

SOIL SURVEY OF THE CLARKSBURG AREA, WEST VIRGINIA.

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DESCRIPTION OF THE AREA.

The Clarksburg area is situated in the north-central part of the State of West Virginia and comprises Harrison and Doddridge Counties. These counties adjoin each other on an east and west line. On

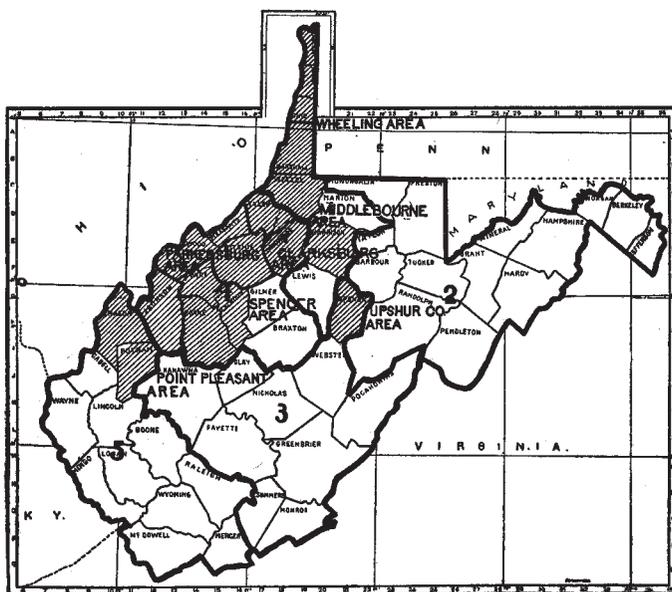


FIG. 26.—Sketch map showing location of the Clarksburg area, West Virginia.

the north the area is bounded by Tyler, Wetzel, and Marion Counties, on the east by Taylor and Barbour Counties, on the south by Upshur, Lewis, and Gilmer Counties, and on the west by Ritchie and Tyler Counties. Doddridge County contains about 348 square miles and Harrison about 433 square miles, a total area of 781 square miles, or 499,840 acres, covered in this survey. Previous soil surveys touching the Clarksburg area are the Middlebourne area, consisting of Marshall, Wetzel, and Tyler Counties; the Parkersburg area, of which Ritchie County forms part of the western boundary; and the Upshur County area, lying on the south.

The topography of Harrison and Doddridge Counties is broken and hilly, consisting of an elevated region much dissected by erosion act-

ing through a long period of time, forming a part of the Allegheny Plateau, a physiographic subdivision of the Appalachian province. In the western part of Doddridge County (the lowest portion) this plateau has a general elevation of about 1,000 to 1,100 feet above sea level, with some higher points on the ridges reaching 1,200 to 1,300 feet. To the east and southeast the general level of the plateau rises to 1,400 or 1,500 feet, with points 1,600 and 1,700 feet high frequently occurring on the higher ridges. The culminating point is reached in the extreme southeast corner of Harrison County, on the Upshur County line, where an elevation of 1,840 feet is reached. The lowest point is on the northwest boundary, where Middle Island Creek leaves Doddridge County on the Tyler County line, the elevation being about 730 feet. There is thus a range of 1,100 feet in elevation within the county. Narrow V-shaped valleys from 300 to 500 feet below the general level of the uplands have been eroded in the plateau by the main streams.

The country rock consists of nearly horizontal strata of interbedded shales, sandstones, limestones, and coal seams of varying hardness and resistance to weathering and erosive agents. All except the sandstones weather rapidly, the shales and limestones forming smooth but rather steep slopes, while the sandstone where massive beds outcrop forms bluffs or precipitous cliffs. Quite commonly the hills and ridges are marked by a series of benches, due to the different rates of weathering of these rock beds. The western part of the area is much more broken than the eastern, the topography being steep and almost mountainous in character. In the eastern section, comprising a large portion of Harrison County, the underlying rock beds are largely limestones and calcareous shales, with very little sandstone, which has given a smoother contour to the hills. These are rounded and often dome shaped, with long, gentle slopes. Occasionally the hills rise from benchlike slopes, as in the western part of the county.

The area lies wholly in the drainage basin of the Ohio River, the line between Harrison and Doddridge Counties following a main drainage divide. To the east practically all of Harrison County drains into the West Fork River, a tributary of the Monongahela. This is the largest stream in the area and flows in a northerly course through the center of Harrison County. The main drainage outlet of Doddridge County is to the northwest by Middle Island Creek and its tributaries, which latter reach the extreme southeast corner of the county. Middle Island Creek empties into the Ohio River near St. Marys, in Pleasants County. The drainage of the extreme southwest part of Doddridge County forms in part the headwaters of Hughes River, which, flowing to the southwest emp-

ties into the Little Kanawha, which in turn joins the Ohio at Parkersburg. The drainage system is formed by a network of larger streams and smaller branches. The latter in their upper courses fall rapidly; the former are sluggish and have meandering courses. The large streams are perennial, but the small creeks and branches are usually dry from late summer until the fall or winter rains begin. The slopes being steep, the surface run-off is rapid, and the streams are soon filled to overflowing, often causing destructive floods, usually of short duration.

Settlement of the area was begun in 1773, but not until after the close of the Revolutionary War was there any great influx of settlers. Settlements in different parts of the area, located along the State roads that had been built, commenced about 1800. All the pioneers were from Maryland and Virginia and mostly of Scotch-Irish stock. At the present time practically all the rural population and a large part of that in the towns are the descendants of these early settlers. Within the last 20 years, and especially in the last decade, there has been a considerable influx of foreigners into Harrison County. The Slavs and Italians, who form the larger part of the labor employed in the coal mines and mills, are the dominant nationalities.

Harrison County, according to the Federal census of 1910, has a population of 48,381, showing an increase of about 21,000 inhabitants in the last 10 years. The county has been gaining rapidly for the last 15 years, the census of 1890 showing a population of 21,919. The rapid strides made by the county began with the development of its natural resources, oil and gas, the extension of coal mining, and finally manufacturing, because of the quantity and cheapness of fuel supplies.

Doddridge County, which until the development of its oil and gas fields was entirely an agricultural county, has changed little in population in the last three decades. The present population is 12,672.

Clarksburg, the county seat of Harrison County, is the largest town in the area, having a population of something over 10,000 within its corporate limits, but is, in fact, a city of over 25,000 inhabitants, including its suburban district. It is one of the most important manufacturing points in the State, having a large tin-plate mill, chemical works, and a number of glass factories. The city is an important railroad center.

From Clarksburg down the West Fork River there is a considerable population around the numerous coal mines. The largest place is Shinnston. Salem, 15 miles west of Clarksburg, on the Baltimore & Ohio Railroad, is the second largest town in Harrison County and the area. It has a population of 2,169. It, too, is becoming a manu-

facturing town, the principal manufactures being glass products. West Union, the county seat, is the largest town in Doddridge County.

The county has exceptionally good railroad facilities. A main trunk line of the Baltimore & Ohio Railroad crosses the area centrally east and west, affording through service east to Baltimore, Washington, and New York, and west to Cincinnati and St. Louis. A branch of the Baltimore & Ohio follows the West Fork River, giving an outlet to the coal mines along the river; to the north it extends to Pittsburgh and south to Weston and Richwood. The West Virginia Short Line extends from Clarksburg northwest through Harrison County, connecting with the Ohio River Division of the Baltimore & Ohio Railroad at New Martinsville. An electric line offers an hourly service for passengers, freight, and express between Clarksburg and Fairmont, the latter about 30 miles from the former. The urban service of Clarksburg reaches all its suburbs, and an electric line is in process of construction from Clarksburg through West Milford to Weston, in the county south of Harrison.

The county roads are numerous, usually following the stream valleys and rising only where they cross over gaps into other valleys. Some roads are located on the tops of the narrow, winding ridges. In parts of the area the hill roads are very steep, but they are usually located with reference to grades.

The rural free delivery of mail is general, and rural telephone lines connect most farm houses with the villages and towns.

CLIMATE.

The climate of Harrison and Doddridge Counties is temperate and salubrious, and well adapted to successful farming of general crops.

The area is situated in the middle section of the State, and its climate is intermediate between that of the Ohio Valley section on the west and of the mountainous plateau region immediately to the east.

Climatological observations for the area are not extensive, the data available being confined to records taken at Lost Creek in the southern part of Harrison County and at Central Station in the western part of Doddridge. The records of the latter station are incomplete. The data for these stations are given in the accompanying tables. By reference to them it will be seen that the mean annual temperature for the area is about 53° F. The summers are comparatively pleasant and the temperatures not unusually high, the highest recorded being 99° F. in July.

The winters, however, are marked by extremes, though the average seasonal temperature for the winter months is at the freezing point. During any of the winter months the temperature is liable at times to

go below zero, and an absolute minimum of -35° has been recorded. Such extremely cold spells are not common nor of long duration. The snowfall averages 26.7 inches. As the soils are generally of a heavy character, their tilth is improved by the freezing and thawing, and where it is practicable fall and winter plowing is advisable. The average date of last killing frost in spring is April 29 and of the first in autumn October 2. Frosts may occur as late as the latter part of May, but this is unusual. The season is always long enough to mature all the crops grown.

The mean annual rainfall amounts to 43.5 inches, and varies little either way from this average for the wettest and driest years, as is shown in the table. The early part of the growing season has the heaviest rainfall, which lasts usually until cultivated crops have reached maturity. In the late summer and fall months the precipitation is considerably less and droughty conditions often prevail, making it difficult to get fall-sown crops, such as grains and grasses, started.

Normal monthly, seasonal, and annual temperature and precipitation at Lost Creek.

Months.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	$^{\circ}F.$	$^{\circ}F.$	$^{\circ}F.$	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
December.....	34	71	- 7	3.7	2.5	2.4	5.2
January.....	34	70	-20	3.1	2.5	5.6	6.4
February.....	28	80	-35	3.5	6.5	1.9	5.5
Winter.....	32			10.3	11.5	9.9	17.1
March.....	44	81	- 1	4.6	6.6	7.5	6.2
April.....	51	91	2	3.3	4.0	2.9	1.8
May.....	62	93	25	4.2	3.2	4.1	0.0
Spring.....	52			12.1	13.8	14.5	8.0
June.....	69	97	36	4.1	4.2	1.8	0.0
July.....	73	99	40	5.7	2.4	4.5	0.0
August.....	71	97	41	3.6	2.1	9.3	0.0
Summer.....	71			13.4	8.7	15.6	0.0
September.....	66	97	31	2.8	1.6	2.3	0.0
October.....	55	91	18	2.0	2.2	4.9	T.
November.....	44	78	3	2.9	2.9	2.6	1.6
Fall.....	55			7.7	6.7	9.8	1.6
Year.....	53	99	-35	43.5	40.7	49.8	26.7

Average date of last killing frost in spring, Apr. 29, and of first in autumn, Oct. 2.

Normal monthly and annual temperature and precipitation at Central Station.

Month.	Temperature.	Precipitation.	Month.	Temperature.	Precipitation.
	° F.	In.		° F.	In.
January.....	32.7	3.32	August.....	72.0	2.97
February.....	29.1	3.06	September.....	66.8	2.75
March.....	43.8	3.31	October.....	54.8	2.29
April.....	50.5		November.....	41.8	2.68
May.....	62.3	3.53	December.....	33.1	3.38
June.....	69.8	4.26			
July.....	73.7	4.24	Year.....	52.5	3.25

AGRICULTURE.

The early settlers paid little attention to agriculture. Their main food crop was corn, of which they tried to produce a sufficient quantity for home consumption.

Live-stock raising dates back to the settlement of the region, sheep being bred for wool and cattle for beef and tallow. The stock were turned loose to forage for themselves and found abundant sustenance in the wild pea vines growing in the woods.

Sheep raising proved particularly profitable to the early settlers, climatic conditions being favorable and the output easily and conveniently marketed at points outside the area. Cattle were sold at outside markets on the hoof, Baltimore taking most of the output of the region. By 1890 this industry had grown to a considerable volume, lambs being shipped extensively to outside markets, in addition to wool and beef.

The development of agriculture was slow, keeping pace with the extension of the settlements. No effort was made to maintain the productiveness of the fields, which when exhausted were soon seeded naturally to bluegrass, making excellent pasture.

The growing of small grains had acquired considerable importance by 1870, wheat, oats, and rye being the most important crops. This continued up to 1900, although the rapid increase in population made the output barely sufficient for home consumption.

Tobacco was grown to the extent of 17,098 pounds in Harrison County and 17,568 pounds in Doddridge County, according to the census of 1870, most of which was for home consumption. Since that time its cultivation has gradually decreased, except for small patches.

The development of the oil and gas resources of the two counties, which began soon after 1890, has taken much attention from the farms. The labor has gone into this field and owners of lands have curtailed their farming operations, depending more upon the royalties and rentals they receive, which far exceed farm profits. The

agriculture of the two counties may be said to be practically at a standstill. The exhaustion of some of the oil and gas deposits has made it necessary for many to return to their farming. Agriculture is confined at present to the staple crops in the valleys and pasture lands on the steep hillsides. Corn is the staple crop of both counties, but its production is not equal to the requirements of the farms. Wheat and oats are grown, the production, according to the census of 1900, being higher than ever before. The census of 1870 shows some buckwheat, but no mention of this crop is made in subsequent reports. The present production is limited to a few scattered patches. The acreage in grasses for hay is slightly greater than that used for corn in Doddridge County, while in Harrison County the acreage in grass is more than twice that given to corn. In Doddridge County the average yield of hay is shown by the Twelfth Census to be 1 ton to the acre. In Harrison it is somewhat larger, owing to the better adaptation of the limestone soils and of the bottom-land types influenced by these soils to the grasses. Timothy is the principal grass cut for hay, although clover is often grown with it. Some bluegrass is also cut. The acreage in permanent pastures is not given, but is relatively high, as the larger part of the cleared hilly lands are used for grazing. Bluegrass seeds naturally on most of the soils, but does particularly well on the limestone land, the Westmoreland silty clay loam, and the red areas of the Upshur clay. Upon the other soils derived from gray and brown shales and sandstones bluegrass does not do so well, its life being short, on the average not more than 10 years. At the end of this period it is generally necessary to return to cultivated crops and then reseed. When the bluegrass begins to run out the native wild grasses and broom sedge come in, and while these make pasturage they are much less valuable than bluegrass.

On the limestone lands in Harrison County the bluegrass holds better and grazing cattle is the most important part of the agriculture. The comparatively large extent of the limestone lands in Harrison County has made it one of the leading grazing counties of the State.

Until quite recently the cattle were practically all of grade stock. Progressive cattlemen have recently introduced improved strains of the Hereford and Shorthorn breeds, the former being the most popular. Besides the stock raised on the farms, considerable numbers are brought in from outside sections. Pocahontas County supplies the greater part of these, but some are obtained from Ohio and even from the West. Where young cattle are taken they are fed through the winter months on the hay cut on the farm and with grain. One to two seasons put the cattle in prime condition. Those not used for local consumption are shipped to Pittsburgh or Baltimore markets and even exported to Europe.

Every farmer keeps cows for the home supply of milk and butter, and there are numerous dairies around Clarksburg, which are inadequate to supply the local demand. The Jersey is the favorite dairy breed, though there are some Holsteins. The latter are gradually displacing the grade stock.

Sheep are to be found scattered over the county, a few on a farm, there being no large flocks. The object is production of spring lambs. The rough lands are better adapted to sheep than to larger animals. Sheep raising is said to be profitable and an extension of the industry would seem to be warranted. The objection to sheep is that they crop the grass too closely. This could be remedied by giving flocks a larger range. The droppings of the sheep do much to fertilize the pastures. No particular effort is made to maintain a certain breed. The Cotswold and Shropshires are most common.

Hogs are raised on most farms, but not more than enough to supply the family needs for pork and lard.

Rotation of crops is not strictly followed, except on the uplands, where the pastures are giving out and it is desired to reseed them. The steep slopes can not be kept for any length of time in cultivated crops on account of washing. Where sod land is plowed the roots will hold the soil for two corn crops, which should be followed either by wheat or oats, sown with timothy and clover or bluegrass. The hay crop is cut as long as the yields warrant it, and in the meantime the bluegrass has come in and the land is turned to pasture. In harvesting the hay crop the hay is put into small stacks at convenient points in the fields and fenced around so that cattle can be pastured. A great waste of hay results from exposure to the weather. Rarely are there hay barns or sheds on the farms.

On the slopes contour cultivation is necessarily followed. There are many hillsides where the shelf lands are in cereal crops, while the steeper slopes are under grass. This is a practice to be commended.

The manure made on the farm is applied generally to the valley fields, very rarely being used on the upland slopes. Grass lands very rarely receive any fertilization.

A few years ago commercial fertilizers were used for the different crops, but the practice has been discontinued entirely. Pastures could be greatly improved and rejuvenated by applications of phosphatic fertilizers and some form of lime. Applications of ground phosphate rock (floats) and slag, as well as acid phosphate, would much improve the soil, while frequent applications of finely ground limestone would prove of great benefit.

In fields so situated as to make the hauling and application of barnyard manure difficult, green manuring is recommended. The best crops for this purpose are the legumes, which include clover,

vetch, cowpeas, and soy beans. There is little or no attempt on the part of the farmers to make or save barnyard manure.

There has been little change for a number of decades past in the size of the farms in the two counties. The average in Harrison County is 116.7 acres and in Doddridge County 107.6 (Twelfth Census). It is further shown from the same source that in Harrison County 81.5 per cent of the farms are operated by the owners and in Doddridge County 75.7 per cent. Renting is not a common practice, the terms of rental varying with circumstances.

Under present conditions little farm labor is required, except at harvest time. Labor is scarce and commands high wages, owing to the demand for hands in the oil and gas fields. The coal mines and unskilled labor of the mills do not draw upon the farms, as this work is all done by immigrants, who seldom go to the farms. Not only have land values risen because of the presence of oil or gas or workable seams of coal, but even the ground leases have increased. Values range from \$10 for rough, hilly farms to \$100 and more an acre for the desirable farms.

As has been intimated previously, the sale of coal rights and the royalties and rentals for oil and gas rights have put many of the landowners in easy financial circumstances. The result is that good houses are being built even in most remote sections and the surroundings generally improved, resulting in an appearance of prosperity often not at all in keeping with the character of the land.

While interest is largely centered on the development of the mineral resources, there is ample opportunity for successful agriculture along a number of lines. As so much of the land is best suited to grazing, this industry should be developed. Effort should be made to improve the pastures, which, with an increase in grain crops, would enable more cattle to be kept on the same land, while the area of the pastures should be extended wherever practicable. Sheep raising, with lambs for market, could also be more generally taken up. The local demands for dairy products would warrant the further extension of dairying, especially near the towns and mines. Poultry raising would for some be a profitable venture. Vegetables are in such demand that trucking could be profitably specialized. Considerable development could be made along this line without affecting the market. The terrace soils along the West Fork River in the vicinity of Clarksburg and below near the mining settlements are suitable for truck crops. Small fruits would also succeed on these soils and would find a ready market.

There is also an opportunity for commercial orcharding in the area, particularly in the production of apples, on the accessible hillsides. The trees must be carefully tended and spraying would be necessary. Eastern and northern exposures should be selected.

Finally, but not the least in importance, there is opportunity for successful and profitable forestry. Much of the rougher lands could be reforested and handled systematically. The growing of locust for posts may be suggested as a profitable source of income. This tree grows everywhere on the hillsides. The original forest growth was removed rather destructively and comparatively little revenue obtained, but from the present forested areas and those that might and should be reforested a considerable income may be expected in a reasonable time.

SOILS.

Exclusive of areas of Rough stony land, 11 types of soil were encountered in Harrison and Doddridge Counties. These may be divided into two classes according to origin—residual soils and transported or sedimentary soils. The first named include the upland types and the transported or sedimentary soils the first-bottom and terrace soils of the valleys.

The residual upland soils cover approximately 90 per cent of the area surveyed. They are largely of a silty texture on the surface, with clay loam, silty clay loam, and clay beneath. Texturally they are all very similar, the differences being largely in color and agricultural value, as determined mainly by the kind of rocks from which they are derived and by their general topography.

The rock formations, of Carboniferous age and sedimentary origin, comprise a great variety of shales, sandstones, and limestones, carrying seams of coal. The materials forming these rocks were laid down horizontally, but with the uplifting of the land the beds were folded or arched. Subsequent erosion of these folds has exposed in different places sections of the different strata aggregating over 2,000 feet. The formations have been separated and correlated. They form the upper three of the five geological divisions of the Upper Carboniferous. From the top of the most recent stratum downward they are, in order of succession, the Dunkard, Monongahela, and Conemaugh.

The Dunkard series has an estimated thickness of 1,135 feet, and its outcrop covers all of Doddridge and the western part of Harrison County. It is composed of a series of gray and brown shales and sandstones, in which thin beds of red shales and shaly limestones occur.

The weathering of the Dunkard series of rocks gives rise to three soil types. The principal type is the Meigs clay loam, the most extensive soil in the area. Owing to the number of rocks entering into its formation, this type is variable in character, including grayish,

light-brown, and Indian-red soils. Areas of the Indian-red clay, which is derived from red shale, where large enough to map, were separated under the name of Upshur clay.

The intermingling of the red Upshur material with the grayish soil derived from the lighter-colored shales and sandstones constitutes one of the conspicuous variations in the Meigs clay loam. The topography of the Meigs clay loam is in the main steep and broken, making the type useful for little but grazing and forestry.

The Dekalb silt loam occurs on the level tops of ridges and their spurs. This type is derived from sandstones and some shales which have resisted weathering to the extent of standing usually as the caps of ridges. Areas of the Dekalb silt loam are found over the Monongahela and Conemaugh formations as a result of like conditions. The soil is one of only ordinary productive power, and rather poorly adapted to grass.

In the western part of Doddridge County there occurs a type—the Upshur silt loam—which differs from the Dekalb silt loam in having a red clay stratum in the lower subsoil. This represents material derived from red shale.

The strata of the Dunkard series rise gradually to the east in the eastern portion of the area and have been eroded sufficiently to uncover the formations included in the Monongahela and Conemaugh. The upper part of the Monongahela is of the same character as the Dunkard; that is, it consists of gray and brown shales and sandstones, with some interbedded red shales. These strata give areas of the Meigs clay loam. They occupy the sharp, wooded peaks of the hills and ridges in the limestone sections of Harrison County. Only the upper 100 feet of the Monongahela formation is of this character. The remaining 280 feet, as well as the upper part of the Conemaugh formation, consists largely of interbedded limestones and calcareous shales, giving rise to the limestone lands of this section of the State. The material, which is predominantly silty, has been given the name Westmoreland silty clay loam.

The Conemaugh outcrops occur only in the eastern part of Harrison County, where they are brought to the surface by the Chestnut-Ridge anticline or fold. The total thickness of the outcrop is 495 feet.

Below the Clarksburg limestone, which represents essentially the base of the interbedded limestone, shale, and sandstone strata giving rise to the Westmoreland soil, the limestones and red shales are thin and unimportant, so that the soil is largely the weathered product of gray and brown shales and sandstones. These represent the Dekalb silty clay loam, a grayish clay loam to silty clay loam, underlain by light-yellow clay loam or clay.

Along the West Fork River and its tributaries flat eroded terraces are developed. These are occupied by two distinct soil types—the Elk silt loam and the Tyler silt loam. Although of relatively small total area, these soils are valuable agricultural types. It is believed that the material giving rise to these soils was deposited by water impounded by ice dams.¹ With the removal of the ice barriers the streams began to cut deeper channels, and erosion became active over the terraces. As a result the terraces in some places now stand 150 feet above the stream level. In many places they have suffered from erosion sufficiently to be quite rolling in character. The material entering into the composition of these soils is derived largely from the Westmoreland silty clay loam.

The important difference between the Elk silt loam and the Tyler silt loam is one of drainage. The latter has the poorer drainage and is slightly lighter colored, with a tendency to mottling. The subsoil is also more plastic. The Elk silt loam is quite similar in general appearance to the Dekalb silt loam, but differs in that it is sedimentary in origin and a more productive soil. In places some residual material from the underlying rocks, principally shale and sandstone, enters into the composition of the lower subsoil. Limestone also occasionally underlies this type.

Along Middle Island Creek, its tributaries, and a number of other streams in that portion of the area outside the limits of the Westmoreland silty clay loam is developed a terrace soil quite similar in general appearance and topography to the Elk silt loam. The material of this soil, the Holston silt loam, is derived largely from the Dekalb and Meigs soils. The type is less productive than the Elk silt loam, as would be expected, since limestone material does not enter into its composition.

Narrow first bottoms are found along all the creeks and stream branches of the area. They are of alluvial origin, being transported sediments deposited over the flood plains of the streams during overflows. These first-bottom soils are influenced to a greater or less extent by the wash from the adjoining upland slopes. Where the materials are markedly affected by wash from the red shale soils, the soil has a reddish color. Such areas were classified as the Moshannon silt loam. This type occurs along the streams in Doddridge and western Harrison Counties. The other first-bottom type is the Huntington silt loam, a brownish soil consisting largely of material washed from the lighter colored upland soils. Both these alluvial types are strong soils.

The Rough stony land includes areas too steep and stony to cultivate. Numerous rock outcrops, particularly of sandstone, are included under this head.

¹ See West Virginia Geological Survey report on the Doddridge-Harrison area.

The following table gives the names and areas of the several soil types shown on the accompanying map:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Meigs clay loam.....	272,320	54.5	Rough stony land.....	4,480	0.9
Westmoreland silty clay loam.	102,080	20.4	Holston silt loam.....	2,048	.4
Dekalb silty clay loam.....	55,488	11.1	Upshur silt loam.....	2,048	.4
Elk silt loam.....	17,920	3.6	Dekalb silt loam.....	1,792	.4
Moshannon silt loam.....	15,488	3.1	Tyler silt loam.....	1,280	.2
Upshur clay.....	14,080	2.8			
Huntington silt loam.....	10,816	2.2	Total.....	499,840

MEIGS CLAY LOAM.

The Meigs clay loam is not a uniform soil type, owing to the fact that a variety of rocks enter into its formation and that the steeply rolling surface in many places has favored the commingling of soil materials of different colors and textures. The surface soil of the Meigs clay loam, which is 4 to 8 inches deep, varies in texture from a silt loam to silty clay loam and in color from a grayish brown to light brown, shading to light yellow with depth. The subsoil ranges from a brownish-yellow, moderately compact silt loam to silty clay loam, grading usually into clay at about 20 inches, which texture usually persists throughout the remainder of the soil profile. The lower subsoil often becomes noticeably heavier and plastic with depth. Where erosion has been especially active the clay is found nearer the surface. The type includes many patches of Indian-red or reddish clay loam or silty clay loam, underlain by a stiff, plastic Indian-red clay, usually having a greasy feel. These areas really represent patches of Upshur soil too small to map. Quite commonly the surface material is grayish and the yellow subsoil grades into reddish-yellow to Indian-red clay or the yellow is mottled with red. Such areas represent either the Upshur silt loam or an intermediate type between the Upshur and Dekalb. Some patches of typical Dekalb silt loam or silty clay loam are included in this type. The brownish-yellow subsoil first mentioned is characteristic of by far the greater part of the type.

The depth of the subsoil varies greatly with the position of the areas. On the steeper slopes erosion has prevented the accumulation of much soil material over the rock, the strata in places being exposed or at least very close to the surface. Usually the depth to the bed rock is 20 inches or more. On the other hand, it may not be encountered within less than several feet of the surface.

Throughout the soil mass and on the surface occur more or less decomposed fragments of shale and sandstone, though rarely in suf-

ficient quantity to interfere with cultivation. Their presence is a general characteristic of the type.

The Meigs clay loam has the largest extent of any of the soil types. It occupies all of the uplands of Doddridge and the western part of Harrison County, covering the hill and ridge tops and their slopes.

The Meigs clay loam area is steep and broken, the surface being rougher than any other soil type except Rough stony land. The tops of the ridges are generally narrow and irregular and the slopes as a rule descend steeply to narrow, V-shaped stream valleys. A marked feature of the hillsides is the presence of narrow benches or terraces, resulting from the occurrence of massive sandstone beds that have resisted weathering and prevented the formation of uniform slopes. On these benches the soil is deeper and more productive than elsewhere. For the most part the slopes are so steep as to make cultivation very difficult.

The surface drainage is rapid, waters falling upon the soil being carried off almost immediately, and where the slopes are not protected by a covering of sod or vegetation the soil material is rapidly carried away, forming erosion gullies. Because of this excessive drainage the type is droughty, crops suffering for moisture in ordinary dry spells, except in more favored locations. The small streams soon dry up, and if the drought is prolonged even the larger streams cease to flow.

The Meigs clay loam is of residual origin, derived from the rock beds of the Dunkard of Permo-Carboniferous age. This formation consists of a series of interbedded shales, sandstones, some thin limestone or shaly limestone, and coal seams. The gray shales and sandstones and the beds of red shales give rise to most of the soil material of this type.

Although in many places too steep for cultivation, much of the type has been cleared for pasture, the soil being fairly good for grasses. Bluegrass does well, although it is rather short lived, except upon phases of the soil particularly adapted to its growth. North and east slopes make the best pasture land, the southern and western slopes drying out more quickly. Care must be exercised in changing the land from its natural forested condition to pasture, or the soil may be washed away. When newly cleared the soil is full of roots and these ordinarily hold it sufficiently for a few years or until the grasses form a protective sod. Corn is the first crop grown and this is planted until the yields decrease, when small grains, with which the grass is seeded, are sown. The bluegrass holds for a time and then the native wild grasses and broom sedge gradually take the land.

To reestablish the bluegrass the land has to be broken, cultivated, and reseeded. The life of the pasture can be prolonged by giving it attention and the growth can be revived by applications of lime, phos-

phatic fertilizers, and barnyard manure. Timothy and clover are sown and cut for hay, making fine yields. The fields are then pastured, the bluegrass, sown with the timothy and clover, finally predominating. On new land corn does fairly well, producing 20 to 50 bushels to the acre. On the benches and on lower slopes the better yields are obtained.

Parts of the type will produce fruits, apples and peaches doing well on the upper slopes in the covelike areas exposed to the north and east, where the soil is more loamy and better moisture conditions prevail. The forest growth is of hardwoods, oak, chestnut, maple, hickory, and poplar. The poplar is found more abundantly on the north and east exposures and gives to these locations the name of "poplar land," while the south and west slopes are spoken of as "white oak land."

The Meigs clay loam has the lowest value of the upland soil types, the prices ranging from \$10 to \$30 an acre, the seller usually reserving the oil and gas rights.

UPSHUR CLAY.

The Upshur clay occurs only in small areas, and the surface soil is variable, being influenced by differences in position. When it occurs on hilltops and the upper parts of slopes it consists of 4 to 6 inches of dark reddish brown or Indian-red clay loam to clay, underlain by dark Indian-red, stiff, rather tenacious clay. Where erosion is not active the subsoil extends to a depth of more than 3 feet, but in places the underlying rock beds may be encountered at 2 feet, and rotten shale fragments of greenish-gray color are often found in the lower subsoil, giving the mass a mottled appearance. On the lower slopes affected by "slips" from soils above, the surface may have a shallow covering of light-brown to grayish silt loam, which when united by cultivation with the red subsoil material gives a reddish color to the surface. Occasionally some sandstone fragments are found on the surface, but these have come from rock formations lying higher up the slopes.

The Upshur clay is found mostly on slopes, which are generally steep, where it occurs as bands, sometimes near the top and again nearer the bottom. It is commonly found in saddles or gaps of dividing ridges extending around the amphitheaterlike heads of branches, its position always being determined by the occurrence of red-shale strata, from which it has been derived through weathering.

The areas are small and scattered, the greater number being found in Doddridge County, though some occur in the western part of Harrison. In both counties it is limited to outcropping of the Dunkard formation.

Though the surface drainage is free, the subsoil is always moist. There is considerable seepage in this rock formation, and moist, springy spots are common on slopes. The moisture conditions make the type cold and late. Its heavy, plastic, and tenacious nature cause difficulty in cultivation. When worked too wet it puddles and becomes very hard and cloddy when dry. The surface bakes and cracks.

This soil should never be plowed except under the best of moisture conditions. Late fall plowing, turning the soil up so as to get full effects of freezing and thawing during the winter, aids greatly in getting good tilth. The soil should have more organic matter, and any roughage can be plowed under to advantage. This soil is all cleared, but its value for pasture is so high that it is mostly devoted to grazing or used in the production of hay. Bluegrass seeds naturally upon it and is permanent. It gives good yields of farm crops where managed properly. Wheat does well and fair yields of corn are secured, though in places the soil is rather heavy for the latter crop.

Fruits do not seem to thrive upon the Upshur clay, and it should not be used for their culture. Since it is so well adapted to grasses it is best to continue with them, and every effort should be put forth to maintain the pastures at their highest efficiency.

UPSHUR SILT LOAM.

The surface soil of the Upshur silt loam, which is from 10 to 20 inches in depth, consists of a friable silt loam of light or yellowish brown color, with a reddish tinge in the upper portion, changing with depth to reddish yellow or frequently to a dull red. The subsoil is a reddish-yellow to dark-red heavy silt loam to silty clay loam, grading usually into an Indian-red clay of the same character as the subsoil of the Upshur clay.

The Upshur silt loam is of small extent, being limited to the extreme western part of Doddridge County. It is found on flat, shelf-like positions on slopes and on rolling ridge tops.

The Upshur silt loam is derived from the sandstones and shales of the Dunkard formation. Strata of red shale have given the red subsoil and the reddish tinge seen in the surface material.

The type has good surface drainage and is easily worked. It is a strong, productive soil and good farms are the rule on the type. It supports a fine growth of grass and gives good yields of the general farm crops. Its value is high as compared with that of the surrounding soils.

Results of mechanical analyses of samples of the soil and subsoil are given in the following table:

Mechanical analyses of Upshur silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
25500.....	Soil.....	0.2	0.9	0.6	1.6	2.5	76.9	17.3
25501.....	Subsoil.....	.0	.2	.3	1.2	2.8	53.2	42.2

DEKALB SILTY CLAY LOAM.

The surface soil of the Dekalb silty clay loam, to a depth of 4 to 8 inches, consists of a light to yellowish brown silty clay loam or heavy silt loam, containing enough sand particles to make it friable and rather mellow for a soil of its class. When dry the surface becomes grayish and has a soft, ashlike feel. The subsoil is a yellow, heavy silty clay loam to silty clay, generally becoming a little more clayey and more compact with depth. It is usually friable, but in places is somewhat plastic. Grayish to brownish mottlings representing rotten fragments of shale are often noticeable. In places the lower subsoil sometimes becomes slightly tinged with red. Shale and sandstone fragments occur frequently on the surface, the latter as small blocks of thin-bedded rock. On the gentler slopes they are absent, while on steep slopes they are numerous both on the surface and in the soil mass, with the underlying rock beds very near the surface. On these steeper slopes the soil is a little more sandy and lighter textured than elsewhere.

The Dekalb silty clay loam occurs in the eastern part of Harrison County, where it is associated with the Westmoreland silty clay loam. It is found on the slopes below the latter type, following that type rather closely and extending up the valleys. Along the Chestnut Ridge anticline, where the Conemaugh formation outcrops, it covers all except the highest hilltops. These slopes are in the main gentle, but are sometimes very steep, breaking off suddenly from narrow, flat to gently sloping benches on the hillsides. The hilltops are smooth and generally rounded, though in places the ridges have narrow, irregular crests. The topography favors ready surface drainage.

The Dekalb silty clay loam is of residual origin, being derived from the rock beds of that part of the Conemaugh formation extending from the Clarksburg limestone bed to the bottom of the formation as exposed in the county. There are three strata approximately 100 feet in thickness. The rocks consist of a variety of shales and sandstones,

with some unimportant beds of limestone and seams of coal. The shales and sandstones have given rise to the larger part of this soil type. The shale beds have weathered more or less completely, the fragments being generally rotten. The stones found in the soil mass are generally of the more resistant sandstones.

The greater part of the Dekalb silty clay loam is cleared and largely in grass for hay and pasturage, particularly the latter. The soil supports a bluegrass sod, but is not naturally so good a soil for grasses as the limestone type—the Westmoreland silty clay loam. The pastures do not last so well, nor is the growth of grass as good on the Dekalb areas. The wild grasses do better on it, but do not make as good pasturage.

Corn gives fair yields on areas of gentler slope, and so do the small grains. Fruits, though grown only for home use and under unfavorable conditions, do fairly well. With proper attention orchards, especially of apples, would give excellent yields, particularly on those areas having exposures to the north and east.

The greater part of this type should be devoted to pasturage and the steeper and more stony slopes to forestry. The forest growth is composed of hardwoods, consisting largely of oak and chestnut, with maple, poplar, hickory, beech, and some other trees.

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

Mechanical analyses of Dekalb silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
25339.....	Soil.....	0.8	2.3	1.8	6.6	5.0	69.0	14.4
25340.....	Subsoil.....	.4	1.4	1.4	3.6	4.4	56.7	32.2

DEKALB SILT LOAM.

The surface soil of the Dekalb silt loam, to an average depth of 8 inches, consists of a light, friable, brown or grayish-brown silt loam, with a soft, smooth texture. The subsoil is a pale-yellow silt loam, which at about 24 inches usually becomes considerably heavier, grading into a silty clay loam. Where the underlying rock beds are close to the surface the deep subsoil may become a little lighter in texture than typical. The type as a rule is free from stone fragments, though scattered blocks of sandy shale or shaly sandstone are found occasionally, and where the soil material is shallow may be met in the subsoil.

The Dekalb silt loam is not an extensive type in the Clarksburg area. It is found in comparatively small bodies in both counties,

the largest occurring in Doddridge County along the Ritchie County line and east of Bridgeport in Harrison County. The other areas are small and scattered.

This type is generally found in the uplands on shelf or bench-like situations that occur at an elevation of 1,100 feet or more above sea level. The areas are flat, gently rolling, or sometimes sloping. The type owes its origin and characteristic topography to massive horizontal sandstone beds, which are very resistant to weathering processes. The soil material is derived from these fine-grained, massive sandstones and fine-grained sandy shales, the weathering having been as a rule so complete that little fragmental rock occurs in the soil. The underlying rock beds are reached at a depth of 5 or 6 feet. The type is not derived exclusively from any one formation of the upper Carboniferous, but indiscriminately from the Dunkard, Monongahela, and Conemaugh, wherever massive sandstone beds occur in those formations.

These sandstone beds have produced a soil considered rather thin and not held in high esteem, except that its friable character makes it easy to cultivate. This soil is readily "run down" by cropping, but it can be brought to a fair state of productiveness by good management.

As a whole, the type is lacking in organic matter and supplying this in the form of green manuring crops and barnyard manure will greatly benefit it. All the cultivated crops of the area are grown. Corn, potatoes, wheat, and oats do fairly well. It does not seem to be adapted to bluegrass or other pasture grasses. Moisture conditions have much to do with this, the drainage being too free. Apples will succeed upon it, but the trees need artificial fertilization. Good orchard sites, permitting the use of spraying machinery, are frequently found.

Its original tree growth was largely chestnut and white oak, with some other deciduous species, and from the predominance of chestnut it has been locally known as "chestnut land."

WESTMORELAND SILTY CLAY LOAM.

The Westmoreland silty clay loam, known in Harrison County as the "limestone land," is derived from interbedded limestones and shales. These two rock formations give rise to distinct soil materials, which, owing to the sloping topography, have become so intermingled as to represent a single soil type.

As a rule the type consists of 4 to 10 inches of a grayish to light-brown, mellow silty clay loam, overlying yellow silty clay loam, which quickly grades into yellow silty clay, generally sticky and plastic in the lower portions. Where overlying limestone beds the soil material is a grayish to yellowish heavy clay loam to clay,

underlain by a stiff, plastic clay, usually yellow or yellow mottled with white. The subsoil material immediately overlying the limestone is frequently of an olive green color and markedly plastic.

The limestone outcrops occur as narrow strips a few feet in width along the hill slopes. They are usually marked by a slight break in the slopes or "bench" and by loose bowlders of the rock on the surface. Such areas of heavy soil usually represent patches of Brooke clay loam too small to map.

The subsoil generally extends to a depth of several feet, except where limestone ledges approach the surface or outcrop. For the most part weathering has been complete, as indicated by the general absence of stone fragments on the surface and in the soil.

The Westmoreland silty clay loam is confined to Harrison County, in which it is the most important soil type. It is found in all parts of the county, except the western and northwestern portions. The areas are irregular and broken by other types, the tops of the hills often being capped by Meigs clay loam, and the lower slopes by the Dekalb silty clay loam, while this type lies between, following the contour of the hills and ridges. It is the smoothest of the hilly lands of the area surveyed, the slopes being gentle and the hilltops rounded. Some of the slopes are broken by series of slight benches, where limestone ledges lie just beneath the surface or are exposed. Over the greater part of this type the slopes are such as to permit of cultivation, though in places they are so steep that farming is not advisable.

The topography of the Westmoreland silty clay loam gives ready surface drainage and in some places the land is gullied, though the strong sod covering tends to hold erosion in check. The type is all well drained and, as is the case with limestone soils in general, is droughty. Where bodies of this soil have been tunneled in mining coal they soon dry out, and crops or grass suffer for lack of moisture.

The Westmoreland silty clay loam is derived from the rock beds of the lower part of the Monongahela and the upper part of the Conemaugh formations. These are composed of a number of limestone strata, with interbedded calcareous shales and very little sandstone. The weathering of these rocks has been quite complete, with the exception of occasional limestone bowlders and outcropping limestone ledges, giving a soil formation of some depth.

Because of its calcareous nature, the Westmoreland silty clay loam is especially adapted to bluegrass and is devoted almost entirely to grazing, being too valuable for this purpose to be used for cultivated crops. The grass thrives on this soil, and the sod holds for a long period of years, though the pasturage is said to be not as good now as formerly. A dressing of phosphate fertilizers would do much to

help the pastures, as would applications of manure. Corn and the hay grasses (timothy and clover) do very well, but they are not grown extensively.

Owners of this land are all engaged more or less in cattle grazing. Some of the stock is raised on the farm, but a large part is brought in from other sections to be grazed and fattened here.

Practically all the Westmoreland silty clay loam is cleared. The original forest consisted of hardwood species. The locust thrives on this soil and is seen in pastures and along fence rows. The growing of locust posts would undoubtedly prove profitable on the steeper slopes.

Farmers owning this land are generally prosperous. The farms are usually large. The Westmoreland silty clay loam is the highest priced farming land in the area aside from the added value of the important coal seams which occur beneath it. The price of surface rights for this type ranges from \$50 to \$100 an acre.

The results of mechanical analyses of samples of the soil and subsoil of the Westmoreland silty clay loam are shown in the following table:

Mechanical analyses of Westmoreland silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
25349.....	Soil.....	1.1	3.1	1.6	4.1	7.1	60.9	22.1
25350.....	Subsoil.....	1.4	4.2	2.9	5.1	4.4	53.2	29.1

ELK SILT LOAM.

The surface soil of the Elk silt loam consists of about 8 inches of light-brown to yellowish-brown, light, mellow to rather compact silt loam. This is underlain by pale yellow silt loam, which becomes somewhat heavier and a brighter yellow with depth. Below 24 inches the subsoil is often slightly sandy, the sand particles giving a gritty feel. The subsoil is usually compact in the lower portion, but when rubbed between the fingers it readily crumbles. When wet it is quite sticky.

This type is fairly uniform in texture, though slight variations occur. In places the surface soil is a little more sandy than the average, especially on the break of slopes where beds of fine yellow sand lie below. Occasionally shale ledges and broken shale are encountered within 2 feet of the surface, the former being projecting points of underlying formations.

The Elk silt loam occupies a considerable area. It covers a greater extent of territory in Harrison County, where it is found in the

West Fork River valley and along its tributary streams. It occurs as a terrace, the top of which is 1,000 to 1,050 feet above sea level and from 20 to about 150 feet above the stream levels. In places the top is flat to gently rolling, breaking into slopes toward the streams, the drop sometimes being very abrupt. Originally these terraces were uniformly smooth and level, but erosion has cut many deep ravines. The streams along which it occurs have meandering courses, the type usually occupying the horseshoe bends, and extending from the stream generally to the upland slopes. It holds the position of a well-defined stream terrace.

The Elk silt loam is a sedimentary soil and believed to be of lacustrine origin. When the Monongahela in its lower course was blocked by ice during the glacial period its waters backed up and formed a lake covering the valley. The fine sediments forming this soil were dropped at that time filling the valley to the highest point now seen in the development of this soil. When the river resumed its flow it began to cut a channel into its sediment-filled valley in a zigzag course, forming what are now the horseshoe bends. The river has now cut down to a rocky floor and is still widening its channel, although the process has not continued long enough to form extensive first bottoms.

Some of the material entering into the formation of the type is doubtless residual in origin, being derived from the underlying sandy shale and massive sandstone beds. Such residual material is represented by the sandy layers in the lower subsoil already mentioned as developed in some places. A large proportion of the material entering into the composition of the type has been washed from the productive Westmoreland silty clay loam. In places near the foot of the upland slopes colluvial material has accumulated.

Lying as it does upon terraces along streams, the Elk silt loam is a well-drained soil. It is mellow, friable, and easily cultivated. Its favorable surface and proximity to streams made it one of the first soils to be cleared and it has been under cultivation for a long time. It is devoted to the general farming crops of the region, of which corn is the most important. Under the present system of management the yields range from fair to good. The type could be greatly improved by the more extensive production of leguminous crops and by the incorporation of organic matter. Much of it is devoted to grass for hay and pasture. Bluegrass and timothy give fairly good results and small grains, especially wheat, do well.

This is one of the best soil types of the area for trucking, both in texture and in location. A ready local market awaits its development for the production of vegetables. Irish potatoes, sweet corn, tomatoes, beets, and cabbage should do especially well. Small fruits such as raspberries, blackberries, and strawberries would also prove

profitable. Most of the type is suited to apple orcharding, as the land lies high enough above the stream to have good air and water drainage. It has the best of facilities for marketing such products, as a railroad and electric line, the latter equipped for carrying freight and express, run through the West Fork Valley.

The Elk silt loam is generally deficient in organic matter. The sod could be much improved by plowing under some green manuring crop, such as rye, clover, cowpeas, or vetch, before reseeding. A profitable system of management would be to carry on dairying, trucking, and fruit growing, using the manure from the dairy to enrich the soil.

Chestnut formed the larger part of the original forest on this soil and the land is commonly spoken of as "chestnut land." Farms of this type of soil bring high prices.

TYLER SILT LOAM.

The Tyler silt loam consists of a grayish-brown to yellowish-gray friable silt loam, with a depth of about 8 inches, underlain by pale-yellow to yellow, compact, sticky clay loam, more or less mottled with gray, drab, and brown. It becomes heavier and more dense in structure with depth, being frequently in the lower portion a silty clay.

Its extent is small and unimportant, small scattered areas occurring over the two counties as second bottoms along some of the larger creeks. It is alluvial in origin and was deposited when the water of streams reached higher levels, or rather when their flow was impeded by the backwater of the larger streams when blocked by glacial ice. The sediments forming the type are the wash from the contiguous uplands.

The Tyler silt loam wherever found in the State is a compact soil, generally rather poorly drained, and therefore a cold, late soil. When thoroughly drained and properly handled the surface is friable and mellow. Its greatest need is drainage and the incorporation of organic matter. With such improvement it can be made to yield fair crops. An application of 1 ton of burnt lime per acre or its equivalent in other forms of lime would benefit the soil. In the present survey it covers so small an area that it is unimportant.

Mechanical analyses of typical samples of the soil and subsoil give the following results:

Mechanical analyses of Tyler silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
25345.....	Soil.....	0.1	1.6	1.7	3.5	3.7	68.1	20.9
25346.....	Subsoil.....	.4	2.5	2.3	4.1	5.3	45.6	39.7

HUNTINGTON SILT LOAM.

The Huntington silt loam consists of 10 to 12 inches of light-brown to brown, mellow silt loam underlain by yellow or yellowish-brown silt loam, usually becoming heavier and more compact with depth. Occasionally some gravelly fragments of shale and sandstone occur either as a definite substratum or scattered indiscriminately through the soil mass. This condition is found along small streams which at times carry greatly increased volumes of water.

The Huntington silt loam occurs in this area only in Harrison County, where it is found in all parts, though in small areas, as narrow strips of first bottom land along the streams. It is associated with the upland soils derived from the Monongahela and Conemaugh formations, and represents the wash from the bordering slopes. It is an alluvial soil of recent formation, and is practically always present on the creeks and branches, though as a rule in very narrow strips along the larger streams. The areas are not continuous, being found only in narrow strips on the inner sides of curves or bends. The larger streams are still cutting their channels and not building flood plains.

While the extent of this soil is small, with its general distribution and its high productive power it is an important soil. Nearly every farm depends upon it for the production of the cultivated crops. Corn does especially well and good yields are obtained without fertilizers, the productiveness being maintained by the addition of sediments at every overflow. Grasses do well and large crops of hay may be expected. The pasturage is excellent.

Originally the Huntington silt loam supported a heavy forest growth of beech, maple, hickory, poplar, and many other deciduous trees.

Like the Moshannon silt loam, the type is held in high esteem and is an important factor in determining farm values.

MOSHANNON SILT LOAM.

The surface soil of the Moshannon silt loam to a depth of 8 to 12 inches consists of a mellow silt loam, varying in color from dark or chocolate-brown to reddish-brown. The subsoil, like the soil, is a silt loam, though slightly heavier, of a more compact structure, and generally of a stronger red than the surface soil. In places the subsoil is yellowish or brownish yellow and very similar to the subsoil of the Huntington silt loam, and areas occur where separation is difficult. Frequently a gravelly substratum is encountered at a depth of 24 inches or below. The gravel consists of pieces of shale and sandstone, merely rounded enough to be subangular, fully rounded, waterworn gravel not being of common occurrence. Simi-

lar fragments are sometimes found on the surface, especially close to the streams or at their confluence. Along the banks of the streams the soil material frequently becomes sandy and, again, in places where the drainage is poor, it appears more clayey, and the subsoil is drab colored or mottled drab, yellow, and brown.

Occurrences of the Moshannon silt loam are limited to Doddridge County and the western part of Harrison, where the type is associated with the soils derived from the Dunkard formation. It represents wash from these types transported by the streams and laid down in small strips as first bottom land. These bottoms are always narrow and may be wanting along the larger streams, except on the inner side of bends. On the smaller streams and branches the type is almost always in evidence.

Though occurring in small areas, the type is an important one, as it is widely distributed. It forms a part of practically every farm and is the soil most depended upon for the corn crop and for hay and grain as well. Corn does well on the overflowed alluvial lands, and yields running from 50 to 100 bushels to the acre are common. One or two tons of timothy hay can be cut to the acre and crops of small grains grow luxuriantly and give good yields. The land is devoted mainly to corn and grass. It furnishes excellent pasturage throughout the grazing season.

Being level, free from stones, easily worked, and highly productive, it is a desirable soil and held at much higher prices than the surrounding hill lands. While its actual market value can not be stated, the extent to which it occurs on farms largely determines their selling price.

HOLSTON SILT LOAM.

The Holston silt loam consists of 8 inches of friable, light-brown silt loam, underlain by pale-yellow silt loam, as a rule somewhat heavier than the surface, but often in lower depths, where it overlies sandstone and shale, somewhat sandy.

The Holston silt loam is found mainly along Middle Island Creek and its tributaries. A few small areas occur along other streams which do not traverse the Westmoreland silty clay loam or other calcareous soils of the area. It is a terrace formation, occurring in the horseshoe bends from 20 to 100 feet or more above the streams. The material represents sediments deposited by the streams when at a higher level than at present. The sediments came originally from the sandstones and shales, giving the residual types Meigs clay loam and Dekalb silt loam. Thus, while this type corresponds in process of formation to the Elk silt loam, it differs in the materials from which derived, the latter being formed largely from the wash of calcareous soils.

The Holston silt loam is noncalcareous and of lower productiveness than the Elk silt loam. It is low in organic matter and not a strong soil, being known locally as "light land." It is an easy soil to cultivate, and by supplying humus it could be improved and made to produce much better yields of the general farm crops than it does at present.

ROUGH STONY LAND.

Rough stony land is represented by steep and stony areas unfit for agriculture. The type occurs most frequently on steep hillsides, extending frequently from the top of the ridge to the stream below. It is caused by massive outcrops of sandstones that stand as sheer cliffs, below which the talus of bowlders renders the land rough and stony. Frequently where the talus is absent the underlying shales are so close to the surface as to make cultivation difficult. The soil material is similar to that of the adjacent slopes and the term denotes a condition rather than difference of soil textures. Excepting the areas of outcropping rock the land is covered by the prevailing tree growths and underbrush. Chestnut and oak are the most prominent species.

Areas of Rough stony land are not common and do not cover much territory. They are found here and there along streams, and are most numerous in Doddridge County, along the Ritchie and Tyler County lines, and up Middle Island Creek and its tributaries, where the massive sandstone appears above the drainage levels. A few scattered areas are found in other parts of the survey. The Rough stony land should be left in forest.

SUMMARY.

The Clarksburg area is situated in the north-central part of the State. It comprises Harrison and Doddridge Counties, and has an area of 781 square miles, or 499,840 acres. It consists of an original high plateau cut by stream valleys eroded from 500 to 800 feet below the general upland level. The altitude of the area ranges from 780 to 1,840 feet. The surface is hilly to broken.

The general drainage of the area is into the Ohio River. Harrison County is drained by the West Fork River and its tributaries. Middle Island Creek drains all of Doddridge County except the extreme southwest, which is drained by streams forming the headwaters of the Hughes River. The general flow of the drainage waters is in a northerly direction.

The area was first settled at what is now Clarksburg in 1773 by immigrants from Maryland and Virginia. Settlement was slow until the discovery of minerals and the opening of the district for their development. Within the last 20 years a large influx of for-

eigners has taken place. The population of the county has doubled within that period, the census of 1910 showing 48,381 inhabitants.

The area has good railroad facilities, being crossed by a trunk line of the Baltimore & Ohio Railroad system. Direct communication with Pittsburgh is had over a line down the valley of the West Fork River.

The climate of the area is suited to general farming. The mean annual temperature is 53° F.; the mean annual rainfall 43.5 inches.

Stock raising is the leading industry of the farm, the land being in most places too hilly for successful cultivation. Grasses and hay are the principal crops. On cultivated areas corn, oats, some wheat, and vegetables are the chief products.

Eleven soil types, exclusive of Rough stony land, were separated and mapped in the area. These may be divided into two classes according to origin: (1) residual soils and (2) transported or sedimentary soils.

Meigs clay loam is the most extensive type in the area. It covers most of the uplands of Doddridge and of western Harrison Counties. Its topography is steep and broken. It is used largely for pasture or remains in forest.

The Upshur clay, derived from beds of red shales, occurs in small areas on hillsides. It is a productive soil and ranks next to the limestone soil (Westmoreland silty clay loam) in adaptability to bluegrass.

The Upshur silt loam is of small extent, being limited to areas in the central districts on the extreme western boundary of Doddridge County. It is a strong, productive soil.

The Dekalb silty clay loam is associated with the limestone land of Harrison County, but like the Dekalb silt loam is not a strong soil, not holding grass well. It is characterized by hilly topography and occurs on very steep slopes.

The Westmoreland silty clay loam is the limestone land of Harrison County and is especially prized as grazing land because of its natural adaptation to bluegrass. Stock grazing is most important on the farms of this type.

The valley soils are those of the high terraces and the first bottoms. The Elk silt loam is found on the high terraces in the main stream valleys. It is not a strong grass soil, but can be easily improved and has a wide range in adaptation. It offers opportunities for the development of a trucking industry to supply local markets in the towns and at the mines.

The Tyler silt loam is a second-bottom soil of small extent.

The first-bottom lands comprise two types, the Moshannon silt loam and the Huntington silt loam. The former occurs in the western part of the area and is influenced by the wash from the red shale

soils. The Huntington silt loam is the brownish first-bottom soil and is closely associated with the limestone lands of the county. Both these types are very productive and are most important in the agriculture of the county, though the areas are small and scattered.

Rough stony land comprises the precipitous cliffs of massive sandstone on the hillsides, with talus slopes beneath. They have no value except for forestry and grazing.

The average size of farms in Doddridge County is 107.6 acres and in Harrison 116.7 acres. The percentage of farms operated by the owners in Doddridge County is 75.7 and in Harrison 81.5.

Farm labor is scarce, better wages being paid in the oil and gas fields. With the development of these resources and the sale of coal lands considerable revenue accrues to landowners in royalties and rentals, making them generally prosperous. This fact has diverted attention from farming.

Stock raising should be extended. By improving the pastures by reseeding oftener and by using fertilizers the grazing capacity of the land could be greatly increased. The rougher lands should be utilized for sheep raising.

Fruit growing might well be developed and apples in particular would do well on the north and east slopes. The terrace soils are adapted to truck crops, for which there is a strong demand in local markets. The same is true of dairy products and poultry.

The opportunity for systematic forestry appears promising. Much of the rough land is suited to little else. Many of the steep slopes now suffering from erosion might be reforested and the timber grown used for fence posts. This would seem to be the type of forestry offering the most immediate profits.

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