

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

SOIL SURVEY OF GRANT AND MINERAL
COUNTIES, WEST VIRGINIA

BY

S. W. PHILLIPS

[Advance Sheets—Field Operations of the Bureau of Soils, 1922]



WASHINGTON
GOVERNMENT PRINTING OFFICE
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[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

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

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SOIL SURVEY OF GRANT AND MINERAL COUNTIES. WEST VIRGINIA

By S. W. Phillips

DESCRIPTION OF THE AREA

Grant and Mineral Counties area lies in the eastern part of West Virginia, and is generally considered a part of the Eastern Panhandle. The North Branch of the Potomac River forms the north-western and northern boundary, separating the area from Garrett and Allegany Counties, Md.

The area is very irregular in outline, being about 60 miles long and varying from about 9 to 22 miles in width. It comprises, according to planimeter measurements, 808 square miles, or 517,120 acres, Grant County consisting of 478 square miles and Mineral County of 330 square miles.

The area lies in the Appalachian Mountain region, and its topography varies from rolling to mountainous. The western part of the area consists of the high rolling to hilly Allegheny Plateau, with the abrupt escarpment or Allegheny Front and Fore Knobs on its eastern side.

East of the Allegheny Front a succession of parallel mountains and narrow valleys extends in a southwest direction across the area from Ridgeley to the Pendleton County line. The most prominent of these mountain ridges is New Creek Mountain, with its southern extension called North Fork Mountain. Walker Ridge and Knobly Mountain parallel it on each side, with narrow V-shaped, deep limestone valleys between. East of this series of mountains lies a broad shale valley, 4 to 8 miles wide, called The Ridges, being locally subdivided by lesser ridges or hills, extending to Patterson Creek Mountain, which marks the eastern boundary line of the area. In the southeastern part of Grant County Cave Mountain and South Fork Mountain, with Middle Mountain subdividing the shale valley between, are the prominent physiographic features. Patterson Creek Ridge and Horseshoe Mountain are the most prominent ridges in the north-eastern part of Mineral County.

The Allegheny Plateau section is characterized by hilly to rolling topography, but near the principal streams and along the North Branch Potomac River the slopes are steep and in places precipitous. In the vicinity of Elk Garden, Hartmansville, and Mount Storm the topography is fairly smooth or rolling.

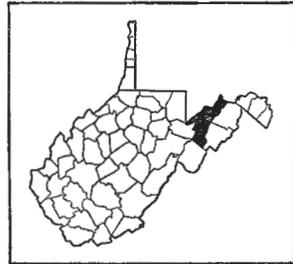


FIG. 30.—Sketch map showing location of the Grant and Mineral Counties area, West Virginia

The crest of the Alleghenies, or what is called the Allegheny Front, is a rough, rocky escarpment, 3,000 to 4,000 feet in elevation, running across the area in a northeast-southwest direction parallel to the general line of outcrop of the rocks in this part of the State. Its east face is abrupt near the top, but gradually becomes less steep as it descends to the Fore Knobs, which are a series of sharp knobs east of the main Allegheny Front but joined to it by narrow ridges. These knobs, which attain elevations of 2,200 to 2,800 feet, are upheld by hard sandstone formations and have narrow V-shaped valleys or gaps between them. The Allegheny Front, which in Maryland is called Dans Mountain, is cut through by the deep gap of the North Branch Potomac River west of Keyser.

The lower slopes of the Allegheny Front are less steep than the upper, and at the foot the shales outcrop and produce slopes that are smoother and more rounded. The shale valley between the Allegheny Front and the New Creek-Walker Ridge chain is hilly, with some terraces along New Creek in its northern part.

Walker Ridge and Knobly Mountain constitute a series of sharp knobs or peaks that bear a somewhat similar relation to the main New Creek Mountain as the Fore Knobs bear to the Allegheny Front. These parallel ridges and mountains, which are in reality the extensions of North Fork Mountain, are cut through by deep, precipitous gorges at four places—by North Fork Gap, west of Petersburg, Kline Gap, near Streby, Mays and Cosner Gaps, west of Maysville, and the Greenland Gap, west of Falls. Between New Creek Mountain and these parallel ridges occur narrow, steep-sided limestone valleys. Most of New Creek Mountain and practically all of North Fork Mountain consist of rough, rocky mountain crests and slopes, high cliffs and huge boulders. Knobly Mountain is a series of steep-sided knobs and ridges held up by hard sandstone and cherty limestone formations, with limestone valleys between. Overlooking the North Branch Potomac River it has in many places very precipitous slopes and cliffs.

Cave Mountain has a precipitous, rocky slope on its west face overlooking the South Branch Potomac River, but its east slope is less steep. Patterson Creek Mountain has steep to precipitous sides and narrow crests. Numerous gaps serve as outlets for the small streams.

Through the broad shale valley or trough called The Ridges the topography is rolling to hilly, but locally the shales have been deeply cut by the streams, which have left steep banks. In the limestone valleys there are numerous sinks that catch the drainage water and deliver it to underground channels.

The bottom lands are wide in the bends of the North Branch Potomac River below Keyser, in the vicinity of Petersburg on the South Branch, and along Patterson Creek down as far as Alaska. Elsewhere they are narrow. (Pl. XXII, fig. 1.) Terraces of old alluvial deposits are developed well above the elevation of the North Branch Potomac at Keyser and east of Dixie, at Petersburg on the South Branch, and in scattered areas along Patterson Creek, Lunice Creek, and Mill Creek (Grant County) and its tributaries.

There is a wide range in elevation in the area. It is about 550 feet above sea level in the northeast corner, where the North

Branch Potomac River passes out of Mineral County, and the maximum is about 4,150 feet on the west boundary line between Grant and Tucker Counties at the head of Stony River. The Allegheny Plateau has a general elevation of about 3,000 feet, and the town of Keyser, at its foot, lies 809 feet above the sea. The Ridges have a general elevation of about 1,000 to 1,200 feet, and Petersburg at the south of this section lies 937 feet above sea level. The general slope is to the northeast, following the dip of the rock formations.

Practically all of the area is drained into the North Branch Potomac River. Abram Creek and Stony River are the principal tributary streams which drain the Allegheny Mountain section. New Creek, Patterson Creek, and Dans Run drain the northern, central, and eastern parts of the area, and North Fork, Jordan Run, South Branch Potomac River, Lunice Creek, Robinson Run, and North Mill and South Mill Creeks drain the southern part. Branches ramify to all parts of the area, so that every farm is connected with one or more of these branches, and the area as a whole is well drained, with the exception of a few places in the wider stream bottoms.

Springs are numerous, particularly in the limestone valleys, where they are fed by the underground watercourses which come out of the limestone sections, and the area is well supplied with water for stock. A number of farmers have installed running water in their homes by piping the water from springs issuing from the local mountain side at higher elevations, and several hydraulic rams are in operation to lift the water from springs at elevations lower than the farmhouses.

The North Branch Potomac River from its headwaters near Henry to the junction with Savage River, a distance of about 30 miles, drops from about 2,700 feet to about 1,000 feet above sea level. The current is swift over the boulder-strewn stream bed, and rapids are numerous. Below Piedmont the river widens out, and the fall is much more gradual. The valleys of the North Branch Potomac River and New Creek at Keyser are more than 2,000 feet lower than the Allegheny Plateau and about 600 feet below the crest of New Creek and Knobly Mountains. The North Fork near Hopeville is about 2,000 feet below the crest of North Fork Mountain. In general the streams have narrow, V-shaped valleys and swift currents and are still actively cutting down their valleys. In The Ridges the stream valleys are 100 to 200 feet below the general level of the neighboring uplands. Here the valleys are also V-shaped, but the currents are less rapid than in other parts of the area, and Patterson Creek has locally reached temporary base level.

Some of the swift-flowing mountain streams and those fed by large springs have sufficient fall and volume to develop water power. Near Masonville, at Williamsport, Laurel Dale, Petersburg, and other places, power sufficient to operate gristmills, flour mills, and saws is developed from the local streams. At Antioch a woolen mill is operated by water power. Formerly more small mills were operated by water power than at present. Power for electric light for Petersburg is developed from the South Branch Potomac River. A number of smaller streams could be easily harnessed to produce

power and light for the near-by farms. A large storage reservoir is maintained at the head of Stony River to maintain a regular supply of water for the pulp mill at Luke, in Allegany County, Md. This river offers opportunity for more water-power development.

Early settlers followed the valleys of the North Branch and South Branch of the Potomac River and of the tributary streams and cleared and opened up the bottoms and terraces, as they were best adapted to farming because of their smooth topography and fertile soils. Later the adjacent uplands were cleared and put into fields. Settlers from Virginia, Pennsylvania, and Maryland, pushing westward in search of new homes, better opportunities, and cheap farm lands, were the first to come into this region. The rural population is largely descended from the early settlers, but the towns and villages, particularly in the coal-mining sections, have drawn their population in part from other near-by States. Trading posts established along the North Branch Potomac River supplied the counties to the west with merchandise.

Mineral County was formed in 1866 from a part of Hampshire County, and Grant County in the same year from a part of Hardy County.

In 1920, according to the census, Mineral County had a population of 19,849, of which 55.5 per cent was classed as rural, and Grant County had 8,993, all classed as rural. The stream valleys are most densely populated, while throughout the rough mountainous sections and in many parts of The Ridges the settlements are widely scattered and the population is sparse.

Keyser, the county seat of Mineral County, with a population of 6,003, is the largest town in the area. It is an important local distributing and shipping point for farm products and fruit, as it is touched by both the Baltimore & Ohio and Western Maryland Railroads. The Baltimore & Ohio Railroad shops are located there. Piedmont, the next largest town, with a population of 2,835 in 1920, is an industrial and coal-mining center. Ridgeley, just across the river from Cumberland, has a population of 410. The Western Maryland Railway shops are located there. Important mining towns include Elk Garden, Franklin, Barnum, Blaine, Potomac Manor, Oakmont, Emoryville, and Gleason. The principal trading points through the farming section are Burlington, Patterson Creek, Alaska, Antioch, and New Creek.

Petersburg has a population of about 500 and is the county seat and the principal trading and shipping point in that section of Grant County east of the Allegheny Front. It is the southern terminus of a branch of the Baltimore & Ohio Railroad. A tannery located there affords a market for bark and hides brought in from the surrounding section. Bayard, a mining town in the western part of the county, on the Western Maryland Railway, is the largest town in the county. Henry and Gormanian are mining towns near Bayard. A tannery is situated at Gormanian. Other local trading points are Mount Storm, Maysville, and Williamsport.

The main line of the Baltimore & Ohio Railroad from New York to Cincinnati and St. Louis runs along the northern border of Mineral County, the track being within the county or just across the North Branch Potomac River in Maryland. This railroad makes

connections at Cumberland with the Baltimore & Ohio and Pennsylvania Railroads to Pittsburgh and Chicago. It is a double-track road and affords ample shipping facilities to this part of the area. A freight short cut has been tunneled from McKenzie, through Knobly Mountain to Patterson Creek, where it again joins the main line. The Petersburg branch of the Baltimore & Ohio operates between Green Springs in Hampshire County, and Petersburg, and is the only railroad in the valley of the South Branch. The Western Maryland Railway, which operates from Cumberland along the North Branch Potomac River parallel to the Baltimore & Ohio Railroad, touches the county in several places, and from Hampshire to Fairfax the tracks are mainly within the area. It is an important coal-carrying railroad, with its western terminus at Elkins, W. Va. A short branch from Harrison affords passenger and freight service to Oakmont, Emoryville, and Elk Garden.

The public roads throughout the area are fairly good. In the ridges the roads are excellent during dry weather, but for the most part are not kept in repair. An abundance of good road material is available in the beds of shale, and with some grading and attention these roads could easily be maintained in good condition. Over the mountains the roads are generally rather rough but usually passable. The main roads in the valleys are generally kept in good condition. A concrete road has been constructed from Keyser to Piedmont, where it connects with the good-road system of Maryland. An oil-bound macadam road has been constructed up New Creek to Laurel Dale. The State highway department has a comprehensive system of main roads planned, and some of these are now under construction. The Northwestern Turnpike crosses the area from Gorman to Burlington. Local telephone lines afford means of communication in the valleys and in some of the mountain sections. Rural free delivery routes are established over most of the area.

Keyser, Piedmont, Petersburg, Ridgeley, and Cumberland in Maryland, and the mining towns along the North Branch Potomac River are the most important local markets for farm products. Washington, Pittsburgh, and Baltimore are the principal outside markets.

CLIMATE

Owing to the wide range in elevation there is considerable difference in the climate of different parts of the area included in the present survey. In the Allegheny Plateau the summers are normally cool and short and the winters cold and prolonged; in the valleys to the east the summers are warm, with hot spells of short duration and cool nights, and the winters are much less rigorous than in the Alleghenies.

According to the Weather Bureau records the mean temperature is higher every month during the year in the valleys, varying from 2.7° to 5.2° higher, with a yearly average of 4.2° higher than on the mountains. There is a difference of 10° in the highest temperatures recorded at the two stations and only 3° between the coldest days. July is the hottest month and February the coldest at both stations.

The average rainfall of 48.69 inches in the Alleghenies is 36 per cent greater than in the lower sections to the east. The rainfall is

well distributed through the year, being greatest during the summer when needed by the growing crops and pastures and lightest in the fall. The average snowfall is twice as heavy in the mountains as in the valleys. The heaviest snowfall is during February.

The average growing season for tender vegetation in the valleys is about five months long and is a month shorter at Bayard. Some parts of the plateau are said to have frosts nearly every month of the year. During the progress of this survey a frost was reported in that section on August 20, which did some damage to corn. Killing frosts have been recorded at Burlington as late as June 11 and as early as September 11, and at Bayard on June 17 and September 7.

The prevailing winds are from the west during most of the year.

The following tables of climatic data are compiled from the records of the Weather Bureau stations at Bayard in the mountains and at Burlington in the Patterson Creek Valley, situated at elevations of 2,700 and 875 feet, respectively.

Normal monthly, seasonal, and annual temperature and precipitation at Bayard

[Elevation, 2,700 feet]

| Month | Temperature | | | Precipitation | | | |
|----------------|-------------|------------------|------------------|---------------|---|--|---------------------|
| | Mean | Absolute maximum | Absolute minimum | Mean | Total amount for the driest year (1904) | Total amount for the wettest year (1907) | Snow, average depth |
| | °F. | °F. | F. | Inches | Inches | Inches | Inches |
| December..... | 28.5 | 65 | -18 | 3.90 | 3.95 | 4.11 | 15.0 |
| January..... | 28.0 | 72 | -30 | 5.20 | 3.25 | 9.42 | 16.7 |
| February..... | 27.4 | 66 | -23 | 3.39 | 2.74 | 4.17 | 17.6 |
| Winter..... | 28.0 | 72 | -30 | 12.49 | 9.94 | 17.70 | 49.3 |
| March..... | 37.7 | 80 | -13 | 4.38 | 4.04 | 6.45 | 12.5 |
| April..... | 49.7 | 83 | 8 | 3.85 | 3.18 | 3.60 | 7.3 |
| May..... | 56.8 | 90 | 19 | 4.22 | 3.80 | 4.42 | .2 |
| Spring..... | 47.1 | 90 | -13 | 12.45 | 11.02 | 14.47 | 20.0 |
| June..... | 63.3 | 93 | 29 | 4.60 | 4.84 | 7.11 | T. |
| July..... | 67.6 | 95 | 36 | 4.94 | 4.17 | 7.55 | .0 |
| August..... | 68.0 | 93 | 32 | 4.61 | 1.71 | 4.60 | .0 |
| Summer..... | 65.6 | 95 | 29 | 14.45 | 10.72 | 19.26 | T. |
| September..... | 60.0 | 90 | 23 | 3.42 | 1.77 | 4.75 | .0 |
| October..... | 48.8 | 84 | 12 | 3.42 | 2.35 | 3.82 | 1.8 |
| November..... | 38.2 | 74 | 2 | 2.46 | .88 | 4.82 | 5.1 |
| Fall..... | 49.0 | 90 | 2 | 9.30 | 5.00 | 13.39 | 6.9 |
| Year..... | 47.4 | 95 | -30 | 48.69 | 36.68 | 64.82 | 76.2 |

Normal monthly, seasonal, and annual temperature and precipitation at Burlington

[Elevation, 875 feet]

| Month | Temperature | | | Precipitation | | | |
|----------------|-------------|------------------|------------------|---------------|---|--|---------------------|
| | Mean | Absolute maximum | Absolute minimum | Mean | Total amount for the driest year (1904) | Total amount for the wettest year (1905) | Snow, average depth |
| | ° F. | ° F. | ° F. | Inches | Inches | Inches | Inches |
| December..... | 32.2 | 72 | -16 | 2.80 | 2.68 | 3.75 | 6.4 |
| January..... | 30.7 | 72 | -27 | 2.65 | 2.40 | 2.45 | 9.6 |
| February..... | 30.3 | 75 | -18 | 2.39 | 1.95 | .90 | 10.8 |
| Winter..... | 31.1 | 75 | -27 | 7.64 | 7.03 | 7.10 | 26.8 |
| March..... | 41.2 | 88 | -5 | 3.06 | 2.03 | 3.90 | 7.6 |
| April..... | 50.6 | 93 | 13 | 2.83 | 1.45 | 1.83 | 2.4 |
| May..... | 61.5 | 94 | 26 | 3.69 | 3.41 | 4.54 | T. |
| Spring..... | 51.1 | 94 | -5 | 9.58 | 6.89 | 10.27 | 10.0 |
| June..... | 68.3 | 98 | 33 | 3.97 | 2.21 | 4.68 | .0 |
| July..... | 72.6 | 99 | 40 | 3.69 | 3.70 | 10.64 | .0 |
| August..... | 71.2 | 105 | 38 | 3.80 | 2.22 | 5.10 | .0 |
| Summer..... | 70.7 | 105 | 33 | 11.46 | 8.13 | 20.42 | .0 |
| September..... | 64.2 | 100 | 28 | 2.99 | 2.35 | 1.95 | .0 |
| October..... | 53.9 | 89 | 18 | 2.27 | 1.44 | 3.65 | T. |
| November..... | 42.1 | 77 | 0 | 1.76 | .68 | 1.10 | 1.3 |
| Fall..... | 53.4 | 100 | 0 | 7.02 | 4.47 | 6.70 | 1.3 |
| Year..... | 51.6 | 105 | -27 | 35.70 | 26.52 | 44.49 | 38.1 |

AGRICULTURE

Agriculture was the chief pursuit of the early settlers in Mineral and Grant Counties. Travel was difficult and transportation facilities were meager, so that the settlers were by necessity compelled to be practically self-sustaining and independent. Corn, wheat, and rye were the principal crops, and a few cattle and sheep were raised for milk, wool, and meat. Hunting, fishing, and trapping helped to supply the home with food and gave the furs and skins that could be traded for the few supplies not produced at home. Potatoes, garden vegetables, and small quantities of tobacco were grown. The clothing was made from home-grown wool, carded and woven into cloth at home. The bottom lands were generally devoted to grain and hay production, and the adjacent slopes were cleared and used for grazing. The land has always been farmed for the most part in small tracts by the owners. Prior to the Civil War only a small number of slaves were owned in the area, so that the freeing of the slaves did not affect the agriculture to any great extent.

The river and creek bottoms, cleared by the pioneers, and the smoother uplands, which were early brought into cultivation, continue to be farmed and constitute the most fertile soils in the area, but some of the steeper slopes and more broken hilly sections which were cleared later have been found too steep for profitable cultivation and are now devoted to grazing or allowed to revert to forest. Some of the inhabitants who lived in the most remote sections of the mountains and small valleys have abandoned their farms and moved to the villages.

The application of fertilizers has become a general practice within the last 20 years. Lime is just coming into general use, although its value has long been known, and some of the early farmers made a practice of burning a kiln of limestone each year for their own use. Since 1880 the acreage of corn and wheat has decreased, while the acreage in hay and potatoes has increased. The apple and peach orchards have increased, particularly in Mineral County, where the orchard area has almost tripled since 1889. The growing of vegetables near the larger towns in the area has been greatly extended in the last 10 years, likewise the production of dairy products, poultry, eggs, and wool. At the present time the agriculture of the larger part of the area is of the general type, including the production of grain, some vegetables and fruit, and livestock.

The acreage and production of the principal field crops in 1919, as reported by the census, are given in the following table:

Acreage and production of principal field crops in 1919

| Crops | Mineral County | | Grant County | | Total | |
|---------------------------------------|----------------|----------------|--------------|----------------|--------------|----------------|
| | <i>Acres</i> | <i>Bushels</i> | <i>Acres</i> | <i>Bushels</i> | <i>Acres</i> | <i>Bushels</i> |
| Corn..... | 5, 122 | 145, 702 | 6, 215 | 169, 111 | 11, 337 | 314, 813 |
| Wheat..... | 3, 263 | 44, 939 | 4, 323 | 54, 101 | 7, 616 | 99, 040 |
| Oats..... | 2, 184 | 40, 552 | 2, 318 | 40, 097 | 4, 502 | 80, 649 |
| Rye..... | 625 | 6, 146 | 1, 313 | 11, 220 | 1, 938 | 17, 366 |
| Buckwheat..... | 517 | 6, 398 | 167 | 2, 101 | 684 | 8, 499 |
| Potatoes..... | 465 | 45, 759 | 455 | 35, 470 | 920 | 81, 229 |
| | | <i>Tons</i> | | <i>Tons</i> | | <i>Tons</i> |
| Hay (tame)..... | 9, 400 | 9, 925 | 9, 801 | 8, 705 | 19, 201 | 18, 630 |
| Other forage crops ¹ | 1, 665 | 3, 745 | 3, 683 | 10, 083 | 5, 348 | 13, 828 |

¹ Includes wild grasses cut for hay.

Hay and forage occupy the largest acreage of any crop in the area and almost as much as all other field crops combined. Practically all of it is consumed on the farm or sold locally. The hay and forage acreage as reported for 1919 included 4,204 acres of timothy, 508 acres of clover, 9,085 acres of mixed timothy and clover, 525 acres of alfalfa, 4,879 acres of other tame grasses, consisting chiefly of redtop or a mixture of clover and redtop, 332 acres of annual legumes, consisting principally of soy beans cut for hay, and 5,348 acres of wild grasses, grains cut green, and coarse forage. The growing of soy beans, particularly in the shale section, for soil improvement as well as for hay, is being rapidly taken up by the farmers, and the present acreage is probably double that reported for 1919. Redtop is grown extensively on The Ridges and in the Allegheny Plateau section.

Corn is the principal grain crop in the area, except in the high Allegheny Plateau section, where the short season prevents its maturing. Most of the corn is used to feed the work stock and to fatten hogs and cattle for market. Wheat, oats, and buckwheat are important crops through The Ridges, as well as the Allegheny Plateau, where these are the principal grain crops. Wheat is an important money crop. Potatoes are grown largely for home use and local markets. In the vicinities of Keyser, Petersburg, and

Ridgeley vegetables and truck crops are grown for sale in these towns and near-by Maryland towns.

Fruit growing has become one of the leading interests in certain sections of the area. Both apples and peaches are produced.

The adaptation of this section to fruit production was early appreciated and by 1889 there were 27,397 apple and 8,265 peach trees in Mineral County and 26,241 apple and 9,038 peach trees in Grant County. The number of trees, particularly peach, increased greatly, and in 1909 the number reported was 39,694 apple and 125,621 peach trees in Mineral and 37,279 apple and 17,896 peach trees in Grant County. Since that time the number of apple trees has increased to 101,645 in Mineral but has decreased to 36,231 in Grant, whereas the opposite is true in the case of peaches, the figures for 1919 being 119,372 and 41,643, respectively. These are trees of bearing age in each case. There were in Mineral County in 1919 nonbearing apple trees to the number of 43,163 and nonbearing peach trees to the number of 27,741. The numbers for Grant County were 6,312 and 4,945, respectively. The production in the two counties in 1919 was apples 76,538 and peaches 57,947 bushels.

Fruit growing is now the leading industry upon the chert and shale lands, and large orchards are established on Knobly Mountain and New Creek Mountain from the vicinity of Keyser to Ridgeley, on Patterson Creek Mountain near Williamsport and Petersburg, and on the east slopes of the Allegheny Front near Keyser. The principal varieties of apples grown are the York Imperial, Ben Davis, Grimes Golden, Winesap, Gano, Delicious, Rome Beauty, and Mother. The principal varieties of peaches are Elberta, Smock, Salwey, and Belle (Belle of Georgia). The peaches are generally set out as fillers in young apple orchards and are removed after their period of maximum bearing is passed and the apples begin to bear. The life of the peach trees ordinarily is short, although there are some trees that have been producing for 12 to 15 years and are still thrifty and bearing. Most of the fruit is shipped from Keyser and handled by a cooperative association which grades, packs, and markets the crop, or from Petersburg. Most of the fruit goes to other parts of West Virginia, Pittsburgh, and Cincinnati.

Pears, plums, cherries, and grapes are grown in many home orchards, but commercially only in a small way. Some strawberries and raspberries are grown for sale, mainly in local markets. Raspberries, blackberries, and huckleberries grow wild in abundance in the hilly and mountainous sections of the area.

Chestnut orchards are maintained by several farmers, the nuts being sold for local consumption or for shipment to eastern cities. Maple sugar and sirup production is important in some places along the face and top of the Allegheny Front, the output reaching several thousand pounds of sugar annually.

Cattle raising is an important pursuit, particularly in the limestone valleys and on the Allegheny Plateau. A few hogs are kept on every farm to supply meat for home needs. Sheep are kept on many of the hill farms, and the sale of wool is an important source of income. Most of the cattle are grades, with some well-bred Angus, Hereford, and Shorthorn. The usual custom among stock-

men is to buy cattle from the smaller farms of the area or near-by counties, pasture and feed them for a few months, and then ship to the Baltimore market. Farm horses are raised in the area in numbers sufficient for local needs. Dairying is carried on to some extent by farmers near the larger towns, which absorb practically all the products. Poultry and eggs are produced, usually as a side line, in connection with fruit or general crops, and are becoming an important source of income. Trucking is carried on to some extent near Keyser and Ridgeley, the produce finding ready sale in these places, in Piedmont, and in Cumberland.

The following table gives the value of all agricultural products of the area, as reported by the 1920 census:

Value of all agricultural products, by classes, in 1919

| | Mineral County | Grant County | | Mineral County | Grant County |
|--|-------------------|-----------------|--|-----------------------------------|-----------------------------------|
| Cereals..... | \$417, 316 | \$480, 763 | Livestock sold and slaugh- tered..... Poultry and eggs..... Wool..... | 1 246, 143 136, 263 18, 840 | 1 578, 780 160, 306 35, 163 |
| Other grains and seeds..... | 6, 079 | 8, 351 | | | |
| Hay and forage..... | 328, 932 | 350, 349 | | | |
| Vegetables..... | 212, 461 | 165, 835 | | | |
| Fruits and nuts..... | 213, 084 | 91, 808 | | | |
| All other crops..... | 3, 779 | 19, 133 | Total..... | 1, 725, 145 | 1, 933, 853 |
| Dairy products, excluding home use..... | 142, 248 | 43, 365 | | | |

¹ Estimated.

In the vicinity of the coal mines a number of miners live on small farms and put in their spare time, such as periods of slack work, by operating their farms. In the broken and hilly sections, which are still forested to some extent, the gathering of hemlock and chestnut-oak bark is an important side line and source of income to some farmers, as these products find ready sale at Petersburg, Gorman, and Keyser for use in the tanneries or for shipment. Railroad ties, bridge timbers and mine props also constitute important sources of income with some of the farmers.

The topography, physiography, climate, and soils of the various parts of the area determine largely the type of agriculture. Thus, in the mountain section, where the seasons are short and corn can not be matured, oats, buckwheat, and some wheat are grown on the smoother fields, and excellent potatoes are produced. The glades and imperfectly drained areas around the stream heads are reserved for hay and pasture, and the slopes and more broken areas kept in pasture. In this section stock raising is the most important agricultural interest.

In the limestone valleys, where the soils are strong and produce vigorous bluegrass, a general type of farming is followed, with considerable stress upon grass and clover production, and some apples are grown. Much of this type of land is too steep for farming and is utilized for permanent pastures. The shale soils in The Ridges are thin, usually require fertilization, and can not withstand much drought. Here wheat and oats are important crops. Corn suffers from lack of moisture in a dry season and is usually planted on the bottom-land soils where the moisture conditions are more favorable for its growth. The chert lands on ridges and knobs, where the air

drainage and soil drainage are favorable and damage from unseasonable frost is minimized, are adapted to the production of apples and peaches. The smooth level alluvial valleys and the terraces are well suited in topography and soils to the production of corn, small grains, and hay, and here power machinery can be readily employed. The red Upshur soils are well suited to grasses, grain, and fruit, apples particularly. These adaptations and limitations of the soils have been recognized by the farmers and have been utilized to some extent, although the general farm crops are grown on most all of the soils.

The farming methods through the area are governed largely by the topography or rather the steepness of the topography. Upon the smooth or rolling farm land machinery and power equipment can be employed in preparing, planting, cultivating, and harvesting, but on the stony slopes and steep hillsides much of the work must be done by hand.

Corn is usually planted after a crop of hay or upon land that has been grazed. The fields are plowed during the winter or early spring to permit the freezing and thawing action of the weather to pulverize the soil, and the seed bed prepared by harrowing and dragging until worked to a suitable smoothness. The corn usually is drilled, except on the bottoms or smooth terrace or upland fields, where it is planted with a check-row planter. It is cultivated three or four times and usually hoed and thinned with hand hoes. The crop is cut by hand and shocked in rows to permit disking for wheat, and husked later. A part of the crop is used for silage, and this is cut about September 1.

Wheat usually is sown with a drill, the fertilizer being applied at the same 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 or stoniness of the fields necessitates the use of the cradle. Wheat is customarily stacked or stored in barns until threshed. There is more or less cooperation in threshing, and farmers exchange labor or employees. Land is sometimes seeded to wheat two years in succession. If a good stand of clover and timothy is obtained after wheat, the field may be kept in grass for two or three years, or until the yield falls off or the field is infested with weeds, when the land is plowed again for corn.

On many farms no definite rotation is followed, although the crops usually are grown in the order corn, wheat, grass. The hay crop is harvested in July and is usually stacked in the field. Hay is seldom baled, being sold loose by the ton or by the stack, which usually contains 1 to 1½ tons. When oats are sown they usually follow wheat or grass and are harvested in the same manner as wheat. Part of the oats is fed in the sheaf. Buckwheat is usually seeded in July, after wheat or on newly turned sod land. Oats and buckwheat are grown widely in the mountain sections because they do not require long growing seasons, and potatoes partly displace corn in the rotation. Soy beans sometimes are seeded as a cover crop after wheat or oats and cut for hay or used for pasture. In some of the bottom lands corn is grown on the same land successively for several years and is then followed by wheat and grass. Alfalfa is seeded either in the spring or in August. The land is

carefully prepared, limed, and fertilized. Alfalfa does very well upon limestone lands.

Apple and peach orchards are usually situated on ridges or knobs. Many of them are set out on chert soils which appear to be a mass of chert and limestone gravel. Cultivation usually is difficult both because of the steepness of the topography and the gravelly nature of the land. The orchard practice varies considerably. In some cases clean cultivation is practiced and the orchard is plowed and harrowed to maintain a mulch. In other cases corn, potatoes, or hay are grown between the rows, and this practice is extensively followed up to the time the trees come into full bearing. Some orchards are kept in grass which is mowed and allowed to remain on the land.

All growers spray for insect pests and fungous diseases. Peaches are troubled considerably by borers and the "yellows." Some of the growers apply nitrate of soda or sulphate of ammonia fertilizers to the trees in the spring. This is particularly beneficial in the thin shale and sandstone soils. Orchardists near Keyser usually ship their fruit to the packing plant at Keyser for grading, packing, and marketing. Other large growers pack and ship independently from the nearest railroad point.

The best orchard sites seem to be those with a southeastern or eastern exposure, as they are sheltered from the severe whipping winds during the winter. The elevation of the orchard is exceedingly important, those at higher elevations being less injured by frosts. In 1922 those orchards which had elevations of 1,750 to 1,900 feet and faced the east or southeast were the only ones that had a good fruit crop; the others had but little fruit because of frost injury.

In the valleys the farm buildings are generally well built and modern, some being of brick construction. The barns are sufficiently large to store the grain crops, part of the hay, and the machinery and implements, besides furnishing stall room for the stock. Silos are a part of the equipment on farms where cattle raising or dairying is important. Many houses are equipped with running water, and some have acetylene or electric lighting systems. The type and supply of implements is generally adequate for the farm needs. In the mountain sections the houses and barns are smaller than those in the valleys, and equipment and work animals are lighter.

Fertilizers are generally applied on wheat and potatoes and are used to some extent on fruit trees. Their use is becoming more general. In 1919, 368 farms, or 47.9 per cent of the total number in Mineral County, reported a total expenditure of \$20,500 for fertilizer, or an average of \$55.71 per farm reporting, whereas in Grant County the total was \$17,446, or \$41.05 per farm reporting, more than half the farms in the county using fertilizers. The most commonly used commercial fertilizer is 16 per cent acid phosphate, which is applied at the rate of 200 to 250 pounds per acre on wheat. A complete fertilizer is generally applied on potatoes. Barnyard manure is generally applied to the mowing land or to land intended for corn. The use of lime is becoming more common. There is an abundant supply of limestone in the county which could be supplied to farmers at very moderate cost. Several pulverizers are being installed, and these should be able to produce an excellent product cheaply.

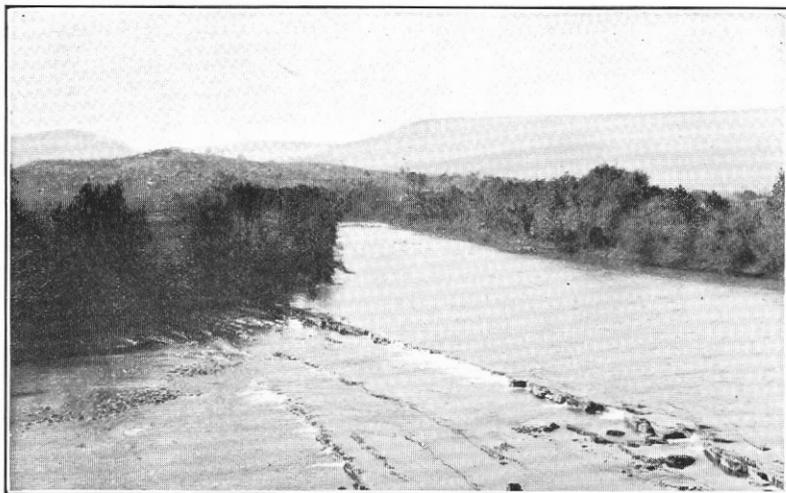


FIG. 1.—VIEW LOOKING WEST AT SMITH FALLS

Showing the general valley topography along the South Branch Potomac River. Allegheny Mountains in the background

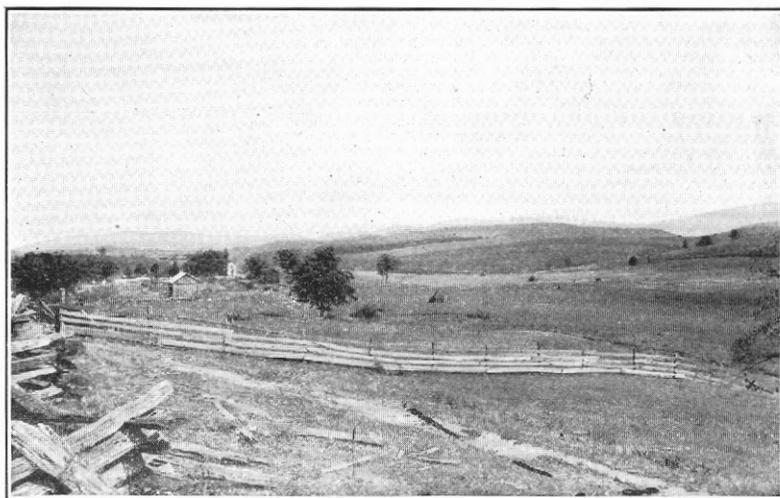


FIG. 2.—DEKALB SHALE LOAM, SHOWING ITS CHARACTERISTIC ROLLING TOPOGRAPHY

View along Falls—Maysville road, looking northeast. Patterson Creek Mountain in background

Most of the farm labor consists of native-born whites, very few negroes or foreigners being employed in this work. At the present time (1922) labor is scarce in the area. The mines, railroads, and industrial plants at near-by cities offer more attractive wages and working conditions than the farmer can, and for the most part the latter must depend upon his own labor and that of the members of his family. The average farm wage is \$30 to \$35 a month, with board and lodging. During the fruit-picking period pickers and packers are paid \$2.50 to \$5 a day. The expenditure for labor in 1919, as reported by the census, was \$131,058 on 322 farms reporting in Mineral County, and \$110,070 on 362 farms in Grant County.

According to the 1920 census, 76.4 per cent of Mineral County and 66.1 per cent of Grant County was included in farms, of which there are 769 in Mineral County and 793 in Grant County. The size of the farm holdings varies from a few acres up to 1,000 acres or more. In 1920 the average size in Mineral County was 221.9 acres and in Grant County it was 245.7 acres. The large size of the farms in the area is mainly due to the fact that so much of the land included in farms is too rough for farming operations and can be used only for the small amount of grazing it affords. The average acreage of improved land per farm in 1920 was 92 acres in Mineral County and 121.4 acres in Grant County.

Throughout the area the farms are generally operated by the owners. This has been the case ever since the region has been cleared. In 1920, according to the census, 84.3 per cent of the farms in Mineral County were so operated and 11.2 per cent and 4.5 per cent by tenants and managers, respectively. According to the same authority 91.2 per cent of the farms in Grant County were owner operated, 8.1 per cent operated by tenants, and 0.7 per cent by managers. Leases ordinarily are on a share basis, the owner and tenant each furnishing half the fertilizer and receiving half the crop. Under this system the tenant supplies labor, machinery, stock, and usually the seed, although in some cases the owner supplies half the seed. There has been very little increase in tenantry since 1880.

The farm land in this area varies widely in selling price, depending upon the topography, accessibility, area of cleared farm land, and improvements. Land in the mountain section is valued generally for the standing timber and the mineral rights. The rough, broken areas sell for \$5 to \$10 an acre, and unimproved land suitable for grazing or fruit sells for \$10 to \$20 an acre. The farm land through the shale region ranges in price from \$20 to \$50 an acre, and the bottom farms, or those which include a large percentage of bottom land, sell for \$60 to \$200 an acre. The best bottom lands are rarely offered for sale. The fruit and orchard farms usually bring from \$150 to \$350 an acre. The average value of farm land is reported by the census for 1920 as \$21.04 in Mineral County and \$20.38 in Grant County.

SOILS

The soils of Grant and Mineral Counties are mainly light colored; they range in color from gray and grayish yellow to brown and Indian red in the surface soil.

All of the soils of these counties are low in organic matter, owing primarily to the fact that this area has been forested until reclaimed for agricultural use. Probably 65 to 70 per cent of the area is still in forest or cut-over land. A thin layer of organic matter covers the surface in many places, but in wooded areas practically none has been incorporated with the soil below 1 or 2 inches. In some of the first-bottom areas there are spots of grayish-brown soils which appear to have considerable organic matter.

No free carbonate of lime has accumulated in any of these soils, although many of the rocks from which they are derived contain lime. The heavy rainfall, combined with excellent drainage, has washed out practically all the soluble materials formed during the disintegration and decomposition of the rocks, the marl deposits at Williamsport and Gerstell being exceptions. All the soils are acid or slightly acid and respond readily to applications of lime.

The soils of Grant and Mineral Counties are comparatively young in their development and bear a close relationship to the parent material or underlying rock formations from which they are derived. Because of steepness of the topography and the angle at which many of these rocks now stand the accumulation of any great depth of soil material has been practically impossible. Therefore most of the soils have no well-developed profile or layer in which there is an accumulation to any extent of the finer materials. In general the soils are friable and gradually grade into slightly heavier but also friable material, and this passes usually at depths between 20 and 36 inches into the disintegrated rock.

On some of the flatter tops of the highest mountains areas of podsol soils¹ are developed at elevations above 3,000 feet. Occurrences of this podsolized material are noticeable along the Grant and Tucker County boundary, on Cabin Mountain, and near the head of Stony River. Most of these higher and rougher areas have been mapped as Rough stony land, and the podsol soil is restricted to spots here and there. The sandy types have a better development of the podsol profile than the heavier types.

The profile of the podsol soils consists of a mere film of vegetable mold and mineral matter, passing into a gray to very light brown horizon ranging from a mere film up to as much as 4 to 6 inches. This is the so-called podsolized horizon. It is underlain by a dark-brown to coffee-brown, fluffy, friable layer, ranging in thickness from 1 to 4 inches. In extreme cases this may become solidified into a kind of hardpan. Below this is a brown to yellowish layer passing at a depth from 15 to 24 inches into the disintegrated sandstone and shale.

The Dekalb silty clay loam and silt loam, some of the flatter areas of the stony silt loam, and a few of the better-developed bodies of Hagerstown silt loam and Holston silt loam, are the only soils in the area which appear to have reached a stage in development or maturity which gives them the distinction of possessing certain definite layers or horizons within the soil section. These soils have

¹ "Podsol" is a folks term used by Russian peasants to designate a widespread gray soil of northern Russia. Similar soil occurs in the northern United States, and it is of scientific interest to note its occurrence as far south as West Virginia at the highest altitudes. The typical profile consists of a layer of leaf mold, underlain immediately by a gray layer, the eluviated zone (A_2), and then by a brownish layer, the illuviated zone (B). The parent material, the layer (C) below the illuviated zone, of course varies with the particular region, being independent of the climatic conditions.

in their natural state a surface layer of an inch or two of brown loam or leaf mold which is usually high in organic matter. Immediately below this is another horizon, a light-brown or yellowish-brown loam or silt loam which extends to a depth of 5 to 8 inches. The third horizon consists of a yellow or brownish friable clay or silty clay, which usually grades into disintegrated rock between 30 and 40 inches below the surface. In the case of the Holston silt loam the underlying materials vary with the local formations.

The carboniferous or coal-bearing measures underlie the western or Allegheny Plateau part of the area, and the coal veins are being operated at the present chiefly along the North Branch Potomac River. At various points along the Baltimore & Ohio Railroad and Western Maryland Railway the limestone formations are being quarried for ballast, road material, and for use in the manufacture of cement. The iron-bearing sandstone formations were worked some years ago, but are not sufficiently rich in iron to be profitably smelted under present conditions.

There is a large variety of soils in Grant and Mineral Counties, owing to numerous and varied geological formations which underlie the country and also to the fact that there is an extremely wide range in the topography of the region. The soils have been grouped into soil series according to color, structure, origin, and drainage conditions. The series are divided into soil types according to the texture of the surface soil. The type is the unit of soil classification and mapping, and the soils have been studied from the surface downward through the subsoil into the parent material. The entire section is called the soil profile.

All of the upland soils of these two counties owe their origin to the weathering of the underlying formations.² Under the series descriptions will be discussed the kinds of rocks giving rise to the individual types.

The types of the Dekalb series have light-brown or yellowish-brown surface soils, resting on a yellow or brownish-yellow silty clay subsoil. They are more extensive in this area than the types of any other series. They are derived from gray and brown shale, sandstone, or a mixture of these. Fragments of the partly decomposed parent formations are usually encountered through the soil section, and in many places the solid formations occur at less than 3 feet below the surface. The Dekalb silt loam and stony silt loam are derived from a number of different formations which contain a larger proportion of shale than sandstone; the shale produces the silty texture that distinguishes these types, while the sandstone, being harder and less readily weathered, in many places litters the surface. The Dekalb shale loam is derived from thick beds of fine-grained platy shales which break up into small shale particles. Besides the types above mentioned, the silty clay loam, fine sandy loam and stony sandy loam, and the colluvial phase of the silt loam, and the hilly phase of the shale loam of the Dekalb series are mapped in this area.

The Lickdale soils are closely related to the Dekalb, occupying poorly drained swales or flat areas around stream heads within areas of the Dekalb soils, and are derived from the same kind of materials.

² For information regarding the geology of this area consult "Geological Survey of Mineral and Grant Counties, W. Va." By David B. Reger, W. Va. Geol. Sur.

The types are characterized by grayish-brown or light-brown surface soils overlying a mottled gray and yellow, compact silty clay subsoil. Lickdale silt loam is the only type mapped in Grant and Mineral Counties.

The types of the Upshur series have characteristic reddish-brown soils over a purplish-red or Indian-red friable silty clay subsoil. These soils are derived from red shale and sandstone, which are somewhat calcareous, and to a very small extent from limestone. They have a rolling to hilly topography and are well drained. The Upshur stony silt loam is littered with sandstone fragments consisting in part of unweathered fragments of the parent formation and in part of materials rolled down from sandstone formations outcropping at higher elevations.

The Meigs soils represent a condition intermediate between the soils of the Dekalb and the Upshur series. They are derived both from the gray shale and sandstone that produce the Dekalb soils and from the red shale and sandstone that give rise to the Upshur soils, the materials being so intermixed and the color of soil and subsoil so varied that separation is impracticable. The Meigs stony silt loam is the only type mapped in the area.

The types of the Hagerstown series have brown to reddish-brown soils over a reddish-brown to red friable clay subsoil. They are derived from the weathering of several limestone formations that vary from relatively pure limestone to those of a siliceous and cherty character. Platy fragments of limestone and angular blocks of chert are commonly scattered over the surface and through the subsoil, and ledges of the parent rock outcrop in places. These soils have a rolling to hilly and steep topography and are well drained. The Hagerstown series in Grant and Mineral Counties is represented by the stony clay loam, the silt loam, and a colluvial phase of the silt loam.

The Westmoreland types have light-brown or yellowish-brown surface soils and a brownish-yellow silty clay subsoil. They are derived from mixed limestone and shale material, differing in this respect from the Hagerstown soils, which owe their origin almost entirely to weathered products of limestone. Fragments of the limestone and shale rocks appear on the surface and through the soil, and bedrock is commonly reached at depths of less than 3 feet. The types mapped in the area are the silt loam and stony silt loam.

The Frankstown series includes types with light-gray to pale-yellow soils with yellow subsoils. They are derived from cherty and siliceous limestone and fine-grained sandstone, fragments of which commonly appear in the soil and subsoil, and the gravelly loam type contains so much of this light-yellow or gray gravel as to render cultivation difficult. Although these soils have a steep topography, they do not erode, because both soil and subsoil are open and porous and rain water is quickly absorbed. They occur usually in close relation to the limestone soils. The gravelly loam and the colluvial phase of the gravelly loam are the only Frankstown soils mapped in the area.

The alluvial soils consist of material washed from adjoining upland soils or similar soils in adjacent areas, transported and redeposited by water. These soils are divided into terrace or second-

bottom soils, and first-bottom or flood-plain soils. The terrace soils occupy higher positions, have lain much longer since deposition, and have acquired some of the characteristics of a mature soil. In contrast, the materials comprising the first-bottom soils are no more than recent geological formations or new depositions of material still subject to change at each overflow of the streams.

The Holston series includes all of the terrace soils mapped in the area. It includes types with light-brown surface soils, which grade into a yellowish-brown silty clay, with a lower subsoil consisting of a brownish-yellow silty clay mottled with gray and rusty brown. The Holston silt loam, the only member of the series mapped, is derived principally from wash from uplands consisting of sandstone and shale soils of the Dekalb series. It has a smooth, flat topography.

In the first bottoms soils of three series have been mapped. These are the Huntington, Atkins, and Pope series.

The Huntington series is characterized by brown soils over a brown subsoil. They are composed chiefly of materials transported by streams from the upland limestone soils of the Hagerstown and Westmoreland series and deposited along their courses. They are usually well drained and are the most important and productive alluvial soils. They include some patches of marl deposited at the mouths of springs which flow from limestone rocks. The loam and silt loam types are mapped in Mineral and Grant Counties.

The Atkins series includes soils having grayish-brown or gray surface soils and a mottled light-gray, yellow, and rusty-brown silty clay subsoil. They occur in the first bottoms of streams which drain the sandstone and shale uplands. They occupy low flat parts of the bottoms, are subject to overflow, and owing to the tough, heavy subsoil, are imperfectly drained. The Atkins silty clay loam is the only type of the series mapped in the area.

The Pope series is found in the first bottoms of streams which rise in and receive most of their wash from the upland soils of the Dekalb series. These types have brown surface soils and a brownish-yellow subsoil. They differ in appearance from the Huntington soils in being somewhat darker in the surface layer. The silt loam is mapped in this area.

The soil types of the area are described in detail in subsequent pages of this report. Their distribution is shown on the accompanying soil map. The table below shows the actual and relative extent of each soil type mapped.

Areas of different soils

| Soil | Acres | Per cent | Soil | Acres | Per cent |
|---------------------------------|----------|----------|-----------------------------------|----------|----------|
| Dekalb shale loam..... | 77, 896 | } 33. 8 | Hagerstown silt loam..... | 6, 912 | } 1. 4 |
| Hilly phase..... | 96, 960 | | Colluvial phase..... | 128 | |
| Rough stony land..... | 116, 672 | 22. 6 | Huntington loam..... | 6, 720 | 1. 3 |
| Dekalb stony silt loam..... | 64, 000 | 12. 4 | Holston silt loam..... | 6, 464 | 1. 3 |
| Frankstown gravelly loam..... | 25, 792 | } 6. 5 | Upshur stony silt loam..... | 6, 144 | 1. 2 |
| Colluvial phase..... | 7, 552 | | Dekalb fine sandy loam..... | 3, 648 | . 7 |
| Dekalb stony sandy loam..... | 21, 120 | 4. 1 | Meigs stony silt loam..... | 3, 456 | . 7 |
| Dekalb silty clay loam..... | 20, 096 | 3. 9 | Westmoreland silt loam..... | 3, 200 | . 6 |
| Hagerstown stony clay loam..... | 15, 744 | 3. 0 | Westmoreland stony silt loam..... | 2, 880 | . 5 |
| Atkins silty clay loam..... | 9, 408 | 1. 8 | Pope silt loam..... | 2, 624 | . 5 |
| Huntington silt loam..... | 9, 024 | 1. 7 | Lickdale silt loam..... | 2, 048 | . 4 |
| Dekalb silt loam..... | 6, 976 | } 1. 6 | | | |
| Colluvial phase..... | 1, 856 | | Total..... | 517, 120 | |

DEKALB SHALE LOAM

The Dekalb shale loam has a surface layer of 4 to 8 inches of brown or grayish-brown silt loam, containing quantities of small, thin shale fragments. Beneath this appears a mass of partly weathered brown or yellowish-brown, thin, platy fragments of shale, together with a small proportion of yellowish-brown or yellow silt loam. The unweathered shale beds in most places occur at depths ranging from 18 to 24 inches, and on slopes they come to the surface in galls or bare spots.

This soil is extensive in The Ridges, the name given to the country lying in the broad trough between the New Creek-Knobly Mountain chain on the west and Patterson Creek Mountain on the east and extending from south of Petersburg northeast across the area to the North Branch Potomac River. (Pl. XXII, fig. 2.) Other areas are found along New Creek and Jordan Run east of the Allegheny Front, and in scattered areas on the Allegheny Plateau. This type has a smooth to rolling or somewhat hilly topography.

Here and there at the base of slopes just above the stream bottoms occur narrow strips of land that are somewhat "seepy" or "springy," the subsoil is mottled with gray and rusty brown, and the shale beds are encountered at lower depths than typical. In The Ridges, north of Martin and Williamsport, the soil is slightly influenced in places by the thin sandstone of the Chemung formation, which caps some of the ridges, and a few small fragments of sandstone are encountered in the soil and subsoil.

In the northeastern part of the area, just east of Alaska, on benches or shoulders about 50 feet above the level of the town, the soil in patches is a silt loam rather free from shale fragments. This difference may be due partly to thin terrace deposits laid down by Patterson Creek at some former time, but if so, the terrace has lost its identity and therefore is mapped as an upland soil. Such areas have the typical shaly subsoil.

Drainage is well established and is sometimes excessive on slopes that have been cultivated, the soil in places having been washed off exposing the bedrock.

Originally this type supported a forest of oak, hickory, cherry, and sassafras, with some shortleaf pine and an undergrowth of sumac, grapevines, blackberry, huckleberry, and elder. A large part of the land has been cleared. It is used chiefly for the production of the general farm crops. The type is considered droughty, and in dry seasons corn suffers for want of moisture and oats and grass are short. In normal seasons these crops produce almost as well as on the associated bottom lands.

Wheat yields 12 to 20 bushels per acre, the quality of the grain being considered better than that produced on the neighboring upland and bottom soils. Corn yields 15 to 40 bushels per acre, the higher yields being obtained when the land has been manured and fertilized. Farmers having fields of this soil generally prefer to reserve them for small grains and hay, planting corn in their creek-bottom fields. Oats yield about 20 to 30 bushels. Hay, consisting mainly of redtop, "whitetop," and some timothy, yields 1 to 1½ tons per acre. Soy beans have been recently introduced as a hay crop and are finding favor among the farmers as a means of im-

proving the fertility of this type of soil. The land usually requires liming to obtain a good stand. The soy beans root deeply and tend to deepen the feeding area for the roots of other plants besides adding nitrogen and humus to the soil. Potatoes do well, particularly when fertilized.

A considerable acreage of this kind of land is used for pasture, but is not particularly adapted to this purpose, as it is droughty in dry seasons and the grasses burn up and the small streamlets dry up completely. In many parts of The Ridges the springs and wells become very low or dry up entirely in summer, and the problem of water supply is at times serious. Several orchards, consisting of apples and peaches, have been established on this soil. Apples seem to thrive better than peaches.

As is the case with most of the Dekalb soils, the shale loam is rather low in organic matter and nitrogen. The content of organic matter can be increased either by applying barnyard manures or by plowing under green vegetation, such as a good grass sod or a crop of soy beans or rye. Application of phosphoric acid at the rate of 200 to 300 pounds per acre on the small grains will increase the yields. At the present time phosphoric acid is being used by most farmers, but the applications are usually rather light. On the steeper slopes, where erosion is beginning, the land should be seeded to grass and kept covered with a sod. When the land is to be cultivated the slopes should be terraced to prevent destructive washing and gulying.

Land of this type sells for \$15 to \$60 an acre, depending upon the location and buildings.

Dekalb shale loam, hilly phase.—The hilly phase of the Dekalb shale loam occurs on steep slopes and eroded hillsides in association with the shale loam. The surface soil is shallower than on the typical soil, and bare “galls” and outcroppings of the dark-gray to light-brown parent shale are numerous. Much of the land is badly eroded and the surface soil is so shallow that plant roots catch hold with difficulty. In many places the soil and substratum consist of a mass of partly weathered shale fragments.

On Horseshoe Mountain and on other ridges and slopes in the central part of The Ridges small sandstone gravel fragments occur on the surface in patches, but the areas of such variations are not of sufficient extent to warrant the mapping of a gravelly shale loam type.

Most of this phase remains in forest or after a few years' cultivation becomes so badly washed that it must be abandoned. Such areas are soon occupied by a straggly growth of scrub oaks, pine, sassafras, blackberry, and huckleberry. They furnish some pasturage for cattle and sheep. Very little merchantable timber is left. This phase includes small patches at the base of slopes that are partly colluvial in origin. In the small stream valleys such patches are frequently the sites of the farm buildings, areas near the houses being used for kitchen gardens. Land of this character should be used for pasture or forest, as its topography and thin soil covering render it unsuitable for farming.

DEKALB STONY SANDY LOAM

The soil of the Dekalb stony sandy loam is a pale-yellow to light yellowish-brown sandy loam, 4 or 5 inches deep, over a yellow sandy loam subsoil varying in depth from 12 to 18 inches, below which the parent sandstone normally appears. Fragments of sandstone are strewn over the surface in such quantities as to render most of the type unfit for farming. Along the contact of this type with the Frankstown soils fragments of chert are locally present on the surface.

The topography is generally steep and broken and the drainage excessive. Some of this type is so broken and littered with rock fragments that it can be mapped either as stony sandy loam or Rough stony land. The type has a rather large total area. It occurs mainly at the base of New Creek, Knobly, and Patterson Creek Mountains and on ridge crests and mountain tops where the sandstone and quartzite rocks outcrop.

About 85 per cent of the type remains in forest. Such areas as are cleared are devoted chiefly to pasture or set out in orchards. Peaches and apples seem to do well on this soil. For best results the trees require some fertilization when set out and subsequently a light application of nitrate every year or two. Some patches have been cleared of timber and stone and used for the production of field crops. Locally small patches are used as home gardens. Goats are kept on a number of farms to assist in clearing the land intended for orchard sites.

The tree growth found on this soil includes shortleaf pine, white oak, some chestnut, laurel, maple, dogwood, and elder, and in the mountain gaps some hemlock and spruce. The rough, broken, and steep character of this land limits its use for agriculture. Most of it is probably best adapted to forestry. The smoother areas are suitable for orchard sites.

Land of this type sells at present for \$10 to \$20 an acre, depending upon the quality of the timber and the character of the associated soils.

DEKALB STONY SILT LOAM

The Dekalb stony silt loam is a brownish-yellow silt loam, 6 to 7 inches deep, with a yellow silty clay subsoil. The parent rock is in most places encountered at depths of less than 3 feet, and scattered over the surface are thin platy fragments of gray or grayish-yellow sandstone and shale, coming from these rocks. In places the fragments are so abundant that the land is practically unfit for any kind of farming.

This is one of the most extensive types in the area. It occurs on the eastern side of the Allegheny Front, on the steeper ridge slopes along the North Branch Potomac River, and in the hilly, broken section south of Petersburg.

This type occupies hilly to broken areas, mainly unfavorable for agriculture. Included patches are so stony that if larger in extent they would be mapped as Rough stony land. Small patches of gravelly and stony shale loam also are included. Upon Knobly Mountain are found areas in which the stone fragments on the surface are red, but apparently such rock has had only a small part

in the formation of the soil. In patches the upper layer of a few inches has a slight pinkish cast, but the subsoil is typical Dekalb material. Where this soil is mapped on lower mountain slopes, it is partly colluvial in origin and the surface is littered with bowlders and shale fragments that have been washed or rolled down from higher elevations. Such areas correspond to the colluvial phase of the Dekalb silt loam. Here and there are narrow patches at the base of slopes where water seeps out of the hillside, keeping the soil wet much of the time, and the subsoil has become mottled with gray and resembles that of the Lickdale silt loam. In the western part of the survey, near areas of the Dekalb silty clay loam, patches of stony silty clay loam are included.

Most of this type is devoted to forest or to range for cattle and sheep. In the Allegheny Mountain section, near Mount Storm, it occupies gently rolling to slightly hilly topography, which, but for the large bowlders residual from the breaking down of the parent sandstone, would be well suited to farming. This land produces a heavy sod of bluegrass and wild grasses and is used principally for pasture and hay land. A number of farmers who also have farms in the valleys retain large acreages in the mountain section for summer range for cattle and sheep. The abundant rainfall maintains a good pasture sod throughout the summer, and the streams, being fed by springs, rarely go dry even in the late summer or fall. When cleared of stones this soil produces good crops of oats and buckwheat and potatoes of especially fine quality. Some soy beans are grown. In the vicinity of Keyser there are several orchards on this soil, and it is regarded as fairly well suited to fruit, particularly apples. The forest growth consists chiefly of oak, chestnut, and maple, with a dense undergrowth of mountain laurel, huckleberry, and a few hemlocks in the deeper ravines and hollows.

When farmed this type is usually in need of lime. Fairly heavy applications of ground limestone or burnt lime have proved profitable, increasing yields and improving meadows and pastures, the effect being plainly visible for a number of years. Fertilizers are not extensively used; acid phosphate is the principal fertilizer used. The soil is typically rather thin and, except on new land, low in organic matter. The wider use of soy beans for hay is recommended, owing to their faculty of storing up nitrogen in the soil and improving the physical condition by increasing the supply of humus. Where the topography is broken this land is probably best suited to forestry.

This soil ranges in price from \$5 to \$20 an acre, except that where coal veins are below the surface the selling price is governed largely by the value of the coal.

DEKALB FINE SANDY LOAM

The Delkalb fine sandy loam consists of a light-brown to grayish-brown sandy loam, 6 to 8 inches in depth, with a pale-yellow heavy fine sandy loam or sandy loam subsoil. Below 16 to 20 inches the disintegrated parent sandstone rock commonly appears, and outcroppings of this rock are numerous. Some sandstone fragments

are found on the surface. In the wooded areas the upper layer of the soil consists of brownish-gray loam a few inches thick.

This type includes patches that are buff or slightly reddish, particularly near exposures of the bedrock, the color apparently being due to the partly decomposed condition of the rock. Such areas lie just east of Petersburg; on the ridge just west of the mouth of Ashcabin Run near Rawlings, Md., and upon the ridge just south of Ridgeley and including part of that town. These areas probably approach in character the Hanceville sandy loam, but they are so small that it did not seem necessary to map them. Patches of stony sandy loam too small to be separately mapped also are included. On the ridge southeast of Burlington where this soil occurs there are scattered over the surface a few chert gravel fragments, but the soil does not seem to have been particularly influenced by this material.

The Dekalb fine sandy loam occupies smooth to rolling ridge tops and slopes ranging from gentle to steep. Most of it is devoted to pasture or remains in forest. In the vicinity of Ridgeley it is used largely for the production of fruit, chiefly peaches, but to some extent apples, and for growing vegetables, such as tomatoes, potatoes, and sweet corn, for marketing in Ridgeley and Cumberland. It is well drained. Steep hillsides erode unless protected with a sod. Small areas of this type are farmed to the general crops, corn, oats, and wheat, and when fertilized the yields about equal those of the Dekalb silt loam. Heavy applications of acid phosphate and manure are made in growing the truck crops. Some manure is obtainable from stables in Ridgeley and Cumberland.

This land ordinarily ranges in price from \$15 to \$50 an acre; improved with orchards it brings \$100 or more.

For satisfactory production of grain, vegetables, and truck crops, the supply of organic matter in the soil must be increased and fairly heavy applications of acid phosphate or complete fertilizer used. The growing of legumes is recommended, and seeding the fields to rye in the fall will not only protect the land from washing but give a green manure crop to turn under in the spring.

DEKALB SILT LOAM

The Dekalb silt loam is a brownish-yellow to light-brown silt loam, 6 to 8 inches in depth, underlain by a brownish-yellow to yellow silty clay loam. In wooded areas there is present a thin covering, only 1 to 2 inches thick, of dark-brown loam. The subsoil below 20 to 24 inches consists of mottled rusty-brown, gray, and yellow disintegrated shale and sandstone. The parent rock, consisting of shale and sandstone, is usually encountered at depths not greater than 30 inches. Small fragments of shale and sandstone are found in places on the surface and through the subsoil, but are not present in sufficient quantities to change the physical structure of the soil or interfere with cultivation.

This soil is found principally in the Allegheny Plateau section of the area upon smooth, rolling, or somewhat steeply rolling ridge tops, with Dekalb stony silt loam or Rough stony land occupying the slopes below. It is not an extensive type but is almost entirely cleared and is of considerable local importance because of the fact

that it occurs in localities where the total area of land suitable for farming is not large.

The smoother areas of the Dekalb silt loam are devoted to the general farm crops, oats, potatoes, buckwheat, and grass, the more hilly land being used for grazing. Little corn is grown because, owing to the high elevations at which the soil occurs, the growing season is usually not long enough to permit the crop to mature. Some corn is grown for silage. Most of the crops are fed on the farm and marketed in the form of cattle. Excellent pasturage, consisting of bluegrass and redtop, with some white clover and hop clover, is afforded, and this land is valued highly for grazing. Several farmers who have lands in other parts of the area maintain fields of Dekalb silt loam in the Allegheny Plateau section for summering their beef cattle. The annual rainfall is greater than normal for the lower elevations and a luxuriant growth of grass and an abundance of water is generally assured during the summer and fall. When cut for hay the grass yields $1\frac{1}{2}$ to 2 tons per acre on the average.

Fairly large yields of potatoes of excellent quality are grown on this soil, and in the local markets of Keyser and Petersburg they are preferred to those grown on other soils. The potatoes produced on the Allegheny Plateau are also in demand for use as seed. A complete fertilizer, or acid phosphate alone, is usually applied, besides barnyard manure.

Oats yield 20 to 35 bushels per acre and buckwheat 18 to 25 bushels. Some fruit, principally apples, is grown on most farms on this type in home orchards, the surplus being disposed of in the mining towns along the North Branch Potomac River or in other local markets. Soy beans have been introduced in the last few years and are becoming popular both for hay and as a green-manure crop for turning under to build up the fertility of the soil.

Application of lime or of ground limestone to this soil gives immediate results, particularly on grassland and on soy beans. Applications of about 1,000 pounds of burnt lime or 1 to $1\frac{1}{2}$ tons of finely ground limestone per acre are recommended. The wider adoption of soy beans both as a hay crop and for turning under will help to increase the productiveness of this land. Experiments conducted by the Maryland Agricultural Experiment Station in Allegany County, Md., indicate that the use of acid phosphate and stable manure will give larger increases in the yields of potatoes, oats, and hay than a complete fertilizer or acid phosphate alone. This soil is of favorable texture and physical structure for cultivation, and, if fertilized properly, will respond well and retain fertilizers without much loss by leaching.

Dekalb silt loam, colluvial phase.—The colluvial phase of the Dekalb silt loam is formed from a mixture of materials washed down or fallen from higher elevations with the local soil material consisting of silt and shale. Generally it carries rounded sandstone boulders and rock fragments strewn so thickly over the surface that most of it is unsuited to agriculture.

The soil is variable. In places it consists of a yellowish-brown or light-brown silt loam, 5 to 6 inches deep, with a brownish-yellow to light-yellow, friable silty clay loam subsoil. Such areas closely

resemble the typical Dekalb silt loam. However, where the colluvial materials have been dropped on shale beds the soil has derived some of its material from these rocks. Fragments of shale are common in the upper soil, the subsoil consists largely of brown or reddish-brown and gray partly weathered shale, and upon the slopes gall spots of the exposed shales are numerous. Small patches of Dekalb shale loam and Dekalb loam also are included in this phase.

Practically all this phase is devoted to pasture or has been allowed to remain in forest. A few fields have been cleared of stones, and these are used in the production of field or orchard crops. When cleared of stumps and stones this soil has about the same productive capacity as the typical soil.

DEKALB SILTY CLAY LOAM

The Dekalb silty clay loam has a surface layer of 3 to 4 inches of brown or yellowish-brown silt loam which passes down into a yellow silty clay loam, which, in turn, at 10 to 12 inches, passes into a rather compact yellow silty clay. Below 24 to 26 inches the material consists of yellow clay loam and disintegrated shale containing some rusty-brown and gray mottlings.

This type of soil occupies a considerable area in the section of the mountain plateau southwest of Mount Storm to the Tucker County line. The topography is rolling to hilly but everywhere rather smooth and free from stone. A large part of the land is in a cut-over condition, and as nearly all of it is underlain by coal seams, much of it is held in large holdings by coal companies. Most of the land included in such tracts is not in use at present. The cleared land and much of the cut-over land is kept for pasture and hay production. A very small proportion is farmed land, used in the production of oats, buckwheat, and potatoes. Oats yield 20 to 40 bushels, and buckwheat 20 to 30 bushels. Potatoes vary in yield from 100 to 200 bushels per acre. Liming is practiced by a few farmers. Where the small grains are grown acid phosphate is generally applied at the rate of about 200 pounds per acre. Apples do very well in the farm orchards. The hay grasses include red-top and "whitetop," some timothy, and wild grasses, including hop clover. The pastures include these grasses and considerable bluegrass. Soy beans for hay and for turning under are finding favor with the farmers who have given them a trial. Corn is seldom grown because of the short growing season on the mountain top. The early frosts rarely permit the crop to mature. The abundant rainfall, together with the naturally strong character of the soil, insure a luxuriant sod for pasture.

Some merchantable timber remains, but this is rapidly being removed. The original growth consisted of white oak, chestnut oak, and other oaks, chestnut, maple, poplar, some ash and beech, and considerable hemlock and spruce on the higher elevations.

This type of land sells for \$10 to \$50 an acre, depending on its accessibility to public roads.

Care must be taken to plow this soil in the proper state of moisture, for if broken when too dry or too wet large clods are turned up and it is hard to put the soil in good condition of tilth. Appli-

cations of lime would improve the physical condition of this soil, making preparation of the seed bed easier, and the growing of more clover and soy beans, with occasional turning under of a green crop, would increase the content of organic matter and add nitrogen to the soil. Ground limestone and acid phosphate applied to the pasture land will improve the sods.

LICKDALE SILT LOAM

The Lickdale silt loam is a grayish-brown or gray silt loam, 6 to 8 inches deep, overlying a mottled gray and yellow silty clay loam containing some rusty-brown specks or concretions. The lower part of the subsoil is rather stiff and tough. Included in this type are small wet spots similiar to the Atkins silty clay loam, but too small to be mapped separately on a map of the scale used.

This type occupies narrow strips around the heads of small stream branches, basinlike swales, or gently sloping to nearly flat areas within the Dekalb upland soils, and lower slopes, associated with the Dekalb silt loam, silty clay loam or shale loam, which are seepy or wet. The largest areas of this type occur in the section between Hartmansville and Gormaniana and near Sulphur City on the Allegheny Plateau section of the area.

At the present time most of this type of soil is cleared and utilized for meadow or pasture, as it supports a heavy growth of redtop, some poverty grass, and wild grasses common to this section. It produces fairly good oats, although it is said that oats rust badly on this kind of soil, probably because of imperfect drainage. Little fertilizer is used. Lime has been applied on a few fields with marked increase in the cutting of hay.

Thorough drainage is the most important improvement needed on this soil. A system of open ditches would probably be the cheapest and most satisfactory. After drainage, application of lime at the rate of 1,000 or 1,500 pounds of the burnt lime or 1 ton of finely ground limestone will "sweeten" the land and result in a heavier and more palatable growth of grass. The content of organic matter is low and should be increased by occasionally turning under heavy sod.

UPSHUR STONY SILT LOAM

The Upshur stony silt loam is a reddish-brown to Indian-red silt loam, underlain by an Indian-red friable silty clay to a depth of 18 to 30 inches. Large quantities of chips of red shale and fragments of sandstone are scattered over the surface and embedded in the subsoil, so that tillage is more or less hampered. The bedrock in most areas is near the surface and in places on steep slopes it outcrops. Small areas of the silt loam free from stones and also small extremely stony spots are included with this soil on account of their small extent.

This type is rather extensively developed in a broken belt extending northeastward along the eastern slopes of the Allegheny Front just below the crest, from near the Pendleton County line on the south almost to the North Branch Potomac River west of Keyser. The elevation of the areas ranges from about 2,000 to 3,000 feet above sea level. The type occupies steeply rolling to hilly mountain slopes

principally, although it also is found on the rolling crests of ridges which connect the Fore Knobs to the main slopes of the Allegheny Front. The small included areas of silt loam texture occupy the smoother upper slopes. Drainage tends to be excessive and cleared areas have been practically ruined by erosion, which has been allowed to go on unchecked.

About 60 per cent of the type is cleared of its original forest growth, which consisted of chestnut, sugar maple, oaks, hickory, walnut, and locust, some pine, and a few hemlocks in the hollows. The rest consists either of forest or partly cut-over land.

About one-fourth of the cleared land is devoted to general farming, with oats, buckwheat, hay, and some wheat constituting the chief crops. Potatoes also are grown to some extent for sale locally. The larger fragments of sandstone have been removed so that cultivation can be carried on without much difficulty. Most of the silt loam areas are under cultivation. The greater part of the Upshur stony silt loam is used for cattle and sheep range. Hogs also run in the forested areas.

Maple sirup and sugar are made on many farms on this type of soil. The rougher broken areas have been allowed to remain in forest or pasture, and this is the best use for such areas. Apples do well, and there are many good sites for orchards not too distant from railroad facilities.

This type of land sells for prices ranging from \$10 to \$25 an acre, depending upon the location and topography.

Cultivation should be confined to the smoother and less stony slopes. The supply of organic matter is rather deficient, and this should be increased wherever the land is regularly cropped.

MEIGS STONY SILT LOAM

The Meigs stony silt loam consists of areas of Dekalb stony silt loam and Upshur stony silt loam so intermixed that a satisfactory separation is impracticable. It includes small areas that have a surface soil of Dekalb stony loam. The type is derived in part from gray sandstone and shale, which give materials forming the Dekalb soils, and in part from red shale and sandstone, which give rise to materials weathering into the Upshur soils. Scattered over the surface are fragments of sandstone, and the subsoil below 12 to 20 inches consists of a mass of partly weathered shale, either gray or Indian red, depending upon the nature of the underlying bedrock. Patches are included that would be separated as Rough stony land if of larger extent.

The Meigs stony silt loam occurs principally upon the slopes of the Fore Knobs of Allegheny Front, upon New Creek Mountain east of Streby and along its west base near Laurel Dale. About 75 per cent of the type remains in forest or is in the condition of cut-over land. Small fields on the sides of stream valleys or hollows have been cleared and devoted to a general type of farming. These fields generally consist largely of Upshur stony silt loam, and some are fairly free of stones. The soil in most areas is rather thin and its mixed nature results in an uneven yield. Corn, oats, some wheat, and buckwheat are produced for home needs. Most of the cleared

land is used for pasture, and this seems the best purpose to which it can be put. In other sections of the State this type is used to some extent for orchards, and there are areas that might be developed for fruit growing. However, owing to its steep and broken topography, the Meigs stony silt loam as a whole is best suited to forestry and grazing.

HAGERSTOWN STONY CLAY LOAM

The Hagerstown stony clay loam consists of a brownish-red silt loam or clay loam, 4 or 5 inches deep, with a reddish-brown or red heavy clay subsoil. In spots the surface soil is eroded away, exposing the red clay subsoil. The limestone from which this soil is derived generally appears at depths varying from 5 or 6 to about 20 inches, and outcrops or ledges covered with only an inch or two of soil are common on the slopes. The surface is littered with limestone fragments, and chert fragments are present here and there.

This type occupies hilly and broken country, narrow ridges, and steep slopes. Practically everywhere platy limestone fragments are present in such abundance as to prohibit its use for farming or at least seriously to interfere with farming operations. Near Short Gap and in several other places along the border between this type and the Frankstown gravelly loam are narrow areas that have an abundance of chert and siliceous sandstone fragments scattered over the surface, but which have the typical Hagerstown subsoil of reddish-brown or red clay. Such areas represent a gradation between the two types. Small patches of silt loam and clay that are less stony are included in the type where too small to be mapped separately.

Drainage is well established; on the steeper slopes it is excessive and the surface soil is rapidly washed away. The fields gully badly when erosion is permitted to continue. In most fields the smoother areas are kept cleared and support a good bluegrass sod; but the steep slopes and broken, gullied parts are allowed to grow up in cedar, oaks, locust, and sumac, which afford some protection against erosion.

The type is extensive wherever the limestone rocks approach the surface. Large areas are on Knobly Mountain between Keyser and Ridgeley, west of Ridgeville and north of Cosner Gap; on New Creek Mountain southeast of Keyser, east and south of Claysville, and north of Greenland; on Patterson Creek Mountain between Twin Mountain and Charles Knob; and on South Fork Mountain east of Masonville and east and south of Rough Run.

About half of the type has been cleared of its original forest growth, which consisted largely of the hardwoods, and is devoted to grazing. Only a very small part is sufficiently free of stone fragments or has a surface smooth enough to permit its use for farming. On the smoother ridges the stone fragments have been removed from the surface in some fields. Such fields, while still more or less stony and gravelly, are used for the production of corn, oats, and grass. The yields about equal those on the Hagerstown silt loam; but the stony soil is thinner and more difficult to plow and cultivate, both on account of the stones and because the soil itself is heavier. On the steeper slopes farming is carried on with great difficulty, and much of the cultivation must be done with hand hoes.

Alfalfa has been seeded on a number of fields and does very well, although it has a tendency to heave out in the winter and suffers more from winterkilling than on the silt loam type. A mixture of timothy and clover produces an excellent yield of hay and seems to be better suited than alfalfa for the production of hay on this soil. Some of the type on Knobly Mountain east and northeast of Keyser is in orchards. Both apple and peach trees seem to thrive, although the apple seems to do better than the peach on this heavy soil. Some phosphate fertilizer is used in growing small grains or alfalfa.

Since much of this type occurs on the rather high ridges and in small steep-sided limestone valleys and is rather difficult to reach, and crops are difficult to plant, cultivate, and harvest, it is not much in demand by the farmers, except for grazing cattle and sheep. Its location, topography, and degree of stoniness are the factors which govern its value for agriculture and its selling price. Prices range from \$8 to \$10 an acre in the rougher more out-of-the-way sections to \$50 to \$60 where it is better suited to farming and is associated with the silt loam or the Frankstown soils.

HAGERSTOWN SILT LOAM

The Hagerstown silt loam is a brown to reddish-brown silt loam, 6 to 8 inches deep, with a reddish-brown, friable clay subsoil. Fragments of limestone and chert are encountered here and there over the surface and in the subsoil. Below 20 to 24 inches the limestone bedrock generally appears, and in places on the steeper slopes ledges of this rock outcrop. In the wooded areas there is an inch or two of dark loam at the surface, passing into a reddish-brown silt loam. Included with this type as mapped are patches in which the surface soil is a silty clay loam or clay, the color in such spots being somewhat redder than typical of silt loam. In places the subsoil is somewhat yellow or brownish yellow and resembles that of the Westmoreland silt loam. This variation appears where the parent rock consists of mixed thin-bedded limestone and shale. The Hagerstown stony clay loam generally occupies the steeper, more broken slopes, lying within or bordering the silt loam type.

The Hagerstown silt loam is developed on some of the steep slopes and rolling ridges and in small, more or less smooth, limestone depressions or sinks scattered through the narrow limestone valleys in the central and southeastern part of the area. Such valleys lie on each side of the crest of Knobly Mountain, New Creek Mountain, Patterson Creek Mountain, South Fork Mountain, Cave Mountain, and North Fork Mountain. The areas are widely scattered, the largest being on Knobly Mountain south of Gerstell, east and southeast of Keyser near the head of Limestone Run, and west of Martin; on New Creek Mountain north of Greenland and east of Jordan Run; east and southeast of Williamsport and east of Forman on Patterson Creek Mountain; and on the east slope of North Fork Mountain along Redman Run. Compared with the smooth rolling topography typical of the Hagerstown silt loam as mapped in the more eastern panhandle counties of the State and in parts of Maryland, the type in Grant and Mineral Counties offers a distinct contrast in being steeper and more hilly, much of it being unsuited to farming and better adapted to grazing than to anything else.

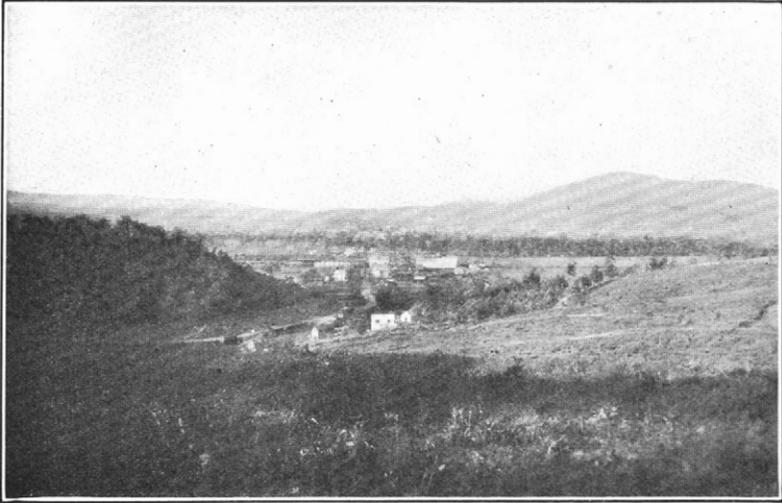


FIG. 1.—THE HUNTINGTON LOAM AND SILT LOAM BOTTOMS AND HOLSTON SILT LOAM TERRACES OR SECOND BOTTOMS NEAR PETERSBURG

Frankstown gravelly loam on Patterson Creek Mountain to right, largely in apple orchards

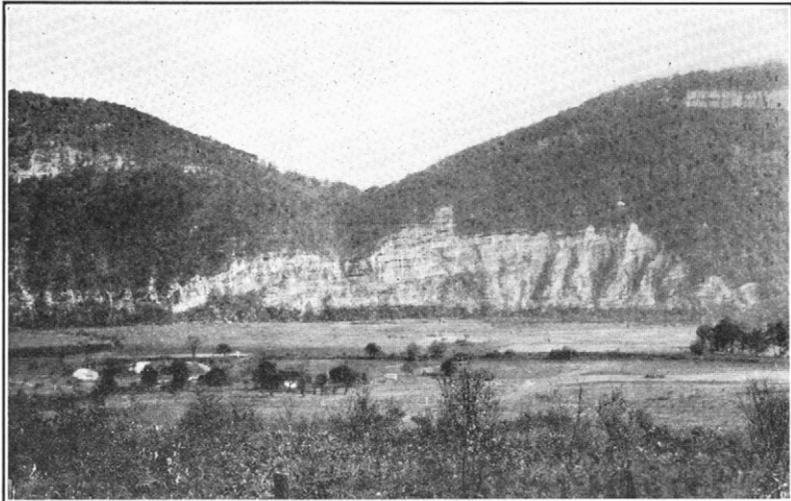


FIG. 2.—BOTTOM LANDS ALONG THE NORTH BRANCH POTOMAC RIVER NEAR CEDAR CLIFF

These alluvial soils are of the Huntington series that have been affected by wash from the limestone formation adjacent

Drainage is well established. In places the surplus water is carried away through the sink holes into underground watercourses in the limestone. On the steeper slopes the soil has a tendency to erode unless care is taken to protect it with grass or small-grain cover crops during the winter.

Most of the type has been cleared of its forest growth, which consisted of oaks, hickory, maple, walnut, cedar, and some pine and hemlock. After removal of the forest, bluegrass starts and produces an excellent sod.

The Hagerstown silt loam occupies a large proportion of the smoother limestone lands and is therefore locally important, as much of the stony types can not be used for crop production. About 60 per cent of it is farmed, the chief products being hay, corn, oats, and wheat. The rest of the land is used for grazing. Alfalfa and other legumes do very well on this soil, and a number of farmers devote the more hilly parts to alfalfa and grass, keeping the more nearly level areas for corn and grain. The soil is naturally strong and productive, and responds to good farming practice. The heavy, rather compact character of the subsoil prevents excessive loss through leaching, but some loss of fertility results from run-off on the steep slopes. Alfalfa produces 2 to 4 tons of hay per acre, in three or sometimes four cuttings, and mixed timothy and clover from 2 to 2½ tons. Soy beans are now being used to a considerable extent, both for hay and as a green-manure crop. Corn yields 25 to 40 bushels per acre, wheat 15 to 20 bushels, and oats 25 to 45 bushels per acre. In some of the smoother fields in the small valleys and depressions, or sinks, the soil is deeper than typical and commonly more productive. Land of this type is included in some of the large orchard tracts east of Keyser and seems to be well suited to fruit, particularly apples.

Acid phosphate is the fertilizer most commonly used. It is applied with the small grains. Light applications of ground or burnt limestone have been found to be profitable upon this type of soil, notwithstanding that it is derived from limestone. The rotation commonly followed is corn, wheat, and hay, the grass being allowed to occupy the land for several years.

Land of this type is included with a variety of other soils in the farms, and its value depends on this association, the topography, the location with regard to the main public roads, and its accessibility. Prices range from about \$25 to \$60 an acre.

Plowing under organic matter, particularly in the form of legumes, would increase the content of nitrogen in the soil, make the other plant food already present in the soil more readily available, and render the soil easier to handle. Occasional applications of lime are recommended. More frequent reseeding of the pastures would result in heavier sods. Applications of acid phosphate with the small-grain crops will be found beneficial.

Hagerstown silt loam, colluvial phase.—The colluvial phase of the Hagerstown silt loam consists of light-brown smooth silt loam, 6 to 8 inches deep, underlain by a friable brownish-red or yellowish-red silty clay subsoil. It is mapped in two areas along the east side of Patterson Creek north of Williamsport, where materials brought

down through gaps in the mountain from the Hagerstown soils and rough areas of limestone and chert lands at higher positions, have accumulated on shoulders or benches above the bottoms. Some fragments of limestone and chert, which have been washed or rolled down from the mountain side, are encountered. The soil as a whole is rather lighter in color than the typical Hagerstown silt loam.

The phase has a smooth topography, the areas sloping away from the base of the mountain, and is well suited to farming. It is all cleared and is used for the production of the general crops of this section. It is also valued as sites for the farm buildings by farmers who cultivate lands in the bottoms. Its small area gives it only local agricultural importance. It produces fine crops of corn, wheat, oats, and hay, and makes the best bluegrass pasture.

WESTMORELAND STONY SILT LOAM

The Westmoreland stony silt loam occupies rougher and steeper topography than the silt loam type and has scattered over its surface sufficient platy limestone and shale fragments to interfere with cultivation. Some limestone outcrops and ledges are present on the steeper slopes and narrow ridge tops. It has a yellowish-brown to light-brown silt loam surface, 6 to 8 inches in depth, with a brownish-yellow to brown silty clay subsoil. The bedrock commonly is encountered at depths from 12 to 24 inches.

This type occupies some of the steep slopes and narrow sharp ridges in the limestone uplands section of the area, the largest areas being mapped southeast of Rough Run in Grant County and on Knobly Mountain east of Keyser. It includes some patches of Westmoreland stony clay and Westmoreland shale loam too small to be shown on the map.

About 35 per cent of the type has been cleared of its timber, the clearings being used chiefly for pasture. A few fields on the smoother slopes and in the vicinity of farmhouses have been cleared of surface stones and are farmed. This soil makes fairly good bluegrass pasture, although much of it is even too steep and stony for this purpose. Its best use seems to be for forestry.

WESTMORELAND SILT LOAM

The Westmoreland silt loam is a light-brown or yellowish-brown silt loam, 8 to 10 inches in depth, with a brownish-yellow, fairly compact, silty clay loam subsoil. In places where this type is developed near areas of Hagerstown soils the subsoil has somewhat of a reddish cast. Upon slopes where the top soil has been washed off, and in spots near outcrops of limestone and shale from which the type is derived, some small areas of silty clay loam with rather plastic yellow and yellowish-brown subsoils are included. Some small platy fragments of thin-bedded limestone and yellow and gray shale and chert gravel are encountered in places through the soil and subsoil, though not commonly in such abundance as to interfere with the farm work, and the bedrock is reached within less than 3 feet over some of the type.

This type occupies rolling to hilly country or fairly smooth ridges and slopes in the limestone upland sections of the area. It is well

drained, but the run-off on the steep slopes is excessive and some fields have become rather badly cut up by gullies.

The type occurs in association with the Frankstown and Hagerstown soils, and is small in extent, the largest areas being mapped just east of Keyser, on Walker Ridge, near Streby, scattered widely over Knobly Mountain, on Cave Mountain east of Shoock School, and on South Fork Mountain southeast of Rough Run.

Most of the type is used as pasture for cattle and sheep, and owing to the good bluegrass grazing which it affords and the abundance of water from springs it is well suited to this purpose. Practically all the type except the most hilly is cleared. About 15 per cent of it is farmed. General crops are grown, with yields but slightly less than on the Hagerstown silt loam. Alfalfa, soy beans, oats, and buckwheat produce well. Near Keyser and on Knobly Mountain some land is in apple and peach orchards. It seems to be well adapted to fruit growing, apples in particular doing well.

Since much of this soil occurs in the narrow limestone valleys at some distance from the main roads and is reached with some difficulty, it has not been developed as much as the Hagerstown silt loam. It is lower in organic matter and not quite as productive. Clovers, soy beans, or buckwheat should be grown more generally and turned under to increase the supply of organic matter in the soil. Applications of 250 to 300 pounds of acid phosphate per acre on small grains would prove beneficial. Light applications of lime should prove particularly valuable in renovating the pasture and improving the hay lands. When within 8 or 10 miles of railroad points, it affords good sites for the production of orchard fruits. Care should be taken to protect the steeper slopes from erosion. Terracing the slopes when used for cultivated crops would do much to prevent gullying. During the winter the slopes should always be kept in sod, small grains, or some other cover crop. The more hilly parts are better suited to forestry than to farming.

Land of this type varies in price, depending upon its topography, nearness to the main roads, and the value of the associated soil types. Prices range from about \$10 to \$50 an acre.

FRANKSTOWN GRAVELLY LOAM

The Frankstown gravelly loam consists of a light-gray to yellowish-gray or pale-yellow gravelly silt loam, 12 to 15 inches deep, with a deep-yellow to slightly pinkish gravelly loam subsoil. Both soil and subsoil contain a large quantity of whitish or light-yellow angular fragments of sandstone and chert and small thin fragments of very light weight, yellow or light-gray sandstone. In many places the type consists of a mass of these gravel fragments, with only a small proportion of fine soil materials. The Frankstown gravelly loam has a whitish appearance in fields and over most of it the chert is present in such abundance as to render cultivation difficult. Near areas of the Hagerstown soils there are patches in which the lower subsoil is a reddish-brown clay corresponding to the Hagerstown subsoil. Such areas, if they had been extensively developed, would have been separated as the Baxter gravelly silt loam. In patches the chert is dark gray or black in color and the gravel small.

Large areas of the Frankstown gravelly loam are mapped in the central and eastern parts of the area, where the type is associated with the Hagerstown and Westmoreland soils. It is conspicuously developed on Walker Ridge and Knobly Mountain. Here it occurs on the slopes and in places on the crests in a long, broken belt coextensive with the cherty sandstone and siliceous limestone outcrops. Other important areas occur on Patterson Creek Mountain between Petersburg and Russelldale, on the slopes of Cave Mountain, and in large areas on South Fork Mountain. It is also an important soil on New Creek Mountain near Keyser. One small area is mapped on Patterson Creek Ridge northeast of Alaska, in the northeastern part of Mineral County.

Included with this type are areas in which the soil material is a loam or sandy loam, this variation appearing in places where the sandstones have played an important part in soil formation. Other patches are so stony that they might be included with Rough stony land, but they are of much higher agricultural value and have therefore been included with the gravelly type.

This soil has a hilly topography and occurs principally on steep mountain sides and sharp ridges, but includes some fairly well rounded knobs and crests. The porous structure of the soil and subsoil gives thorough drainage and minimizes damage from erosion. On the other hand, soil moisture is maintained in favorable supply, owing to the mulch formed by the gravelly surface which tends to prevent loss of moisture by evaporation during dry spells. The soil has a high absorptive capacity for rainfall and retains much of it. Even in dry seasons when they suffer on many soils, corn and other crops continue green and vigorous on the Frankstown gravelly loam.

About 40 per cent of the type is cleared of the original forest growth, and most of the rest has been cut over and the most valuable timber removed. Originally the type supported an excellent growth of oaks, hickory, chestnut, ash, dogwood, and some maple.

Excellent corn, oats, and mixed clover and timothy hay are produced, although cultivation ordinarily is difficult, and on the steeper slopes most of the cultivation must be done by hand. Several fields have been successfully seeded to alfalfa. Potatoes also do well. Very little of this kind of soil is used for pasture, as it does not afford much grazing.

Probably half of the cleared land of this type is occupied by apple and peach orchards, which are said to do better than on any other soil in the area. Much of it is favorably situated for orchard sites, the air drainage being very good and injury from unseasonable frosts minimized. In the eastern counties of West Virginia and in the western part of Virginia the Frankstown gravelly loam is highly regarded as an apple soil and many large orchards have been successfully established upon it. In this survey the percentage of chert fragments seems to be larger than normal in the other counties. Until the fruit trees begin to bear, corn, soy beans, and some oats are grown between the rows. Fertilizers are usually applied to the orchards in cultivation, acid phosphate being most commonly used. It has been found advisable to apply some nitrate of soda when setting out the trees and also in small amounts around the trees every

year or two thereafter. Clovers are grown to some extent in the orchards as cover crops and for green manuring.

This soil is commonly low in organic matter, which can be added by turning under such crops as clover and soy beans. Crops respond well to applications of acid phosphate. Near Dixie, in the northern part of Mineral County, truck crops, including tomatoes, potatoes, and beans, are grown successfully on this type, and their production is recommended where this kind of soil is near markets. It is very well adapted to the growing of peaches and apples, particularly where the orchards can have an eastern or southeastern exposure and at elevations within the thermal belt. The steepest and most inaccessible areas should be allowed to remain in forest.

Land of this character in the uncleared and undeveloped condition sells for \$10 to \$20 an acre; in orchards it brings \$200 to \$400 an acre.

Frankstown gravelly loam, colluvial phase.—The colluvial phase of the Frankstown gravelly loam is formed by materials washed down or moved down by gravity from the Frankstown gravelly loam and Dekalb stony sandy loam and accumulated upon the lower slopes of the mountains. It is variable in texture and structure. Normally it is similar to the typical Frankstown gravelly loam, although as a rule it does not carry such a large percentage of chert and sandstone fragments on the surface and mixed with the soil and subsoil. In most areas it is a yellowish-brown silt loam or loam with a yellow or brownish-yellow heavy silt loam or silty clay loam subsoil. In many places, however, shale rock lies below the colluvial material at 18 to 24 inches, and on the steeper slopes and in gullies where the surface deposits have been eroded away the rock is exposed. In places where the Dekalb stony sandy loam occurs on the slopes just above this phase the soil is lighter in texture and contains more sand. This phase usually occurs near the mouths of the gaps and in places is influenced to some extent by wash from the limestone soils above the gaps.

The phase is developed principally on the east side of Knobly Mountain on the gently sloping to steep lower slopes along its base in an intermittent band from the vicinity of Knobly to near Maysville, on the west side of Patterson Creek Mountain, and a fairly large area along the east base of Cave Mountain near Pansy. It is of considerable extent but not of much agricultural importance. Most of it is cleared or partly cleared and used for pasture. Some of it near Knobly is improved with apple and peach orchards. Corn, wheat, and oats do fairly well, although they do not yield as well as on the typical soil.

HOLSTON SILT LOAM

The Holston silt loam consists of a light-brown silt loam, 8 to 10 inches in depth, underlain by a yellowish-brown or brownish-yellow silty clay loam. Below 20 to 24 inches the subsoil is a brownish-yellow silty clay loam containing mottlings of gray and rusty brown. Some rounded gravel fragments are encountered in the soil and subsoil. The material is derived principally from uplands consisting of Dekalb soils, and the soil material more nearly resembles the Dekalb silt loam than any other of the upland types.

Included are small areas of Holston loam, notably in the vicinity of Petersburg and along New Creek near Keyser. Some areas along the North Branch Potomac River have brown soils and subsoils and approach the Elk silt loam in character.

The Holston silt loam occupies high bottoms or terraces and represents old alluvial deposits. In the town of Keyser near the academy, at Hampshire, and north and south of Petersburg areas of this soil occur 50 feet or more above the present level of the bottom lands, with areas of residual material between. Along Lunice Creek and the South Branch of the Potomac near Petersburg, along New Creek near Keyser, and along Patterson Creek, this type includes areas which consist of a thin deposit of the alluvial materials upon the underlying shales. In places the mantle of deposited material has been eroded, exposing the shale beneath. Some patches have rounded waterworn gravel and small bowlders strewn over the surface and through the soil; such areas are marked on the map by the gravel symbol. In places the deposits are so shallow that their influence is small and they have been included with the surrounding soil types. The topography is nearly level to gently rolling and drainage usually well established.

Practically all this type has been cleared of its original forest growth and is farmed. A considerable area is used for pasture. The soil was selected by the early settlers as sites for homes because of its smooth topography and elevation above the bottoms, which were subject to overflow. The towns of Keyser and Petersburg are built largely upon this type of soil. It is fairly extensive and owing to its favorable topography is important locally for farming. The largest areas are around Petersburg where Lunice Creek and the South Branch Potomac River come together. Smaller areas lie along Mill Creek and its tributaries south of Petersburg, along Lunice Creek in scattered areas, along Patterson Creek from above Williamsport down to the North Branch Potomac River, along New Creek above Keyser, and in small areas well above the present stream level along the North Branch Potomac River. One fairly large high area is mapped in the bend of the river at Dixie.

A general type of farming is practiced upon the Holston silt loam. Wheat, oats, buckwheat, corn, potatoes, and grass are the chief crops. Some fruit is grown, mostly for home use. Wheat yields 12 to 18 bushels per acre, oats 20 to 40 bushels, buckwheat 20 to 30 bushels, corn 25 to 40 bushels, and hay 1 to 1½ tons per acre. Potatoes yield 150 to 200 bushels per acre. Soy beans are being adopted for a summer cover crop after wheat or oats and as a green-manure crop to be turned under in building up the soil. A few fields of alfalfa have been successfully established on land that had been limed. Near the towns this type is used to some extent for growing melons and other truck crops. Applications of lime have been found to be very beneficial on mowing and pasture lands, the effects being noticeable for a number of years in the more luxuriant stand and darker green color of the grass. The principal hay grasses are timothy, clover, and redbtop. Some bluegrass is found in pastures.

A system of farming that includes soy beans in the rotation after removal of the grain crops, the crop to be turned under to increase the supply of organic matter, is recommended for this type of soil.

Applications of lime, at the rate of 1 ton of the finely crushed limestone or 1,000 pounds of burnt lime per acre every five or six years, and of phosphate fertilizers at the rate of 200 to 300 pounds per acre are recommended for the grain crops. The soil is naturally retentive and the loss of added materials through leaching is relatively small.

Land of this type for farming sells for prices ranging from \$40 to \$80, and near the towns of Keyser and Petersburg it brings \$100 or more an acre.

HUNTINGTON LOAM

The Huntington loam consists of a brown loam passing at 8 to 12 inches into a light-brown loam or silt loam. Variations consisting of a slightly pinkish or light reddish-brown soil, lying along the upper course of the South Branch Potomac River are included; these owe their color to material washed from the Upshur and Hagerstown soils. In places there is a remarkable uniformity in texture and color throughout the soil and subsoil. This type occurs in first bottoms of streams which receive drainage waters from uplands consisting of limestone, sandstone, and shale rocks. In places the land is subject to overflow, and a deposit of fresh alluvium tends to maintain its fertility. Some of it, however, has not been flooded for many years.

Included in this type, in the wide bottoms of the South Branch Potomac River near Petersburg, are narrow ridges or hummocks of fine sandy loam. Along the North Branch Potomac River in the vicinity of Keyser and at the bends in the river farther downstream the type consists of a rather light loam and contains fairly large areas of Huntington fine sandy loam. Next to the stream there commonly occurs a narrow strip of fine sandy loam or fine sand. In the northwest part of the area the bottom soil along the North Branch Potomac River, from near the mouth of Savage River up to the vicinity of Bayard, is a light-brown loam derived entirely from Dekalb soils. Such soil in reality is Pope loam and would have been so mapped if its total area had been larger. These various soils have been included with the Huntington loam, owing to their small extent. Associated with this type and lying next to the uplands are small, poorly drained strips, which have been mapped as Atkins silty clay loam.

The Huntington loam is the principal soil in the bottoms along the North Branch Potomac and South Branch Potomac Rivers, and is also relatively extensive along New Creek. It has a flat to very gently undulating or slightly hummocky topography. It is subject to overflow, but, owing to the open structure of the subsoil, is well drained between flood periods.

Practically all the type is under cultivation. Corn is the most important crop, the fields in many cases being planted to this crop for several years in succession. Corn yields 30 to 40 bushels per acre and in places as much as 50 bushels. Other important crops are wheat, oats, soy beans, potatoes, and hay. Wheat produces 12 to 15 bushels and oats 20 to 35 bushels per acre. Oats have a tendency to lodge. Excellent yields of mixed timothy and clover hay are obtained. In the vicinity of Petersburg and Keyser this soil is used in the production of vegetables, berries, and melons, and

its light-textured, easily cultivated surface soil makes it particularly well suited to trucking. It responds quickly to applications of fertilizers and manure, and these are necessary for the maintenance of fertility. Although it is derived in part from wash of limestone uplands, applications of 500 to 1,000 pounds of burnt lime per acre every five or six years have proved beneficial. Pasture land supports an excellent stand of bluegrass and timothy. Several orchards have been set out on this type, but owing to its low elevation unseasonable frosts frequently injure the fruit buds in spring, so that it can not be recommended for tree fruits. Silos are common, and dairying and cattle raising are extensively followed. A number of farmers utilize the adjacent upland fields for pasture, depending on the bottom land for the production of most of the grain and hay. Alfalfa catches readily upon this soil and yields well in the few patches where it has been seeded.

Where subject to overflow this type requires only light application of fertilizers. The content of organic matter is in general fairly high, but for heavy corn production it must be replenished by turning under barnyard manure or an occasional cover crop. Hay lands are improved by occasional liming.

Land of this kind ranges in price from \$60 to more than \$100 an acre, depending upon the location and value of the land on the adjacent uplands. Near Petersburg, in the wide bottoms of the South Branch Potomac River, farms of this soil have sold for \$200 or more an acre. This higher price, however, is due almost entirely to the nearness to town and to exceptionally good farm buildings.

HUNTINGTON SILT LOAM

The Huntington silt loam is a dark-brown mellow silt loam, 12 to 15 inches deep, underlain by a subsoil of brown clay loam or silty clay loam. Most of it is subject to periodical overflows that deposit new materials and thus maintain the fertility of the soil. In places where the stream channel has shifted back and forth across the bottom the subsoil is variable in texture and may consist of sandy loam or gravelly loam. Near the stream banks in places are narrow strips of loam and fine sandy loam of too small extent to be shown separately on the map.

At Williamsport and just east of Gerstell where the waters flow out of springs in the limestone rocks, deposits of marl have developed, the one at Williamsport in particular being of considerable thickness. These marl deposits have a thin covering of Huntington silt loam and are included with this type because of their small extent. Small areas of gravelly material corresponding to River-wash are also included with this type along some of the minor streams.

The Huntington silt loam is developed in the first bottoms along the North Branch Potomac River near Potomac, Md., and Cedar Cliff (Pl. XXIII, fig. 2) and in scattered areas farther downstream, to a considerable extent along Patterson Creek below Williamsport, and along Mill Creek and its branches south of Petersburg. (Pl. XXIII, fig. 1). Small strips also are mapped along Lunice and New Creeks.

This type has a level or slightly undulating topography. The depressions or swales next to the uplands, which are usually poorly

drained and mottled gray and yellow, are mapped as Atkins silty clay loam and are of common occurrence along Patterson Creek from the vicinity of Burlington to its mouth. Where the adjacent uplands consist of Dekalb shale loam the bottom soils next to the slope are usually influenced to a considerable extent by material such as shale chips and yellowish silt loam washed out of the uplands.

The typical Huntington silt loam is well drained, but retains sufficient moisture so that crops do not suffer in seasons of drought. It is a strong and productive soil. All of it has been cleared and most of it is used for the production of corn and hay. Some oats, wheat, and soy beans are grown, and a few patches have been seeded with alfalfa. One patch of 2½ acres east of Arthur produced about 10 tons of alfalfa hay during one season in four cuttings. In this case about 250 pounds of acid phosphate per acre had been applied to the land just before sowing the seed. Corn on the same land has produced as high as 55 bushels per acre. Along Patterson Creek the yields, depending somewhat upon the season, have been 20 to 35 bushels of corn, 10 to 18 bushels of wheat, and 30 to 35 bushels of oats per acre. Oats and wheat generally produce much straw and show a tendency to lodge. Buckwheat and soy beans are grown to some extent as summer cover crops. This land is frequently planted in corn several successive years, and hayfields are maintained for three or four years and heavy cuttings removed before the sod is broken again. It can withstand such farming methods because its fertility is replenished by overflow. Near Keyser, fields including Huntington silt loam are devoted to truck crops.

The marl deposits could profitably be applied to the uplands which need lime, although heavier applications than of the burnt lime or ground limestone must be made, because the marl has a much lower content of lime carbonate.

The Huntington silt loam, being subjected to occasional overflows, is maintained by the alluvial deposits, and little in the way of commercial fertilizers is needed. The use of acid phosphate in growing wheat is usually profitable. Being well suited to the production of corn and grass, these bottom lands should be devoted largely to these crops, the uplands being used for the small grains. Alfalfa could be successfully grown upon the higher and better drained parts of the type, which are not subjected to overflows over long periods.

Farms which include considerable of the Huntington silt loam in the bottom fields sell for prices ranging from \$60 to \$150 an acre.

ATKINS SILTY CLAY LOAM

The Atkins silty clay loam is a dark grayish-brown heavy silt loam, 4 or 5 inches deep, over a subsoil consisting of steel-gray silty clay loam which passes at 15 to 18 inches into a mottled light-gray, yellow and rusty-brown sticky clay. It is a first-bottom soil, and much of it is subject to overflow. In places where it is associated with the Pope and Huntington soils the surface is a brownish or brownish-yellow silt loam and the subsoil is not as heavy as typical. This variation lies along the upper part of Patterson Creek and its North Fork. Another variation is a dark-gray to almost black heavy clay with a mottled steel-gray and yellowish-brown silty clay sub-

soil. This is found in patches along Lunice Creek between Petersburg and Arthur and on Patterson Creek near Burlington. Next to the hill slopes the material is in part of colluvial origin, and near the Dekalb shale loam it is composed to some extent of small shale chips.

This type occupies most of the bottom lands in the Allegheny Mountain section where the adjoining uplands are principally silt loams and silty clay loams. It occurs along Lunice Creek north of Petersburg, on Hoglan Run, throughout the length of the bottoms along Patterson Creek, and in scattered areas along New Creek. It occupies low, rather poorly drained areas next to the uplands, with areas of Huntington soils developed on the better drained parts next to the stream channel.

The Atkins silty clay loam is imperfectly drained and during much of the year is too wet for farming. Practically all the merchantable timber has been cleared off. Most of the land is used for hay production or for pasture. It supports a fairly good sod of wild glade grasses and poverty grass, with some redtop and timothy. Corn is the principal cultivated crop and yields 25 to 40 bushels per acre. On the Allegheny Plateau corn rarely matures, the season being too short. On the better drained parts of the type oats yield 25 to 40 bushels and wheat 12 to 15 bushels per acre. Acid phosphate is used on small grains to some extent.

Before the Atkins silty clay loam can be brought to its highest state of productiveness it must be thoroughly drained and provision made to carry off excess water that accumulates during wet seasons. The land under cultivation has been drained by ditches. Applications of lime at the rate of 2 to 3 tons of crushed limestone or 1,000 to 1,500 pounds of the burnt stone per acre will prove valuable in the work of reclamation. Lime also benefits the pasture land and hayfields, producing a more vigorous growth of tame grasses and aiding them to outgrow the less desirable wild grasses and weeds. The supply of organic matter, except in the darker areas, is low, and plowing under a sod or a crop of soy beans will result in increased yields.

The price of this type of land depends on the location and on the nature of the other soils in the farm. Farms containing it range in price from \$40 to \$100 an acre or more. In the Allegheny Mountain section the price is governed by the value of the underlying veins of coal.

POPE SILT LOAM

The Pope silt loam is a first-bottom soil occurring along streams which rise in and receive practically all their drainage from sandstone and shale uplands. It is mapped along Abram Creek and its tributaries on the Allegheny Plateau and in the narrow bottoms of the small streams that drain the large belt of Dekalb shale loam in The Ridges. It consists of a brown silt loam, 12 to 15 inches deep, with a brownish-yellow loam, silt loam, or silty clay loam subsoil. It resembles the Huntington silt loam in appearance but ordinarily is not as productive. It includes small areas of loam and fine sandy loam and patches consisting largely of gravelly loam stream wash. In The Ridges some of this type is mottled

with gray in the lower subsoil and is somewhat plastic in structure, closely resembling the typical Atkins subsoil.

The Pope silt loam has a flat topography and some parts of it are poorly drained. Most of it has been cleared of the original forest which consisted of sycamore, beech, poplar, maple, oaks, and other hardwoods. A large part of the land is now devoted to pasture. When farmed it is generally used for the production of corn or grass. Corn yields 25 to 40 bushels per acre. Practically all this type mapped on the Allegheny Plateau is grass or pasture land. The hay consists in part of wild grasses and in part of redtop and timothy, with here and there some red clover. Clovers do not seem to thrive unless the land is limed. Oats, wheat, and soy beans are minor crops. Bluegrass and "whitetop" constitute the principal pasture grasses. Little fertilizer or lime is applied.

In building up this soil for crop production the most important steps are the addition of organic matter and lime. This soil is lower in organic matter than the Huntington silt loam, and incorporation of stable manure or plowing under of a green cover crop, preferably a legume such as soy beans, would do much to increase crop yields.

ROUGH STONY LAND

Rough stony land includes rough, stony, and broken areas that, under present conditions, are unsuited to farming. Some of the included area consists of cliffs and rock outcrop and very stony mountain tops and slopes. Extensive areas of this character lie on North Fork, Cave, and New Creek Mountains, along the east face of the Allegheny Front and on the Plateau, along Stony River, and bordering the North Branch Potomac River on the west and north-west boundaries of the area. This land along contacts with the Upshur soils includes some areas in which the fine silty soil between the stones consists of Upshur material. Such areas, if cleared of their forest cover, would afford some grazing.

Practically all the area mapped as Rough stony land remains in forest or is in the condition of cut-over land. Most of it is held in large tracts by lumber and coal companies.

SUMMARY

Grant and Mineral Counties are in the eastern part of West Virginia and comprise 808 square miles, or 517,120 acres. Grant County contains 478 square miles and Mineral County 330 square miles. They lie in the Appalachian Mountain region, and the topography varies from rolling to mountainous. The mountains and ridges extend in a northeast-southwest direction, and the general flow of streams is to the northeast, following the general slope of this region. The area is drained into the North Branch Potomac River. The bottoms are narrow except in a few places along the larger streams. Old alluvial terraces are developed at bends of the large streams or at points where the tributaries flow into them. The Allegheny Plateau section lies at an average elevation of about 3,000 feet above sea level, the mountains to the east are 500 to 1,000 feet lower, and The Ridges in the eastern part have a general elevation ranging between 1,000 and 1,200 feet above sea level.

Mineral County in 1920 had a population of 19,849, of which 55.5 per cent is classed as rural. Keyser, the county seat of Mineral County, with a population of 6,003, is the largest town in the area. The population of Grant County in 1920 was 8,993, and is all classed as rural. The Baltimore & Ohio and the Western Maryland Railroads and their branches afford good shipping facilities to the eastern markets. Coal mining is an important industry in the western part of the area, and lumber is produced in considerable quantities in the mountainous sections. Washington, Pittsburgh, and Baltimore are the principal outside markets.

The climatic conditions of the area vary with the elevation, the high Allegheny Plateau having cool summers and cold, severe winters, while the lower-lying ridges and valleys have warm summers, with brief hot spells, and winters less severe than the plateau. The average growing or frost-free season varies from four to five months.

The agriculture of the county consists for the most part of general farming and livestock raising. Apples and peaches are grown commercially on the chert and shale ridges in the northern and eastern parts of the area. Of the field crops hay and forage occupy the largest acreage. The other principal crops are corn, wheat, oats, buckwheat, and potatoes. Trucking and dairying are carried on near the larger towns. The use of fertilizers is becoming general, and the local limestone formations are being developed to some extent as a source of agricultural lime.

The soils of Mineral and Grant Counties may be grouped into three classes for agricultural purposes. The first group comprises the smoother upland soils having a rolling to hilly topography. Such soils are adapted to orcharding and to the pasturing of cattle and sheep. The second group includes the first-bottom and second-bottom soils, which in the main are quite productive. These soils are best suited to the production of corn, hay crops, and pasture grasses. The third group of soils occupy the rough mountainous areas, which are generally more or less stony and too steep for profitable cultivation. Such areas are best suited to forestry, although patches here and there could be used for orchards or pastures.



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Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the

Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at http://www.ascr.usda.gov/complaint_filing_cust.html and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by:

- (1) mail: U.S. Department of Agriculture
Office of the Assistant Secretary for Civil Rights
1400 Independence Avenue, SW
Washington, D.C. 20250-9410;
- (2) fax: (202) 690-7442; or
- (3) email: program.intake@usda.gov.

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