Temper- ature.	Precipi- tation.		Temper- ature.	Precipi- tation.
	° F.	Inches.		° F.	Inches.
January.....	31.3	2.82	August.....	70.1	4.04
February.....	31.1	3.74	September.....	64.3	2.67
March.....	43.3	3.64	October.....	52.9	2.37
April.....	50.1	2.33	November.....	42.4	2.21
May.....	60.6	4.01	December.....	34.8	2.71
June.....	67.7	4.25			
July.....	71.3	5.23	Year.....	51.7	40.02

The table below gives the dates of the first killing frosts in the fall and the last in the spring for the years 1898 to 1903, inclusive, and 1906, and also the average dates for the entire period:

Occurrence of killing frosts.

Year.	Blacksburg.		Year.	Blacksburg.	
	Last in spring.	First in fall.		Last in spring.	First in fall.
1898.....	May 9	Oct. 16	1902.....	Apr. 18	Sept. 14
1899.....	Apr. 19	Sept. 28	1903.....	May 2	Sept. 29
1900.....	May 10	Oct. 18	1906.....	May 11	Oct. 12
1901.....	Apr. 12	Oct. 4	Average.....	Apr. 29	Oct. 4

AGRICULTURE.

The agriculture of Montgomery County before the advent of white settlers, consisted of the growing of small patches of corn and tobacco by the Indians on the easily cultivated and more productive soils of the level areas and depressions adjacent to stream courses.

The first white settlers were homeseekers from the colonies and early immigrants, who cleared small areas of land and devoted them to the cultivation of corn, wheat, buckwheat, tobacco, and various vegetables.

Later, settlers came in from time to time and brought a few domestic animals which they pastured over the immediately surrounding country. The early agriculture is distinctly identified with the growth of tobacco as the principal crop, supplemented with corn, wheat, hay, fruits, and vegetables in sufficient quantities to supply local needs. Tobacco, in the early life of the section, was the principal medium of exchange, as it was throughout Virginia, and continued as such for a long time. The gradual development of the country resulted in a more diversified agriculture, and tobacco, while still important, gradually gave place to other farm products which could be more profitably disposed of. To-day tobacco is of little importance in the county, owing to competition of other sections with soils better suited to this crop. The grazing of sheep and cattle has steadily grown until the county holds an important place in the production of live stock.

According to the census of 1900 the county had 193,987 acres of farm land, of which 111,842 acres were improved. These lands, together with improvements, buildings, implements, machinery, and live stock, represented an investment of \$4,035,087. After deducting the expenditures for farm labor and fertilizers, amounting to \$51,270, from the value of farm products not fed to live stock, amounting to \$533,263, a net surplus of \$481,993, or 11.9 per cent on the capital invested is shown.

The chief crops grown are corn, wheat, oats, clover, and grasses. The following statistics from the 1900 census show the acreage and the yields of the various farm crops:

Acreage and yields of principal crops.

Crops.	Acreage.	Production.
	<i>Acres.</i>	
Corn.....	12,188	291,190 bushels.
Wheat.....	11,930	87,150 bushels.
Oats.....	1,160	19,080 bushels.
Rye.....	668	4,600 bushels.
Tame grasses.....	7,720	8,104 tons.
Clover.....	1,044	998 tons.
Grains cut green for hay.....	301	324 tons.
Tobacco.....	280	161,480 pounds.

Buckwheat, potatoes, millet, Hungarian grasses, vegetables, and orchard and forest products show approximately a value of \$105,000. The general prosperity within the last decade has materially increased land values, much of the limestone valley and shale lands selling for \$75 to \$100 an acre.

Corn and wheat, the chief grain crops, are grown in rotation over the Hagerstown loam and silt loam and the Dekalb silt loam generally, while the alluvial soils of the narrow bottom lands are devoted almost exclusively to corn and hay. Corn has yielded 80 bushels and wheat 30 bushels to the acre without any especial fertilization, but these yields are exceptional.

There is generally some system of crop rotation practiced, which includes a grass crop seeded with wheat and allowed to run for a year or two for the hay product or for grazing purposes.

Some attention has recently been given to the production of tomatoes, beans, and other crops for supplying the various canning factories of the area. Many of the slopes, coves, and valleys seem to be well suited to the growth of excellent grades of tomatoes, which mature without rotting, a difficulty often encountered in the production of this crop in other sections.

Sheep and cattle are profitably raised upon a large scale, as native grasses, including bluegrass and areas seeded in timothy, orchard grass, tall meadow oat-grass, and redtop, afford excellent pasturage. The abundance of native grasses has been the chief factor in building up this industry. The grazing of cattle is largely confined to the limestone and shale valley lands in the central and western parts of the county, where from 2 to 4 acres are allowed for each animal. The cost of pasturing stock is about as follows: Yearlings, 75 cents; sheep, \$1 to \$1.25; cows, \$1.50; and horses \$2 per head.

The steep, rugged surface of a considerable part of the area precludes tillage. Probably at least one-third of the county should not be cultivated to farm crops. These steeper lands should be seeded

down for pasture. This would prevent much severe erosion, now taking place in cultivated fields. Much of this acreage is devoted to sheep raising, though the industry has not been fully developed and should be extended. The conditions are favorable for sheep raising and the market demands are continually increasing. The production of spring lambs is probably the most profitable side of the industry, although there is ample demand for wool. The breeds best adapted to the conditions and requirements are the Middle Wool Downs, Shropshires, Southdowns, Dorsets, Hampshires, Suffolks, and Oxfords, with their crosses.

The rolling valley lands and bottom lands along the larger streams form the most progressive farming sections of the county. Here much improved machinery is being used and the tendency is toward more improved methods of cultivation. While the animal husbandry practiced results in a return of some organic manures to the soil, the amount is entirely inadequate and commercial fertilizers are used extensively for grain, tobacco, and vegetables.

The value of land varies according to the use to which it is suited, location, and condition of improvement. The less rolling limestone soils, the alluvial soils, and portions of the shale soils, have the highest value. These lands vary in price from \$25 to \$100 an acre, while some of the mountainous and very hilly areas range in value from \$5 to \$25.

Some difficulty is experienced in securing farm labor. Wages range from \$15 to \$20 a month, with house, fuel, garden, and pasture free. The bulk of the labor is done by the piece or by the day, the day wage ranging from \$1 to \$1.50. In the busy season of planting and harvesting the laborer receives higher wages. A large proportion of the hired farm labor is negro and is efficient.

Farms are either operated by the owners or by tenants on shares or for a money rental. The share system is more general, and most of the tenanted farms are held in this way. The two most popular forms of share tenancy are known as the "one-third" and the "two-thirds" systems. When the landowner furnishes the land and house only he receives one-third of the crop yields; when he furnishes land, houses, barns, stock, implements, and seed, he receives two-thirds of the produce. Fertilizers are invariably used, and the tenant and landowner share the expense. The average farm is 157.7 acres. Seventy-five per cent of the farms are operated by the owners. On a cash basis, the rent ranges from \$1 to \$3 an acre for the land actually cultivated, but in exceptional cases, where small areas of the strongest lands are leased, the rent may be as high as \$6 to \$8.

It is probable that increased yields could be had by deeper plowing and by following a crop rotation that included every few years a leguminous crop to be plowed under. The addition of organic matter in this way, in connection with barnyard manure, more of which should be saved, would greatly increase the fertility of the soils.

The steeper slopes, where erosion is severe, should be seeded in some deep-rooted grass to prevent washing, and utilized as pasture.

SOILS.

Montgomery County lies chiefly within the great valley region of southwest Virginia. This region, as already stated, is a section of the great limestone valley which has its beginning in New York and, running in a southwest direction, ends in Alabama. On each side of this limestone valley, which is from 5 to 10 miles wide, rise various mountain spurs or ranges composed of the harder or mountain-forming rocks, such as sandstones and conglomerates. These ranges generally extend in a well-defined northeast and southwest direction.

The county is properly called a limestone area, since that formation covers approximately two-thirds of its extent. The upland soils of the area are residual in character and follow more or less closely the underlying geological formations from which they are derived. Local conditions and modifying agencies over smaller areas have contributed to a variety of less important soil types, as has also the intermingling of disintegrated material of two or more formations. The small marginal areas of overflow lands along the courses of the larger streams present the only recent alluvial soil of the county. The various soils and soil conditions, climatic conditions, amount and distribution of rainfall, and the natural productiveness of the limestone soils particularly, combine to render the area well adapted to a diversified agriculture.

Twenty-three types of soil were established in the area, varying from a sandy loam to a clay or clay loam. Some of the shale and sandstone soils often have a low agricultural value, but the limestone areas are invariably productive when properly managed, which is also true of the alluvial soils.

The following table gives the name and the actual and the relative extent of each type:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Rough stony land	77,824	30.9	Cumberland loam	2,368	0.9
Dekalb stony loam	31,872	12.7	Toxaway fine sandy loam	2,176	.9
Hagerstown stony loam	29,888	11.9	Hagerstown clay loam	1,792	.7
Dekalb silt loam	25,792	10.2	Paris loam	1,536	.6
Hagerstown loam	22,400	8.9	Radford loam	704	.3
Hagerstown silt loam	20,160	8.0	Huntington silt loam	576	.2
Pilot loam	8,960	3.6	Holston silt loam	576	.2
Dekalb fine sandy loam	7,552	3.0	Decatur clay loam	448	.2
Meadow	4,800	1.9	Indian loam	384	.1
Cumberland gravelly loam	3,840	1.5	Cumberland clay loam	192	.1
Pilot gravelly loam	2,752	1.1	Total	251,776
Upshur silt loam	2,624	1.0			
Huntington loam	2,560	1.0			

The geological formations underlying the greater portion of the area comprise a vast thickness of sediments ranging in age from Cambrian to Mississippian, or Lower Carboniferous. The extreme southeastern part of the county shows the oldest formations encountered, those of crystalline rocks, such as mica schists, talcose-schists, and quartzose sandstone, of Archean age. The other rocks of the area are chiefly limestones, sandstones, shales, and conglomerates. In common with other areas of the Appalachian Mountain system, these sedimentary rocks, originally laid down in horizontal beds, have been subjected to such an intense compression that they have been greatly folded, twisted, and faulted. Since this compression and resultant uplifts erosion has been active in wearing down the less resisting rocks, like the shale and limestones, much more rapidly than the more resisting rocks, like the sandstones and conglomerates; hence the latter rocks clearly mark the mountain ridges and highest elevations. The variations in topography are indicative of the character of the underlying formation and also of the nature of the overlying soil. Broadly, the soils of the area are influenced by three geological systems, which run in a general line with the Blue Ridge and Appalachian mountains—that is, in the northeast and southwest direction. The most extensive system in the county is the limestone of Cambro-Ordovician time, probably separable into several members. It occurs through the central portion of the county and gives rise to various soils of the Hagerstown series. The purer the limestone the heavier the derivative soil and the smoother the topography. Considerable areas of this limestone show the presence of cherty masses which have resisted weathering and have been left on the surface and in the soil. This cherty material, together with some sandstone fragments, characterizes the Hagerstown stony loam type. The occurrence of this soil is over the well-rounded hills and ridges of the limestone valley. The Hagerstown silt loam and Hagerstown loam are the predominating limestone soils of the more or less rolling valleys and constitute the most valuable soils of the county. In connection with the Hagerstown series were found several small areas of a very red soil which was mapped as Decatur clay loam.

The next extensive system is found both north and south of the valley limestone and is composed of shales, sandy shales, and sandstones ranging in age from Silurian to Lower Carboniferous. From this general division is derived the Dekalb series of soils and the Upshur silt loam. The predominating soil is the Dekalb silt loam, derived from the weathering of shales, sandy shales, and probably some fine-grained sandstone. It occurs more extensively over the south-central portion of the county, where it occupies a topography ranging from more or less rolling to very hilly. The harder sandstones and conglomerates, which preserve the mountain ridges and spurs, give rise to the stony loam and fine sandy loam members of the series.

The other distinct system is found in the extreme southern section of the county and is composed of a series of mica and talcose schists with what seems to be a quartzose sandstone. This is a part of the Floyd County plateau of crystalline rocks of Archean age and, in this county, the derivative soils were classified as Pilot loam and Pilot gravelly loam. The gravelly loam member, containing varying quantities of quartz fragments, occupies the higher elevations.

The alluvial soils of the county are very limited in extent and occur as narrow marginal areas at varying intervals along the courses of the larger streams. This class of soils is divisible into two series, according to the two principal drainage lines of the area, the Little and New rivers in the west and the North and South forks of the Roanoke River in the east. The material occurring along the western streams, which flow through areas underlain by crystalline rocks before reaching Montgomery County, was mapped as the Toxaway fine sandy loam, and the material found along the forks of the Roanoke River, which flow through a region of rocks of different character, was mapped as Huntington loam and Huntington silt loam. The highest terraces along the courses of the Little and New rivers, where waterworn gravel and cobbles are plentiful, represent areas that have in past ages been subjected to river action and present a class of soils composed of ancient alluvial material mantling the residual material, or quite thoroughly mixed with it. Over such areas was mapped a variety of soil types, of which the principal ones are the Cumberland gravelly loam, Cumberland loam, and the Radford loam. The mountainous areas, where cultivation is impossible and where the stone and rock content is high, have been mapped as Rough stony land. The smaller streams of the area, flowing through the narrow valleys, are almost invariably bordered by materials partly alluvial and partly colluvial, which on account of their variable composition it was impossible to separate. Such areas, together with those more typical, have been mapped as Meadow.

HAGERSTOWN STONY LOAM.

This soil consists of a grayish to brownish loam or silt loam 6 to 10 inches deep, underlain to a depth of 24 inches by a reddish-yellow silty clay loam which passes at 30 inches into a yellowish-red to red clay extending to a depth of 36 inches or more. The type is made to include all areas of limestone material having a high stone content or carrying numerous small fragments of cherty limestone and sandstone. In many instances it represents the intermediate conditions between the Rough stony land and the more level and easily cultivated soils. In such cases the soil consists mainly of numerous rock fragments of limestone, cherty masses, and occasionally some sandstone. Outcrops of massive limestone occur at varying intervals over the surface, especially on the slopes and crests of the hills and ridges. In

this position the soil has a very hilly and broken topography, often mountainous, and little of it is capable of cultivation, grazing being its only use. The lower slopes of many of these elevations are made up of a mixed colluvial material, and here limited areas are cultivated with good results. The heavier phases of soil are found in these areas as well as the brighter colored phases, much of the upper material having been transported by the surface waters, leaving the reddish subsoil at or near the surface. The more decided grayish loamy phase is found over the less broken areas where cultivation is more often carried on despite the difficulties arising from the large stone content. These stones are principally fragments of cherty limestone and sandstone. This phase occurs closely associated with the Hagerstown loam, occupying the crests and slopes of many of the higher hills and ridges surrounded by that type.

The soil occurs in areas of varying sizes over the extent of the limestone valley, but more especially over the more broken areas in the east or where the limestone formation adjoins that of the sandstones.

It has a surface ranging from hilly to mountainous. The mountainous and more hilly areas generally support a fair to good grade of hardwood with some pine, while the less mountainous areas are either cultivated or pastured. Much of this class of land could no doubt be successfully utilized in growing apples, as many varieties seem to be well adapted to the conditions. Orchards of limited extent have been grown and fairly good grades of fruit are obtained.

Over the areas where cultivation is feasible good yields of corn and wheat are produced with the aid of fertilizers. On the better areas corn will produce about 35 bushels, wheat from 10 to 20 bushels, and hay from 1 to 2 tons an acre. Grasses are generally seeded with the wheat and allowed to run for two or three years for hay and as pasturage for sheep or cattle. The value of this type varies from \$10 to \$50 an acre.

The following table gives the average results of mechanical analyses of samples of soil and subsoil of the Hagerstown stony loam:

Mechanical analyses of Hagerstown stony loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17552, 17554.....	Soil.....	1.1	3.8	3.4	9.0	2.3	69.5	11.3
17553, 17555.....	Subsoil.....	.4	1.5	2.6	6.6	5.3	35.1	48.1

HAGERSTOWN LOAM.

The soil of the Hagerstown loam is a gray to a light grayish-brown loam 8 to 10 inches deep, underlain by a yellowish clay loam which passes at about 24 inches into a stiff, heavy, yellowish-red to red clay

extending to a depth of 3 feet or more. The soil contains generally much silt, and the sand content is of finer grades. The more level areas and lower slopes and depressions in the valley lands are gray in color and have the deepest surface soil. Much of the fine earth of the upper soil has been washed down to these positions by the surface waters. The crests and upper slopes, and occasionally a more level area, will show the yellowish-gray to grayish-brown soil which often approaches a clay loam. In these instances erosion has transported enough of the sands and silt to bring the remaining surface material under the influence of the yellowish-red subsoil. In a great many cases the correlation of such areas was an arbitrary matter. Over many of the ridges and hills were found varying quantities of cherty material, which remains from the weathering of the impure massive limestone and fragments of sandstone. These ridges rise irregularly throughout the area occupied by this soil and generally extend in the direction of the longer axis of the valley. The percentage of rock fragments is often sufficiently high to interfere with cultivation. The soil is broken with many small areas of the Hagerstown stony loam. The subsoil is uniform throughout the type.

The Hagerstown loam is found in many irregular areas throughout the limestone valley. A few small bodies were mapped in the northeast part of the county between Brush and Paris mountains. The most extensive occurrence begins on the divide a few miles north of Blacksburg and reaches, as a narrow strip generally parallel with the divide, to Christiansburg, where it broadens out and extends in a westerly direction to New River, broken, however, by many small areas of other soil types. The soil occupies approximately 35 square miles and is considered good farm land, easily cultivated and improved.

The general topography is gently rolling to rolling and the drainage is everywhere excellent. The more hilly areas are inclined to wash, but terracing or seeding in grass will prevent serious damage from this source.

This soil is derived from the weathering of a more or less pure limestone of the Shenandoah formation. The less pure strata give rise to the cherty material so generally found on the ridges. There occur quite often seams of calcareous shales and sandy shales which influence the immediate soil, but such areas are too small to represent on a map of the scale used. Where the soil adjoins the shale lands to the south there is a gradation zone showing an intermingling of the two formations, but with the limestone material predominating.

Corn, wheat, and grass are the chief farm crops, and good yields are obtained. Corn will yield from 30 to 60 bushels, wheat from 15 to 25 bushels, and hay from 1 to 2½ tons to the acre, the lower lying areas and depressions being probably better suited to grass and corn. The soil seems to be especially adapted to certain varieties of apples,

including the York Imperial, Ben Davis, Smith Cider, Yellow Transparent, Peck's Pleasant, and Grimes Golden, named in order of their apparent adaptability to soil and climatic conditions. Tomatoes and beans do especially well. They are grown in large quantities for the various canning factories of the area and are very profitable. Many of the hills and ridges in this soil, which support a hardy growth of nutritious grasses, are used almost exclusively for cattle and sheep grazing. The practice of seeding the steeper slopes to grass is probably the best method of utilizing such areas. The value of the soil varies from \$30 to \$100 an acre, according to location and local conditions.

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

Mechanical analyses of Hagerstown loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17548.....	Soil.....	0.6	4.5	6.3	17.1	4.3	54.6	12.9
17549.....	Subsoil.....	.4	1.1	2.6	6.7	6.4	30.9	51.1

HAGERSTOWN SILT LOAM.

The soil of the Hagerstown silt loam is a gray or occasionally brownish-gray silt loam, often containing a low percentage of fine sand and over some of the well-rounded and gently rolling hills a percentage of very small, well-weathered calcareous shale fragments. The subsoil is a yellowish to reddish-yellow clay loam, passing at about 24 inches into a stiff, heavy, yellowish-red clay, which extends to a depth of 3 feet or more. The depth of this clay is uncertain, as washes and road cuts will often show it to be 15 feet deep. Narrow seams of calcareous shales are found on the crests and slopes of some of the higher, well-rounded hills and ridges in the more or less rolling valley lands, and the subsoil contains some disintegrated shaly fragments. In the more level areas or valley depressions the surface soil has a characteristic gray to light-gray color, and reaches its greatest depth. It may, however, in the lower depressions along the courses of the small streams where drainage is poor, show small spots where the color of the soil ranges from dark gray to black and of the subsoil from gray to light gray. The presence of an excess of moisture no doubt produces these variations in color. The grayish brown phase is invariably found on the crests or slopes, where erosion has influenced an intermingling of the red clays beneath, giving a soil that approaches in texture a clay loam. These areas are usually very small, but when large enough were mapped as the Hagerstown clay loam. The type as a whole is one of the strongest and most valuable

for general farming, fruit growing, and grazing. Cultivation is easy, and a good tilth is readily maintained.

The only extensive occurrence of this soil is found in the northwest quarter of the county in two uniform areas—one in a broad, rolling limestone valley to the north of Prices Mountain and west of the divide near Blacksburg, the other in a somewhat more rolling country south of Prices Mountain and west of the divide near Christiansburg. Prices Mountain, a Lower Carboniferous formation of sandstones and shales, rises in the midst of this limestone valley. The two areas extend in a rather uniform breadth almost to New River. The topography of the type is more or less rolling, often very gently rolling, but the relief is always sufficient to afford excellent drainage without producing erosion.

The Hagerstown silt loam is derived from the weathering of the purer grades of the Shenandoah or Valley limestone of Cambro-Ordovician age, with cherty areas of impure material. The limestone rock has weathered more completely and to a greater depth than in the other soils of the area, and this has resulted in a smooth topography with less active erosion. The lower depressions will invariably show, however, a deeper surface soil than the crests and slopes of the surrounding elevations.

The soil forms a broad expanse of excellent farming land, ranging in value from \$75 to \$125 an acre. Corn, wheat, and hay are the chief crops, while various fruits and vegetables are produced for local consumption. Tomatoes seem to do exceptionally well, and many small areas are planted to supply the canneries. Corn produces from 35 to 50 bushels, wheat from 15 to 30 bushels, and hay from 1 to 3 tons to the acre. The fields are allowed to remain in grass for a year or two as pasturage for cattle, the grazing industry being extensive in this section. Some of the lower lying areas along the streams are devoted exclusively to the production of hay. Commercial fertilizers are advantageously used. The application of stable manure and a rotation, including a leguminous crop to be plowed under, will insure a continuation of good crop yields.

The greater part of the type is under cultivation or in pasture, with a few wooded areas supporting a good grade of hardwood.

The following table gives the average results of mechanical analyses of samples of this type:

Mechanical analyses of Hagerstown silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17542, 17544.....	Soil.....	1.2	3.1	2.0	7.7	4.9	71.9	9.5
17543, 17545.....	Subsoil.....	.4	1.3	1.0	4.1	11.0	41.1	40.3

HAGERSTOWN CLAY LOAM.

The Hagerstown clay loam consists of 6 to 8 inches of a yellowish-red to brownish clay loam, carrying often small fragments of cherty and shaly limestone. The subsoil is a stiff yellowish-red clay. The more loamy phase of the surface soil is of a silty nature, as the type is closely related to the Hagerstown silt loam. It is developed in a single limited area in the western part of the county south of Prices Mountain. It occupies the crests and slopes of some of the hills or ridges, where erosion has carried away most of the silty surface soil. The drainage is everywhere excellent. The type is a good soil for general farming, though less easily handled than the lighter textured limestone soils.

The Hagerstown clay loam, like the Hagerstown silt loam, is derived from the Shenandoah limestone, its occurrence being due to erosion, which has brought the underlying subsoil near the surface. The soil at present is not in the best condition, but could be improved by careful tillage to prevent washing and to produce a friable surface soil. The addition of organic matter through the use of stable manures or the plowing under of cowpeas, clover, or other leguminous crop would have a very beneficial effect on the texture and would improve the yields.

DECATUR CLAY LOAM.

The soil of the Decatur clay loam to a depth of 6 to 10 inches is a brown to reddish-brown clay loam, underlain by a heavy reddish-brown to red clay loam quickly passing into a heavy, stiff, deep-red clay. The surface soil is occasionally a heavy loam or silty loam where the surface does not allow severe erosion, and it has the greatest depth in such areas. In the more hilly to mountainous areas, where the relief is severe, the surface soil has a redder color and is shallower. The subsoil, into which the soil passes gradually, is at all times a heavy dark-red clay. Where cultivation is feasible this type of soil is easily handled and a good tilth is obtained. As this soil is heavy, care must be taken to plow it in the proper moisture condition.

The soil is not at all extensively developed, being mapped only in two small areas, one about 7 miles southwest of Christiansburg, the other near Shawsville. In the former position it has an easy rolling topography, while in the latter the surface is very hilly, merging into rolling valley lands immediately north of Shawsville. Drainage is good throughout, though on the steeper slopes erosion is apt to be severe.

The soil is derived from the weathering of the massive Shenandoah limestone. A few fragments of unweathered rock indicate that the limestone contained some cherty material, though in much smaller quantities than is general. Near the Roanoke River around Shawsville the surface soil carries some rounded, waterworn cobbles of flint and sandstone.

The areas of this soil permitting cultivation are chiefly devoted to the growing of corn, wheat, and grasses. When seeded to grass the fields are used for a year or two as pasture before being replanted in corn or wheat. Good yields are obtained and the type is regarded as a strong soil. Corn will yield from 40 to 60 bushels, wheat from 15 to 25 bushels, and hay from 1 to 2½ tons to the acre. Commercial fertilizers insure increased yields of wheat and corn, though their use is not general. The value of land of this type of soil averages about \$60 an acre, the mountainous slopes having considerably lower value, while some small areas may command \$100 an acre where well located and well improved.

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

Mechanical analyses of Decatur clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17527.....	Soil.....	1.8	5.6	2.8	8.4	3.3	54.0	23.2
17528.....	Subsoil.....	3.8	4.4	2.1	5.5	7.9	50.7	25.8

DEKALB STONY LOAM.

The Dekalb stony loam, to a depth of 4 to 10 inches, is a gray to yellowish-gray loam to silty loam, underlain by a more decided yellow clay loam to clay subsoil. The surface soil may in places contain a sufficiently large quantity of sand to make it a fine sandy loam or a light-textured loam, and everywhere there is a high content of sand-stone fragments of various sizes and generally some fragments of conglomerate. This conglomerate, while found more conspicuously in the southern portion of the county around Pilot Mountain, may be seen in limited quantities over most of the high mountainous ridges. This soil is underlain by sandstones, sandy shales, conglomerates, and gray to brownish shales, outcrops and ledges of which may often be seen on the crests and slopes of the elevations. The fine earth of the type has not been used as a basis for separation and the Dekalb stony loam will include areas ranging from a clay loam to a sandy loam. The general roughness of the areas and the high stone content are the controlling factors in the classification. Cultivation is in general impracticable and often impossible, either the underlying rock formation being too near the surface or the percentage of rock fragments too high. Cultivation is limited to a few of the more level areas and valleylike depressions, or to some less steep and stony slopes, but even here farming is carried on with more or less difficulty and with little profit. The greater part of the deforested areas is utilized as pasture for sheep, while the timbered stretches of the hills and mountains are valued chiefly for their chestnut and chestnut oak timber, which is of moderate growth.

The type is mapped extensively in the northwest, east-central, and southern sections of the county, where occur the Paleozoic shales, sandstones, sandy calcareous shales, and conglomerates. These formations represent the mountain-forming rocks of the area and the topography as a whole is very rough and broken. The soil in the narrow valleys or more level stretches adjacent to the base of the mountain slopes, represents, no doubt, much material that has worked down from the elevations. Drainage is everywhere good.

The chief crops are corn and wheat, with small patches of buckwheat and vegetables, fair yields of which are obtained. Sheep grazing is extensively practiced in the hilly and less mountainous areas which support a fair to good growth of native grasses. No doubt much of the Dekalb stony loam now of little agricultural value could be profitably devoted to the production of suitable varieties of apples. Many small orchards now in bearing are giving satisfactory returns.

DEKALB FINE SANDY LOAM.

The Dekalb fine sandy loam consists of a gray to yellowish-gray fine sandy loam from 9 to 16 inches deep, underlain by a yellowish to reddish-yellow compact fine sandy loam, sometimes passing into a friable yellowish clay occasionally streaked with red. The surface soil generally carries fragments of sandstone, especially on the slopes of the mountains. These fragments may occur throughout the soil and subsoil, though they are more numerous on the surface.

The soil occurs in the northern part of the county at varying intervals along Brush Mountain, in the narrow valley between Brush and Gap mountains, and in the eastern part of the area on the eastern slope of Paris Mountain. The slopes extend in a rather easy incline from the base to the crests. This topographic feature, together with the thick timber growth of chestnut, oak, and pine, prevents any very serious erosion, and the disintegrated material accumulates to a depth of several feet. On the eastern slope of Brush Mountain, where the largest area of the type occurs, the rotten broken sandstone is often encountered at a depth of less than 3 feet. The soil in the Paris Mountain area is probably more loamy than on Brush Mountain, and contains a slightly higher percentage of silt. Here a yellowish subsoil often mottled with reddish streaks occurs. Little of the type is under cultivation, although much of it could be cleared and utilized profitably for agricultural purposes.

The soil is residual in origin, derived from the disintegration of sandstone and shale rocks, which belong to the Lower Carboniferous.

The topographic relief is generally sufficient to insure good drainage, though small areas were encountered in the valleys with a rather level topography. Many of these areas are under cultivation

and fair yields are obtained. The soil is very easily cultivated, and responds readily to fertilization, but yields only fair crops. Corn will average from 12 to 20 bushels and wheat from 5 to 12 bushels to the acre. It is probable that the type on the southern and southeastern slopes is far better adapted to fruits and vegetables than to the general farm crops. The soil is very loose and light and the incorporation of organic matter with the fine earth is essential.

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

Mechanical analyses of Dekalb fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17531.....	Soil.....	2.8	8.1	9.4	32.5	7.0	32.6	8.0
17532.....	Subsoil.....	1.4	3.9	0.7	19.9	5.7	33.0	29.5

DEKALB SILT LOAM.

The soil of the Dekalb silt loam, to a depth of 10 to 15 inches, is a gray to pale yellowish-gray silt loam, carrying a small percentage of fine sand and numerous small fragments of red and yellow shales, sandy shales, and sandstones. These fragments from the underlying formations are generally pretty well weathered, especially at or near the surface. The subsoil, from 14 to 26 inches, is a yellowish silty loam to clay loam, showing little tendency to plasticity and stickiness, and having a percentage of small shaly fragments. At 26 inches the material passes into a rather heavy yellowish clay which extends to a depth of 3 feet or more. The subsoil has not always so great a depth and sometimes passes into the underlying rock formation at from 20 to 30 inches. In the more hilly or ridgy areas, the silt loam or clay loam generally grades into a rotten shale or fine-grained sandstone, which can be bored into for a few inches, when a less disintegrated material is encountered. Outcrops of the formation often appear on the crests and slopes of the hills and ridges, and occasionally the fine earth of the type has a depth of only a few inches with the unweathered rock material just beneath. Many of the ridges are almost bare and a continuous outcrop of shaly rock marks their crests. The soil, however, increases in depth down the slopes and is deepest in the more level areas or valleylike depressions surrounding the hills and ridges. This greater depth is due to wash of material from the higher land. Such areas are usually more productive. Sometimes the quantity of shale fragments becomes so great that the type approaches a shale loam, but areas of this character are of small extent. The varying color of these

shales, ranging from yellowish to reddish-brown to purplish-red, locally influences the color of the soil, but the predominating color is yellow and such areas were included with the Dekalb silt loam rather than with the Upshur silt loam.

The Dekalb silt loam is most extensively developed in the southwest part of the county, though many small areas occur at irregular intervals throughout the central part. The largest area is found southwest of Christiansburg, between the limestone belt on the north and Pilot Mountain on the south, where the less resistant shales have resulted in a hilly or more or less rolling topography. Many smaller areas occur in proximity to the limestone soils. In fact the soil along the lower slopes of many of the well-rounded hills and ridges is broken by outcrops of crystalline limestone and contains an admixture of material derived from this formation. In such instances erosion has worn away the later shale formation and exposed the underlying limestone, while the crests and higher slopes still retain a mantle of the carboniferous material which may be several feet thick. Such detail conditions could not be shown in the map. In the northeast part of the county between Paris Mountain and Fort Lewis Mountain there are a few square miles of this type.

The Dekalb silt loam is derived from the weathering of yellow to gray shales, sandy shales, and fine-grained sandstones chiefly of Paleozoic age, ranging probably from Silurian to Lower Carboniferous. The shale formations vary in color from a yellowish or reddish to dark gray, while the sandstones are generally of a yellowish-gray color.

As a rule the topography varies from more or less rolling to hilly and the drainage is everywhere excellent. Some of the more accentuated hilly areas are inclined to suffer from erosion. The softer shales, as southwest of Christiansburg, have weathered more easily and the topography in such cases is smoother.

The Dekalb silt loam has good tilth, responds readily to fertilization, and crop yields are generally good. The rougher areas where cultivation is less feasible are used as pasture for cattle and sheep. These areas support a good growth of native grasses and sheep raising, especially, is an extensive industry over the hilly areas. Of the staple farm crops, corn, wheat, and hay are most important. Corn will produce, with the application of some commercial fertilizers, an average of 20 to 35 bushels, wheat from 12 to 20 bushels, and hay from 1 to 2 tons to the acre. The lower lying areas are more productive than the average uplands and corn makes better yields, especially on the areas adjacent to streams. Increased yields could no doubt be secured by the application of organic matter, either in the shape of stable manure or by plowing under green manuring crops, preferably some of the legumes, as cowpeas, clover, or vetch.

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

Mechanical analyses of Dekalb silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17535.....	Soil.....	2.5	2.1	0.7	2.3	2.8	80.4	9.2
17536.....	Subsoil.....	2.3	2.3	.9	2.1	6.3	60.2	25.5

PILOT GRAVELLY LOAM.

The soil of the Pilot gravelly loam is a yellowish-gray loam containing a high percentage of small and often large fragments of white quartz. The subsoil to a depth of 36 inches is a pale yellowish to yellowish-red clay loam to clay having a greasy feel. The fine earth is quite similar to that of the Pilot loam. The type occurs in connection with the Pilot loam, occupying some of the crests or slopes of some of the hills and ridges. The soil, in many cases, can not be cultivated on account of large quantities of gravel and stone, but when cultivation is feasible fair to good yields are obtained.

The Pilot gravelly loam is not an extensive soil and occurs only in the southeastern part of the county. It is derived, like the Pilot loam, from crystalline rock of Archean age. The quartz, originally occurring in veins, has been left on the surface and in the soil during the processes of weathering and erosion. The uncleared areas support a fair growth of hardwood and pine, which is being marketed in large quantities.

The type has a value of \$10 to \$35 an acre, depending on location and condition of improvement.

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

Mechanical analyses of Pilot gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17568.....	Soil.....	4.3	12.1	6.0	12.9	8.8	39.8	15.6
17569.....	Subsoil.....	3.4	7.6	3.9	8.4	12.1	34.1	30.0

PILOT LOAM.

The soil of the Pilot loam consists of a yellowish-gray to yellowish-brown loam 8 to 12 inches deep, containing a small percentage of coarse sand and some very small fragments of schist and quartz rock. The subsoil is a yellowish-red to brownish clay loam grading into a heavy red clay, not very tenacious or plastic, containing some

small subangular gravel, some sand, and having a slick, greasy feel. The gray phase of the type is found over the areas where erosion has been less effective, while the brownish phase is found generally on the crests or slopes of the elevations adjacent to stream courses or valleys. Here erosion has removed much of the surface soil and brought the subsoil sufficiently near the surface to influence the color.

The topography of this soil ranges from hilly to gently rolling, with some small areas quite level and others quite steep and broken. Drainage is at all times good.

The Pilot loam occurs in the southern and southeastern parts of the county south of Pilot Mountain and extends to the Floyd County line. It covers an area of approximately 14 square miles. Occurring as it does over a part of the Floyd-Carroll-Grayson plateau, the soil is derived from the weathering of crystalline rocks—mica schists, talcose schists, and coarse-grained quartzose sandstone, belonging to Archean age and constituting the oldest geological system of the county. In the process of soil formation much rock has been left on the surface.

The soil is comparatively easy to handle, and the yields range from fair to good. It is cultivated in corn and wheat principally, corn producing from 30 to 50 bushels and wheat from 10 to 20 bushels to the acre. Oats and grasses are grown as forage crops and average yields are obtained. This soil responds quite readily to fertilizers and is capable of decided improvement. The adoption of a systematic crop rotation, including a leguminous crop to be plowed under, would substantially increase its productiveness and less commercial fertilizer would be needed. The type has a value of \$10 to \$50 an acre.

The following table gives the average results of mechanical analyses of fine-earth samples of this type:

Mechanical analyses of Pilot loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17564, 17566	Soil	3.8	16.2	8.1	15.5	8.1	35.1	13.1
17565, 17567	Subsoil	3.5	10.5	5.5	10.3	6.9	27.3	35.9

UPSHUR SILT LOAM.

The soil of the Upshur silt loam to a depth of 8 to 15 inches is a purplish-red to purplish-gray or Indian red silt loam, containing a high percentage of small red-shale fragments which have been weathered from the underlying formation. The sand content of the soil is low and consists of the finer grades. The subsoil is a heavy, purplish-red, compact silt loam grading into a reddish-brown silty clay and passing at lower depths into decomposing shales of a reddish to yellowish

color. The percentage of rotten shale fragments increases with depth and generally the type passes at about 24 to 36 inches into massive rotten shale. In both soil and subsoil are generally found varying quantities of yellow-colored shales, though not enough to change the characteristic red color.

The Upshur silt loam occupies almost invariably well-rounded hills and ridges, though the surface may be steep and suitable only for grazing. Local areas in rougher sections contain so much broken sandstone that they are of little value save for the timber. The character of the surface promotes good drainage.

This soil is derived from the disintegration and weathering of red sandstones, red shales, and red sandy shales of Paleozoic age. The red to purplish-red color of the soil distinguishes it from the Dekalb silt loam. The separation of the two types in the field is often difficult because of the intermixture of red and yellow materials, and in such cases, the boundary lines were drawn somewhat arbitrarily.

The native timber growth is a more or less scrubby hardwood, with some pine. The cultivated areas are used for wheat, corn, and hay, and fair to good yields are obtained. The soil has a good tilth, is easily handled, and responds readily to fertilization. Commercial fertilizers are used with good results. The application of stable manure would tend to a more permanent improvement, and where manure is not available some crop rotation, including a leguminous crop to be plowed under, will prove valuable. Corn will average from 12 to 25 bushels, wheat from 10 to 20 bushels, and hay from 1 to 2 tons to the acre. The type is not extensively developed and is of little importance in the agriculture of the county.

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

Mechanical analyses of Upshur silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17581, 17583	Soil	1.7	3.7	1.4	8.1	11.5	59.2	13.8
17582, 17584	Subsoil	1.8	8.4	3.6	6.9	6.1	48.6	24.3

ROUGH STONY LAND.

The Rough stony land includes the various areas of the county which are either too rocky or stony, or too rough and broken, for agriculture. The fine earth of the Rough stony land in the mountainous areas composed of the harder rocks, like the sandstones, is a sandy loam, while in other mountainous areas, especially in the east, the interstitial material is mainly clay. This latter phase of the Rough stony land is derived for the most part from crystalline limestone,

bowlders, outcrops, and ledges of which form the crests and slopes of the high hills and ridges. The possibility of agriculture was the basis for the separation in these areas. Occasional patches of corn, buckwheat, or vegetables may be seen on the mountain slopes, especially on the lower slopes where the soil has accumulated as wash from the higher elevations.

The Rough stony land is found in the northern and eastern parts of the county, principally, over the mountain ranges and highest hills. Gap, Brush, Prices, Paris, Fort Lewis, Poverty, and Pilot mountain ranges give rise to more or less extensive areas. The eastern part of the county, including the territory embraced by the Poverty Mountains, is especially rough and broken.

The Rough stony land is valuable mainly for its timber growth of hardwood and pine, and considerable lumbering is being carried on. No doubt many areas of this type could be utilized very profitably in the growing of apples. Sheep are grazed over limited areas which show a fair to good growth of native grasses.

CUMBERLAND GRAVELLY LOAM.

The soil of the Cumberland gravelly loam consists of 6 to 12 inches of a grayish to yellowish-gray loam, often approaching a sandy loam in texture, though the content of silt is always high. The subsoil is a heavy yellowish loam to clay loam, which generally grades into a heavy material, becoming redder as the depth increases, and at 30 to 36 inches passing into a yellowish-red to red clay. There is generally a slight sand content in the upper subsoil. The percentage of rounded pebbles and cobbles on the surface and in the soil is generally high. These pebbles and cobbles vary in size from one-eighth inch to 3 inches in diameter.

The soil is found in small areas scattered along the courses of the larger streams. It occurs in some of the old river terraces in connection with the Cumberland loam, and is of the same origin and manner of formation. It forms the crests or slopes of some of the hills and ridges, and its drainage is always good.

The better areas are devoted to the cultivation of the usual farm crops, corn, wheat, oats, and grass. The yields are fairly good. As the area of this soil is limited it has little agricultural importance.

CUMBERLAND LOAM.

The soil of the Cumberland loam is a grayish to yellowish-gray loam, tending in some places to a silty or sandy loam, 10 inches deep, carrying generally a small percentage of rounded, waterworn gravel and traces of minute mica flakes. The subsoil is a heavy yellowish loam, or clay loam, becoming heavier in texture and structure with depth, passing at about 24 inches into a yellowish-red to red clay.

This clay is not especially tenacious, and, like the surface soil, contains some mica flakes. Along the slopes of the elevations as they grade to the river valley proper is found the brighter-colored phase of the type. In this position the drainage waters have removed much of the soil, and the subsoil lies near the surface. The subsoil also, in this position, being often exposed through the agencies of erosion, has a much redder color, owing, no doubt, to freer aeration and more perfect oxidation. In some cases around Radford the subsoil is very red.

The Cumberland loam is found along the courses of Little and New rivers, occupying the most elevated and oldest of the river terraces. It has a topography ranging from gently rolling to very hilly, with excellent drainage, except in a few instances. The material was laid down by the rivers during a remote period and its origin is sometimes quite obscure, though the presence of rounded, waterworn gravel and cobbles establishes the action of running water at some stage of its formation. Erosion during the time in which the river has worn down its valley to the present level has removed much of the original alluvial material of these old terraces to lower elevations, and what remains has become more or less intimately mixed with residual material from the underlying limestone formations. The surface soil, where erosion has not been active, is unquestionably a material of ancient alluvial origin, while the subsoil is derived in situ from the underlying rock. On the slopes around Radford where the pronounced red subsoil occurs the ancient alluvial soil has been almost entirely removed.

The soil is used chiefly for corn and wheat, with small patches of vegetables and other garden crops for home consumption. Grasses are also grown and cut for hay or utilized as pasture for stock. The type has a value of \$10 to \$100 an acre, depending mainly on its position.

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

Mechanical analyses of Cumberland loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17572.....	Soil.....	1.0	4.0	2.7	12.4	9.9	56.5	13.4
17573.....	Subsoil.....	.6	2.0	1.7	8.1	11.8	35.2	40.9

RADFORD LOAM.

The soil of the Radford loam, to a depth of from 10 to 24 inches, is a gray to brownish-gray loam, containing a relatively high percentage of silt and some mica flakes. The subsoil to 24 inches is a

heavy yellowish loam to clay loam, showing little tenacity and containing also minute mica flakes. Below 24 inches the material grades into a yellowish-red clay loam to clay, passing at lower depths into a reddish friable clay. The soil is quite easily tilled.

The type occurs as a second-bottom soil between the oldest river terraces and the most recent bottoms. The topography is level to gently rolling and drainage is good, except over the more level areas, where it is sluggish. As the soil is more or less open-textured, better drainage could be effected by open ditches.

The soil represents an intermingling of alluvial, colluvial, and residual material. The upper soil to a depth of 1 to 2 feet is composed of alluvial material which was laid down at an early period during overflow, and of transported material, or the wash from the surrounding elevations through the action of the surface waters. The subsoil is for the most part unquestionably residual. On the swells is found the lightest colored phase of surface soil, and the mixed condition of the transported and residual materials is most evident. The lower depressions have the darkest colored soil, owing no doubt to the presence of much organic matter and to the wash from the adjacent elevations.

The general farm crops of corn, wheat, oats, and hay are grown profitably. The lower, moister areas are usually devoted to corn, which yields from 40 to 75 bushels to the acre. Some of the soil is continuously used for hay and as pasture for stock. Careful and deep tillage, systematic crop rotation, and the addition of organic matter will maintain the productiveness of this type of soil. Much of this soil type has a value of \$25 to \$100 an acre, according to location and condition of improvement.

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

Mechanical analyses of Radford loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17562.....	Soil.....	0.2	3.0	3.3	23.0	15.7	42.5	11.6
17563.....	Subsoil.....	.7	2.0	3.3	19.6	18.2	32.1	23.9

HUNTINGTON SILT LOAM.

The soil of the Huntington silt loam is a light-gray silt loam 12 inches deep, passing quite abruptly into a mottled light-gray and reddish silt loam, which extends to a depth of 24 inches. This material grades into a reddish-yellow clay loam, which passes in turn at about 30 inches into a yellowish-red clay, extending to a depth of 3 feet or more. The slight depressions occurring over the type will

show a slightly darker colored surface soil, owing no doubt to the presence of accumulated organic matter. The soil is cultivated with some difficulty on account of poor drainage, but when handled under proper moisture conditions good tilth is secured.

The Huntington silt loam is found in the second bottom chiefly along the South Fork of the Roanoke River below Shawsville. This bottom is but slightly higher than the first bottom, where the Huntington loam is the soil type.

The topography is comparatively level and drainage is sometimes inadequate. Open ditches or tiled drains would relieve this condition and obviate the chief difficulty in cultivation—excess of moisture.

The Huntington silt loam is no doubt formed from the intermingling of the wash material from the adjacent slopes and the alluvial deposits of the Roanoke River. It is a less recent soil than the Huntington loam, though one of the more recent soils of the area. Its occurrence is not at all extensive. It lies midway between the oldest river terraces and the recent bottom lands immediately along the channel.

The type is productive and yields are, as a rule, good. Corn, wheat, and hay are the principal crops grown, corn yielding from 40 to 60 bushels, wheat from 12 to 20 bushels, and hay from 1 to 2½ tons to the acre. Deeper tillage, with some leguminous crop to be plowed under and proper attention to drainage, would result in increased yields. The type has a value of \$60 to \$75 an acre.

Below are the results of mechanical analyses of samples of soil and subsoil:

Mechanical analyses of Huntington silt loam.

Number.	Description.	Fine. gravel.	Coarse. sand.	Medium. sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17577.....	Soil.....	1.4	4.0	1.4	4.4	7.2	71.4	9.8
17578.....	Subsoil.....	.2	.9	.8	6.2	7.8	48.3	34.9

HUNTINGTON LOAM.

The Huntington loam consists of a brown loam, often approaching a sandy loam, 18 inches deep, underlain to a depth of 36 inches or more by a compact, rather heavy loam. The entire soil section of 3 feet often shows no appreciable change either in color or texture. Occasional areas approximate a sand, and there may also be found small areas containing a percentage of rounded waterworn pebbles and small angular fragments of rock, transported from the adjacent elevations. The soil in general is comparatively easy to work.

The Huntington loam occurs chiefly along the courses of the North and South forks of the Roanoke River at irregular intervals as narrow marginal strips, and there are a few areas along the courses of some of the smaller streams in the eastern part of the county.

There is a very limited development of the alluvial soils in the area as a whole, this type being confined to the very narrow valleys of the Roanoke forks.

The surface of this soil is nearly level, though the slope is seldom insufficient for good drainage. Like most first-bottom lands, it includes an occasional depression, where drainage is sluggish. Open ditches are all that is necessary to drain these areas, as the soil is quite open textured and allows free movement of water.

The Huntington loam is of a rather heterogeneous nature and consists of both alluvial and colluvial material. From the steep slopes flanking the narrow valley on each side, material has been washed to the lower lying land, where it has become mixed with sands, silts, and clays deposited by the streams. The heavier phase of the type is generally found in the depressions, where the surface soil is darker colored.

This type of soil, where carefully cultivated, yields well, corn being the chief crop, producing from 40 to 75 bushels to the acre. Much of the Huntington loam is used for the production of tomatoes and vegetables to supply the local canneries. A high-grade tomato is produced and the various vegetable crops prove satisfactory and give paying returns.

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

Mechanical analyses of Huntington loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17574.....	Soil.....	0.1	1.1	0.9	10.7	21.2	50.3	14.7
17575.....	Subsoil.....	.1	.9	1.8	16.3	25.8	39.9	15.8

TOXAWAY FINE SANDY LOAM.

The Toxaway fine sandy loam, to a depth of 12 inches, is a brown fine sandy loam containing numerous mica flakes and a fair percentage of organic matter. It is underlain to a depth of 36 inches or more by a material of the same character, though slightly heavier in texture and a little lighter in color, generally, passing at about 30 inches into a rather sticky clay loam. The surface soil varies from a rather light to a heavy fine sandy loam, with the sand content chiefly of the finer grades. The color also varies to some extent according to position—the lower depressions having the darker brown color. The heavier phase of the soil occurs in these depressions. The soil is cultivated without difficulty.

The topography is comparatively level to very gently rolling or undulating, and the drainage is generally adequate, the soil being

rather loose textured and porous. Occasional small areas have rather sluggish drainage, necessitating the use of open ditches or tile drains.

The Toxaway fine sandy loam is found at varying intervals along the courses of Little and New rivers as narrow marginal strips, seldom over 100 or 200 yards wide.

The soil is alluvial in origin, having been derived chiefly from material transported by the rivers and deposited during periods of overflow. It is the most recent soil of the area. The presence of material derived from the disintegration of crystalline rocks and schists indicates that at least a part of the soil has been transported from the headwaters of these streams. This feature of the alluvial soils along these streams distinguishes them from the alluvial soils of the other streams of the area, which do not drain regions of crystalline rocks. No doubt a part of this soil is derived from the disintegrated material transported from the surrounding slopes through the action of the surface waters.

The Toxaway fine sandy loam, though limited in extent, is one of the most desirable soils in the county. Practically all of it is under cultivation, with wheat as the chief crop, and good yields are obtained. Occasional areas are used almost exclusively for the production of hay, which yields $1\frac{1}{2}$ to $2\frac{1}{2}$ tons to the acre, and as pasture. Corn yields from 40 to 75 bushels to the acre. This soil will produce good yields of melons and the various quick-maturing vegetables. Tomatoes would no doubt make excellent yields, and they could be produced in commercial quantities.

The type has a value of from \$50 to \$100 an acre, according to location.

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

Mechanical analyses of Toxaway fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17560.....	Soil.....	0.0	0.3	1.4	37.6	18.1	30.2	11.9
17561.....	Subsoil.....	.0	.1	.4	28.5	27.6	31.9	11.6

INDIAN LOAM.

To a depth of from 8 to 10 inches the Indian loam consists of a grayish loam, often approaching a sandy loam and containing very small rock fragments derived from a quartzose sandstone of a grayish color. It is underlain by a yellow to reddish-yellow material of similar texture, grading into a redder and heavier subsoil. At about 30 inches it passes into a reddish sandy clay. The sandstone and quartz fragments are more or less numerous especially on the crests of

the rounded hills and ridges. These fragments are often sufficiently abundant to make the type a stony loam, but such areas are not large enough to warrant separation. The subsoil has something of a greasy, slick feel, due to its derivation from the underlying micaceous material.

The Indian loam occurs as a single small area in the extreme south-western section of the county, adjacent to Little River. It has a hilly to rolling topography and drainage is excellent. The area is somewhat eroded.

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

Mechanical analyses of Indian loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17558.....	Soil.....	0.9	6.8	6.6	32.5	7.7	38.2	7.7
17559.....	Subsoil.....	.6	3.9	5.7	19.9	10.6	18.1	41.9

HOLSTON SILT LOAM.

The Holston silt loam, to a depth of about 10 inches, is a gray to yellowish-gray silt loam. The subsoil to a depth of 36 inches or more is a yellowish to reddish-yellow clay loam, passing into a clay of the same color. The surface carries a few rounded cobbles of sandstone and the entire section is quite silty. It occurs in two small areas near Shawsville, along the course of the Roanoke River, occupying adjacent elevations. The type is not extensively developed and is of very little agricultural importance.

The material is chiefly residual, having been derived from the underlying sandstone and shaly formations. The presence of a few rounded cobbles would indicate that it was remotely influenced to some extent by river action. It is a soil more or less easily cultivated. A part of the type is utilized as pasture for sheep and cattle. The cultivated areas are used for the general farm crops with fair to good yields.

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

Mechanical analyses of Holston silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17579.....	Soil.....	2.0	4.2	2.6	6.4	7.6	59.0	17.3
17580.....	Subsoil.....	.9	3.2	1.3	3.8	5.0	40.8	44.4

MEADOW.

The Meadow includes areas of sandy loam, stony loam, and clay occurring at irregular intervals as narrow marginal strips along the courses of some of the smaller streams. It is always low-lying and represents the wash from surrounding elevations during seasons of excessive rainfall. Much of it is subject to overflow. The kind of soil in the immediate vicinity largely determines the character of the materials laid down along the stream courses in the Meadow areas, though there is a mixture of material brought down by the streams from their sources.

Some of the Meadow is under cultivation and is very productive, though a great part of it is of little agricultural value. Where not too stony it is one of the best soils of the area for corn and hay, corn yielding from 40 to 75 bushels and hay from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons to the acre. The area of Meadow is limited. The valleys are narrow and afford little opportunity for the accumulation of transported soil. The Meadow has a value ranging from \$5 to \$75 an acre.

PARIS LOAM.

The Paris loam consists of 10 inches of a dark brownish to very dark gray loam, with occasional spots almost black. There is generally an accumulation of organic matter in the soil, which no doubt accounts for much of the dark color, and numerous huge boulders outcrop at irregular intervals. The subsoil is brownish to reddish-brown clay loam passing at about 20 inches into a heavy reddish to reddish-brown clay. The soil is more or less easily cultivated and very productive.

It is found on the crests of Paris and Fort Lewis mountains, where a rather level table-land affords limited areas for cultivation. The depressions and coves which extend down the slopes present the darkest phase of the soil. The drainage is good.

While this soil is very productive it has a low value, owing to its inaccessible position. Corn, the chief crop, will yield from 40 to 65 bushels to the acre. Other crops adapted to the region do well.

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

Mechanical analyses of Paris loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
17570.....	Soil.....	1.2	8.1	4.5	21.5	14.0	34.5	16.0
17571.....	Subsoil.....	2.5	7.6	4.6	21.2	11.4	22.3	30.5

CUMBERLAND CLAY LOAM.

The soil of the Cumberland clay loam, to a depth of 8 to 12 inches, is a brownish to grayish-brown clay loam, carrying some of the finer textured sand and a low percentage of rounded waterworn cobbles. The subsoil is a reddish-brown to reddish heavy clay loam to clay which extends to a depth of 36 inches or more. The type is cultivated with some difficulty on account of the heavy nature of the soil, but when properly handled it responds readily in good yields.

It is found in a single area just to the east of Shawsville between the high uplands and the first river bottoms. In this position it represents wash from the limestone hills and, no doubt, some material laid down at an earlier period by the streams. The former unquestionably affects the color of the soil, which is more pronounced in areas immediately adjoining the limestone formation. The topography is gently rolling and the drainage is good.

Most of the Cumberland clay loam is utilized as pasture, though small parts of it are cultivated in the general farm crops, chiefly corn. The yields are invariably good.

SUMMARY.

Montgomery County comprises an area of 251,776 acres, or about 393 square miles, and is situated in southwest Virginia in the second tier of counties from the West Virginia line, within what is known as the "Valley of Southwest Virginia." The northern and eastern parts of the county are mountainous and rough. The southern part is a rolling valley and meets the dissected upland known as the Floyd-Carroll-Grayson plateau near the southern boundary. A drainage divide crosses the center of the county from north to south, forming two drainage systems, one toward the west, the other toward the east. The western system comprises Little and New rivers and their tributaries, whose waters ultimately reach the Gulf of Mexico. The eastern system includes the North and South forks of the Roanoke River flowing toward the Atlantic.

Christiansburg, a town of about 1,000 inhabitants, near the center of the county, is the county seat. The Norfolk and Western Railroad, dividing the county into nearly equal parts, furnishes the transportation facilities. Montgomery County has a fairly well distributed population of 16,000, of which number 3,000 are colored. Thirty or forty miles of the roads are macadamized, and all the turnpike roads are fairly good.

Brickkilns, limekilns, and canning factories are successfully conducted in various sections of the county, and lumbering and coal mining are carried on to some extent.

The winters are mild and the summer temperature is about 72° F. The growing season is six months long, and rainfall is well distributed throughout.

Tobacco, once the important crop, is not grown extensively at present. The chief crops are corn, wheat, oats, clover, and grasses. Tomatoes and beans are grown to supply the local canneries. Sheep and cattle raising is a very important industry, and can be considerably developed.

The rolling valley lands and bottom lands along the larger streams mark the more progressive farming sections. Although manure is used to some extent, the supply is inadequate and commercial fertilizers are used to a great extent, especially for grain, tobacco, and vegetables.

The bulk of the labor is negro, and is efficient. The day wage is \$1 to \$1.50. The farms are either operated by the owners or by share tenants, the share system predominating.

The agricultural methods include some sort of rotation, the most noticeable one being the seeding of grass with wheat, and allowing the grass to grow for a year or two for hay or for grazing.

Increased yields could be obtained on the soils of the county by deeper plowing and by following a crop rotation, including a leguminous crop to be plowed under. The addition of organic matter in this way, together with applications of barnyard manure, would greatly increase the productiveness of the soils.

The soils of Montgomery County are chiefly derived from limestones, sandstones, shales, and mica and talcose schists, giving rise to the Hagerstown, Dekalb, and other series, and several miscellaneous types.

The Hagerstown stony loam includes all areas of limestone material having a high stone content. On the higher elevations it is rough and broken and is used for grazing cattle. The more level parts are either cultivated or used as pasture. Where cultivation is feasible, good yields of corn and wheat are obtained. The value of the Hagerstown stony loam varies from \$10 to \$50 an acre.

The Hagerstown loam is easily cultivated and improved and is considered a good general farming soil. Its topography is gently rolling, and its drainage is excellent. Corn, wheat, and grass are the principal crops, corn yielding 30 to 60 bushels, wheat from 15 to 25 bushels, and hay from 1 to 2½ tons an acre. The soil should be used more for apple growing. Tomatoes and beans do well and are grown for the local canneries. Many of the hills are now used for grazing sheep and cattle. The type has a value ranging from \$30 to \$100 an acre.

The Hagerstown silt loam is one of the strongest and most desirable soils of the county for general farming, fruit growing, and grazing. Corn produces from 35 to 60 bushels, wheat 15 to 30 bushels, and hay 1 to 3 tons to the acre. Tomatoes also do well on this soil. Its value varies from \$75 to \$100 an acre.

The Hagerstown clay loam, like the other Hagerstown soils, is derived from limestone. It is a good general farming soil and has

excellent drainage. Careful tillage to prevent washing, together with the application of barnyard manure and the planting of leguminous crops to be plowed under, would prove beneficial.

The Decatur clay loam is a strong soil, derived from the limestone. It is easily handled and gives a good tilth. Corn yields from 40 to 60 bushels, wheat 15 to 25 bushels, and hay 1 to 2½ tons to the acre. The average value of the type is \$60.

The Dekalb stony loam is derived from sandstone and conglomerate. Only the more level areas are cultivated; the steeper parts are devoted to sheep and cattle grazing. Some chestnut and chestnut oak of moderate growth is found on the type. Where cultivated, fair yields of corn, wheat, buckwheat, and vegetables are obtained. The soil could be profitably devoted to the production of apples.

The Dekalb fine sandy loam occupies the gently rolling slopes of the valleys. It is covered for the most part with chestnut oak and pine, and little of it is under cultivation. Where cultivated, corn yields 12 to 20 bushels and wheat 5 to 12 bushels to the acre. The southern slopes are better adapted to fruit and vegetables than to general farm crops.

The Dekalb silt loam has a rolling to hilly topography. The rougher areas are used for pasture, but, where cultivated, corn yields 20 to 35 bushels, wheat 12 to 20 bushels, and hay 1 to 2 tons to the acre.

The Pilot gravelly loam is derived from crystalline rock of Archean age. The uncleared parts support a fair growth of hardwood and pine. On account of the large quantity of gravel and stone, cultivation is difficult, but, where cultivated, fair yields are obtained. It has a value of \$10 to \$35 an acre.

The Pilot loam has a hilly to gently rolling topography. Corn yields 30 to 50 bushels and wheat 10 to 20 bushels to the acre. Oats and grasses are grown for forage. Its value ranges from \$10 to \$50 an acre.

The Upshur silt loam is derived from the weathering of the red sandstones and shales of Paleozoic age. It occupies the well-rounded hills and ridges. The native timber is scrubby hardwood and some pine. Where cultivated, fair yields of wheat, corn, and hay are obtained. The type is of small extent and of little agricultural importance.

The Cumberland gravelly loam is of limited extent. The better areas are devoted to corn, wheat, oats, and grasses, and the returns are good.

The Cumberland loam, like the Cumberland gravelly loam, is made up of material laid down by rivers during a very remote period. Its topography is gently rolling to hilly, and it has excellent drainage. Corn, wheat, and vegetables are grown on this type, as well as grass for hay and pasture. It is valued at \$10 to \$100 an acre.

The Radford loam represents a mingling of alluvial, colluvial, and residual material, and occurs as a second-bottom soil. Corn yields from 40 to 75 bushels an acre. Some of the type is used for growing hay and as pasture. Its value ranges from \$25 to \$100 an acre.

The Huntington silt loam is a little higher in position than the first bottom, where the Huntington loam is found. It is very productive, corn yielding from 40 to 60 bushels, wheat 12 to 20 bushels, and hay 1 to 2½ tons to the acre. It has a value of \$60 to \$75 an acre. The drainage of the type could be improved by open ditches and tile drains.

The Huntington loam is of very limited extent. Much of the type is used for growing tomatoes, and the yields are good. Corn is the chief crop and yields from 40 to 75 bushels per acre.

The Toxaway fine sandy loam is alluvial in origin. Its topography is level to gently rolling, and drainage is good. Although of very limited extent, it is a desirable soil, and is practically all under cultivation. Corn yields 40 to 75 bushels and hay 1½ to 2½ tons to the acre. It is valued at \$50 to \$100 an acre.

The Indian loam, Holston silt loam, and Meadow are of relatively small extent. The latter, where cultivation is practicable, gives good yields. Corn produces 40 to 75 bushels and hay 1½ to 2½ tons to the acre.

The Paris loam, although very productive, has a low value owing to its inaccessible position. Corn, the chief crop, yields from 40 to 65 bushels per acre.

The Cumberland clay loam is found in a single area just east of Shawsville. Its topography is gently rolling and its drainage is good. It is chiefly used for pasture, although where cultivated the general farm crops give good returns.

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