

of narrow "hog-back" ridges and steep hillsides. However, in many places the ridges broaden out into small plateaus and in others the hills are more rounded and the sides more gently sloping. In the western part of Mason County the ridge tops are fairly flat and the valleys deep and decidedly V-shaped. Rocky promontories are frequently found along the bluffs of the larger streams. The upland for the most part is well suited to grazing and the flat ridge tops can be cultivated without danger of erosion.

The bottoms upon the larger streams, including second bottom, vary from one-fourth to 1 mile in width. The Kanawha bottoms average about 1 mile in width throughout the area. Upon many of the small streams the bottom land is very narrow and in many places entirely wanting. A very marked topographic feature of the area is the ancient stream valleys, represented by Teays Valley and the many winding valleys of the ancient Ohio River found in the northern part of Mason County.

The lowest point in the area, where the Ohio River crosses the Mason-Cabell County line, is about 500 feet above sea level and the highest point—Garnes Knob, in Jackson County—is about 1,300 feet above sea level, giving a range of 800 feet in elevation. The general line of the ridge tops is from 800 to 1,000 feet above sea level, with many places reaching above 1,200 feet. The general elevation of the ridges above the streams is about 200 to 400 feet. The ridges dividing the drainage systems are very irregular in shape and serrated in relief, although the general level of the highest points seems to be in the same plane. This is also noticeable in many of the spurs.

Most of the drainage of the area passes through small streams directly to the Ohio River. The remainder empties into the Kanawha River and thence to the Ohio River. Practically all the secondary drainage ways head within the area.

Many early explorations were made into the area. The most notable of these was by the French, who placed a disk at the confluence of the Ohio and Kanawha Rivers, laying claim to the country. But it was not until the summer of 1770, when George Washington and his corps of engineers made a survey of many large tracts of land along the Ohio and Kanawha Rivers that any actual steps were taken toward the colonization of the country. These tracts were granted to soldiers of Virginia for their services in the French and Indian wars and about 20,000 acres were patented by Washington, mostly within the limits of this area. Washington made many offers to induce immigration, but the remoteness of the country and the danger from Indians prevented settlers from coming. Not until after the battle of Point Pleasant, October, 1774, was it safe for settlers, and then only in the immediate vicinity of the fort. A settlement was made at

Point Pleasant after the battle by some of the pioneers that participated in the fight.

Washington abandoned his scheme of colonization during the War of Independence and it was not until after that struggle was over that any attempt was made to settle the outlying districts.

The State of Virginia established a land office in 1779 and offered land for 2½ cents an acre (Continental money). Large tracts of this land were bought by eastern speculators, but no settlers took up land until after the peace of 1783.

The first settlement was made in Teays Valley in 1800. Buffalo, the oldest town in Putnam County, was laid out in 1834 and incorporated in 1837. Winfield was not incorporated until 1868. However, a settlement was made at Redhouse Shoals in 1806, and a ferry established in 1815. Settlements were made in Jackson County along the Ohio River in 1796. The first cabin was built in Ravenswood in 1808. The early settlers came in boats down the Ohio River from Pennsylvania, Maryland, and Virginia, and down the Kanawha River from Virginia and the Carolinas. They were largely Scotch-Irish and English, and from necessity and environment were hunters and trappers, regardless of their previous vocation. The remoteness of the country and the difficulty of transportation from the manufacturing centers reduced the imports to bare necessities. Small patches of land were cultivated to furnish bread and vegetables for home use, while game and fish supplied the meats. Nearly all fabrics for wearing apparel and household goods were manufactured at home.

The pioneers settled the bottom land along the large streams first and gradually worked back into the hill country. During the early occupation of the country the hill land was considered worthless, and settlers stopped where they pleased, built a cabin, and made a clearing. Many of the settlers of this class were afterwards turned out by holders of patents for service in the Revolution.

Mason County was formed in 1804 from Kanawha County; Jackson in 1831 from Mason, Kanawha, and Wood Counties; and Putnam was formed in 1848 from Mason, Kanawha, and Cabell.

The following table gives the growth of population in the several counties as shown by the United States census:

Population of counties included in Point Pleasant area.

County.	1850	1860	1870	1880	1890	1900	1910
Mason.....	7,539	9,173	15,978	22,293	22,863	24,142	23,019
Jackson.....	6,544	8,306	10,300	16,312	19,021	22,987	20,956
Putnam.....	5,335	6,301	7,794	11,375	14,342	17,330	18,587

The building of the turnpikes was an important factor in the early development of the area. The most important of these was the James River & Kanawha Turnpike from Richmond, Va., to Guyandotte, W. Va., passing through Teays Valley. This was begun in 1778 and completed to Guyandotte in 1830. The Charleston and Point Pleasant Turnpikes, extending along both sides of the Kanawha River, were completed in 1851 and 1861, respectively. The Parkersburg & Charleston Pike, crossing Jackson in a general north and south direction, was completed in 1861. The Ravenswood & Spencer Turnpike and the Ripley & Spencer Turnpike were completed in 1854 and 1858, respectively.

The factors influencing the later development of the area were the opening of the railroads and the locking and damming of the Kanawha and Ohio Rivers. The Chesapeake & Ohio Railroad was opened to traffic to Huntington in 1872 and was the most important of all the railroads built in the area, giving direct connection to the east. The Kanawha & Michigan Railroad was opened from Charleston to Point Pleasant in 1882. The Ohio River Division of the Baltimore & Ohio Railroad was completed in 1884, the Ripley Branch in 1888, and the Spencer Branch in 1892.

The improvements upon the Kanawha River were started in 1875, and there is now a complete lock system from Charleston to Point Pleasant. The lock and dam system upon the Ohio River, which is to give a 9-foot stage the year round from Pittsburg to Cincinnati, is still in progress of construction and will be a great benefit to the area when completed.

Salt is made in the area from brines, and was first shipped from the Kanawha district in 1808. The works here were subsequently abandoned. The Hartford salt district extends along the Ohio River from Hartford to West Columbia, a distance of about 7 miles. The first salt well drilled in this district was at West Columbia in 1849. In 1880 the production was 2,500,000 bushels, and in 1908 nine furnaces turned out 3,700,000 bushels of salt. The salt produced is of a very high quality, and many chemicals are produced as by-products. The salt is obtained as brine from the Pottsville formation, the wells being from 1,100 to 1,200 feet deep.

The oil industry is not developed in this area as in many of the adjoining counties, but much of the land in the southern and eastern parts of both Jackson and Putnam Counties is under lease, and some producing wells have been obtained.

Coal was discovered at Raymond City in 1800, but it was not until about 1860 that mining operations were commenced. A number of mines are located along the Kanawha River. Coal is mined along

the Ohio River from Hartford to West Columbia and also at Ashton. The first mines in this district were opened in 1845.

Nearly all of the present population of the area is descended from the original settlers and is largely agricultural or engaged in business that is mainly dependent upon agriculture. Very few people of foreign birth are found. There are a few negroes, mostly in Point Pleasant and Teays Valley. The stream valleys are the most thickly populated parts of the area, especially the high terraces along the larger streams. The flat ridge tops and limestone ridges are fairly well populated. Nearly all the area is cleared and largely in pasture.

Point Pleasant, the largest town in the area, has a population of 2,045 (1910 census). The town is situated at the junction of the Ohio and Kanawha Rivers and is the center of the boating and docking business of the Kanawha River and a long section of the Ohio River. The Kanawha & Michigan Railroad and Baltimore & Ohio Railroad (Ohio River Division) cross at the point and give ample railroad facilities and cheap rates. Also water transportation facilities favor this city as a manufacturing point. Mason is an important town on the Ohio River opposite Pomeroy, Ohio. Hartford and New Haven are small towns in the same district. Ravenswood, the largest town in Jackson County, population 1,080 in 1910, is situated upon a high terrace of the Ohio River and is the junction of the Ravenswood & Spencer Branch of the Baltimore & Ohio Railroad. It is the center of the Jackson County apple district and has a canning factory and creamery. Ripley, the county seat, is the distributing point for a large part of Jackson County and a large cattle market. Millwood is a small town but an important fruit market, and Leroy is a small town upon the Ravenswood & Spencer Branch of the Baltimore & Ohio and the center of the Jackson-Wood-Wirt tobacco district. Winfield, on the Kanawha River, is the county seat of Putnam County. Raymond City is a mining town, also upon the Kanawha River. Hurricane, in Teays Valley, lies in a prosperous farming section and is the center of the Teays Valley tobacco industry.

The area is supplied with excellent transportation facilities. The Ohio and Kanawha Rivers give water transportation to important markets. The latter is navigable practically the year round and the Ohio will be navigable for the entire year when the system of locks and dams now under construction is completed. The Chesapeake & Ohio Railroad crosses the southern end of the area through Teays Valley. The Kanawha & Michigan passes through the area along the north side of the Kanawha River, crossing the Ohio at Point Pleasant. The Ohio River Division of the Baltimore & Ohio Rail-

road extends the length of the area along the Ohio River. This system has two branch lines, one traversing the northern end of Jackson County and the other reaching to the center of the county at Ripley. The public-road system is good, considering the topography of the county and the character of soils and road material. The county is threaded by telephone lines, and nearly all farm houses are supplied with telephone and daily-mail service.

The principal market for cattle, sheep, hogs, veal, turkeys, chickens, eggs, and fruit is Pittsburg. Some cattle and wool go to Baltimore and Philadelphia. Parkersburg and Wheeling also furnish small markets for farm products. Local markets, such as Gallipolis, Pomeroy, and Middleport, Ohio, use a quantity of vegetables and dairy products. Charleston and Huntington also afford good markets for truck and dairy products.

CLIMATE.

The climate of the Point Pleasant area is healthful and agreeable. There are no long-continued spells of excessive hot weather and the cold spells are not especially severe and are generally of short duration. The annual mean temperature is 56° F., the absolute minimum is -26° F., and the absolute maximum is 102° F., but the temperature rarely falls below zero or rises above 100° F. Hence the summers are warm but not excessively hot and the winters are cold but not rigorous. January and February have an average mean temperature of 32.5° F.; July and August an average mean temperature of 76° F.

The alternate freezing and thawing common to the section during early spring is very beneficial to the soil, loosening it up and putting it in good physical condition.

The precipitation, about 40 inches, is well distributed throughout the year, the heaviest rainfall occurring during the growing season, June and July, and the lightest in September and October, during the harvest season. The snowfall is light and remains upon the ground only a short time. The active growing season has a duration of six months, but pastures can be used eight months in the year.

The climatic conditions in this area make it well suited to agriculture; to the carrying on of either general farming, stock raising, dairying, fruit culture, or late trucking.

The following table gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at the Weather Bureau station at Point Pleasant:

Normal monthly, seasonal, and annual temperature and precipitation at Point Pleasant, W. Va.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	°F.	°F.	°F.	Inches.	Inches.	Inches.	Inches.
December.....	35	70	- 5	3.1	4.4	2.6	1.6
January.....	33	73	-14	3.6	1.5	8.0	4.9
February.....	32	75	-26	3.6	1.3	1.9	5.0
Winter.....	33			10.3	7.2	12.5	11.5
March.....	45	84	4	3.7	2.4	5.8	5.0
April.....	55	95	23	3.0	6.9	1.5	0.5
May.....	66	98	31	3.5	5.8	3.5	0.0
Spring.....	56			10.2	15.1	10.8	5.5
June.....	73	102	44	4.8	7.3	2.4	0.0
July.....	77	102	47	3.7	0.7	2.8	0.0
August.....	75	99	50	3.2	1.6	6.4	0.0
Summer.....	75			11.7	9.6	11.6	0.0
September.....	70	100	37	2.2	2.3	2.1	0.0
October.....	58	90	19	1.9	0.2	3.2	0.0
November.....	45	81	14	3.2	2.6	2.7	0.5
Fall.....	58			7.3	5.1	8.0	0.5
Year.....	56	102	-26	39.5	37.0	42.9	17.5

Average date of last killing frost in spring, April 17; of first in autumn, October 18.

AGRICULTURE.

As already stated the early settlers paid little attention to agriculture, clearing only small patches of land and planting such crops as wheat, corn, flax, and potatoes for home consumption.

At the next stage in development the staple crops were grown and sold to emigrants on their way west. This became quite a profitable business. Before the days of steamboats or railroads the farmers along the Ohio and Kanawha Rivers shipped potatoes, wheat (as flour), and apples by flatboat to New Orleans.

The growing of wheat became an important industry after the establishing of water-power mills, and continued so until the opening of the western wheat fields by the railroads. The farmers of this section could not compete with the virgin lands of the west, as machinery for handling large crops could not be used successfully upon the hill land. The recent high price of wheat has again stimulated the growing of that crop on a considerable area. The production of

oats seems to vary in inverse proportion to that of wheat, but oats have never been an important crop. Corn has been grown in larger quantities than any other crop since the first settling of the country and has shown a steady increase in each decade. The hay crop is of considerable importance and the production has steadily increased, although the country is considered a grazing rather than a hay-producing country. White clover grows wild in this section and bluegrass comes in naturally on all cleared land where weeds are kept down, but the natural growth can not be depended upon for a stand.

Tobacco was produced in large quantities from 1850 until a few years after the Civil War, its culture being discontinued when the war tax was placed upon it. About 1880 the growing of tobacco began again. From 1890 to 1900 a slump in prices caused a proportionate curtailing of the acreage. During the last few years production has increased at a rapid pace, owing to the sharp advance in price caused by the pooling of the crop in Kentucky. The varieties grown are White and Yellow Burley, used largely for plug tobacco. The greater part of the crop is air cured, under which method expensive equipment is not required.

The growing of tobacco up to a few years ago was confined to the limestone ridges in the northern part of Jackson County and to Teays Valley in Putnam County. But recently the crop has spread to such an extent that in the southern part of Mason and Putnam Counties it is grown even on bottom lands. It is estimated that the production for 1909 is about 25 per cent greater than for the preceding year. The production of the Jackson-Wood-Wirt tobacco district will probably reach about 2,500,000 pounds. Over three-fourths of this is grown in Jackson County. About 3,000,000 pounds were handled through the Hurricane market last season from the Teays Valley district. The tobacco grown upon the limestone ridges is of good quality and the growers have learned to handle the leaf successfully.

The old river terrace soils produce a very fine leaf which is used mostly for plug wrappers. The bottom land, while giving heavy yields, produces a dark, inferior grade of tobacco.

A large area is in bluegrass pastures and a considerable area is in meadow, mainly timothy and clover. Hay is usually stacked and fed to stock in the field. Cowpea hay is produced to a limited extent. The Early Black pea is considered the best variety for hay production and the Whippoorwill for seed. Soy beans and vetch do well, but are used less than cowpeas. Sorghum is grown in small patches in all parts of the area, both for sirup and forage. Broom corn is grown upon the bottom land in some sections. Millet is grown to a very

limited extent. Buckwheat is used as a cover crop to some extent, but the most of it is harvested.

Irish potatoes are produced in large quantities upon the high terrace land along the Ohio River and to a less extent in nearly every part of the area. The larger growers spray with Bordeaux mixture and Paris green. Sweet potatoes are grown to a considerable extent upon the sandier types and phases of the bottoms and terraces.

A much smaller acreage is devoted to rye and barley than in former years. Some patches of alfalfa are occasionally seen on the Brooke clay loam, but the results have been indifferent. The poor results are probably due to improper preparation of the seed bed and failure to provide proper inoculation.

Cantaloupes and watermelons yield abundantly upon the light terrace soils of the Ohio River. A considerable acreage is devoted to tomatoes, particularly in bottom lands near Ravenswood. Vegetables are grown in all parts of the area for home consumption and local markets, but very little is shipped out of the area. The canning factory at Ravenswood uses large quantities of tomatoes and corn.

Fruit growing as an industry is well developed in certain sections of the area, along the low hills and terraces of the Ohio and Kanawha Rivers. Many commercial orchards are found that are kept in good condition by spraying, pruning, etc.

The apple is the important fruit. The Ben Davis, Improved Ben Davis, Rome Beauty, York Imperial, Baldwin, Northern Spy, Grimes Golden, and Russet are the leading varieties. The Ben Davis is grown more extensively than all the other varieties combined. The Rome Beauty and York Imperial are the next important varieties in commercial orchards. The other varieties are found mostly in small mixed orchards.

Bordeaux and arsenical mixtures are in common use for combating orchard pests. In the last few years many orchards have been sprayed on contract for one-half the fruit.

Peaches are grown to some extent upon the limestone ridges and the old terraces. The Elberta does best. Late and Early Crawford are also considered good varieties. Cherries, plums, and grapes do well, but are grown only for local consumption. Small fruits such as blackberries, raspberries, and strawberries yield large crops of excellent fruit, but are grown only on a small scale.

Several nurseries, producing mainly apple and shade trees, are situated within the area upon the Ohio River terraces near Point Pleasant and Mason.

The following table gives the acreage and production of the principal crops according to the census of 1900:

County.	Wheat.		Corn.		Oats.		Tobacco.	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Pounds.
Mason.....	25,203	225,640	26,049	638,660	1,023	16,480	126	78,490
Jackson.....	19,775	163,990	26,919	605,290	1,224	16,560	325	215,310
Putnam.....	14,285	113,730	21,326	443,320	1,307	18,250	929	626,680
Total.....	59,263	503,360	74,294	1,687,270	3,554	51,290	1,380	920,480

County.	Clover.		Potatoes.		Cultivated grasses, including clover.		Vegetables.	
	Acres.	Tons.	Acres.	Bushels.	Acres.	Tons.	Acres.	Value.
Mason.....	1,573	1,402	967	58,089	11,149	8,893	931	\$47,898
Jackson.....	1,584	1,226	1,113	59,292	15,528	10,955	1,008	48,310
Putnam.....	1,457	1,350	458	27,971	6,541	5,787	944	55,338
Total.....	4,614	3,978	2,538	145,352	33,218	25,635	2,883	151,546

County.	Sorghum.		Sweet potatoes.		Value of orchard products.	Value of forest products.	Value of small fruit products.	Value of dairy products.
	Acres.	Gallons.	Acres.	Bushels.				
Mason.....	238	16,558	122	6,115	\$38,004	\$106,361	\$5,058	\$127,049
Jackson.....	370	23,698	134	7,589	40,417	133,563	2,390	135,748
Putnam.....	283	19,082	111	6,604	44,780	92,216	3,352	102,002
Total.....	891	59,338	367	20,308	123,201	332,140	10,800	364,799

The early settlers kept a few cattle, but it was not until 1840 that this industry became important. The first cattle were grades, and up to the building of the railroads they were driven to the eastern markets. About 20 years ago attention began to be paid to the introduction of purebred cattle. The Shorthorn was the first breed imported. Blooded cattle were nearly all introduced from Roane County. The Hereford, strictly a beef type, was introduced about 15 years ago, and the Aberdeen-Angus, another beef breed, was introduced near Ravenswood five years ago. The Hereford predominates at the present time, but there seems to be very little difference in the relative value of these two breeds. They are both well adapted to the conditions of the area and give satisfactory results. Many large dairy herds are maintained along the Ohio and Kanawha River bottoms, the Jersey and the Holstein breeds predominating. Milk is shipped to Charleston, Huntington, Parkersburg, and local markets.

Some sheep were raised by the early settlers, but the industry did not become important until the sixties. It flourished until about

1890, when the low price of wool caused it to be almost abandoned. The first purebred sheep introduced was the Merino near Garfield, followed later by the Southdown and Shropshire. The last-named breed was introduced about six years ago. The Southdown is the principal breed raised in the area now, as it seems to find the climatic conditions especially favorable. It is used for both wool and mutton. Sheep are very destructive to pasture sods and are kept mostly in the rougher sections of the area and upon the limestone ridges, where close grazing is not so injurious to the grass. The sheep upon the limestone soils produce a very fine grade of wool and under ordinary circumstances only such "wool breeds" as Delaines and Merinos should be handled; but the present high price of mutton makes a dual purpose breed more profitable.

Goats are raised in small herds in the rougher sections of the area. They prove very effective in keeping down noxious weeds and brush in pastures. It pays to keep them only on very rough land where the grazing of cattle is impossible.

Hogs are raised in all parts of the area, but largely for home use and local markets. The Poland-China, Jersey Red, and Chester White are the principal breeds.

The raising of chickens and turkeys constitutes an important industry, which, however, is carried on mainly in a small way on most farms, usually as an adjunct to general farming and stock raising. Considerable quantities of poultry and eggs are shipped. Horses are not raised in sufficient numbers to supply the local demand.

As the early settlers cleared the bottom land first and then moved back into the hill country, the upland section along the Ohio River was the first to be brought under cultivation. Having been longest cultivated, this section has suffered most from erosion. The interior country coming into use later has been more generally utilized for grazing and consequently more land here has had the effective protection against erosion offered by sod. Too little attention, however, has been paid to the maintenance of grass, with the result that erosion has made no little headway. The limestone land and heavy calcareous soils such as the Brooke clay loam and Upshur clay have needed comparatively little attention, as such land is well adapted to bluegrass, but it is well even with such good grass land to keep down brush and weeds and to reseed the area in which the grass occasionally dies out.

Many farmers take advantage of the alternate freezing and thawing during the winter to prepare their heavy soils, plowing in January and February, preferably the latter part of February. The variable weather of spring assists in pulverizing the clods and bringing the soil into good tilth. If breaking is put off until spring the unfavorable soggy condition of the soil makes it almost impossible to prepare

the fields in time for the planting season. Upon the heavier soils deep plowing is usually practiced.

The agricultural methods differ widely in different sections of the survey. In the southern part of the area, where tobacco is becoming the principal crop, the tendency is toward a one-crop system; while in the northern part of Jackson County, where large quantities of tobacco are grown, farming is more diversified. Over a large part of the area cattle raising is the principal industry, and all other operations are subordinated to that. Along the low range of hills back from the Ohio and upon the old river terraces fruit growing receives a great deal of attention. Along the Ohio River bottoms diversified farming is practiced, with trucking or dairying an important feature. The Kanawha River bottoms are extensively utilized for wheat and hay.

Labor-saving and improved machinery, such as cultivators, corn binders, and shredders, are used mainly upon the valley land of the large streams.

In a general way the farmers of the Point Pleasant area recognize the adaptability of certain soils to certain crops, though crops are grown more or less indiscriminately on all classes of soils. Corn is the most important crop on the bottom lands and these are admirably suited to its production, but nearly every type in the area is used to a certain extent for corn. Tobacco does best on the heavy limestone lands and on some other soils freshly cleared or heavily fertilized. It is also grown upon the bottom land, where the yields are heavy, but the leaf is rather inferior and the crop exposed to damage or total loss by overflow.

The Ohio River terrace soils are recognized as excellent potato, melon, and truck soils, while the contiguous red hill land is valued for its grazing qualities. The low, flat ridge tops along the Ohio River (the remains of an ancient stream terrace) are recognized as good fruit land, and the industry is here developed to some extent, but the full value of these soils for fruit is not appreciated. No matter how much the adaptation of soils to crops may be recognized in the hill country, to a certain extent the natural conditions compel some crops to be grown indiscriminately. The important crops, however, should be determined by the character of the soil.

Crop rotation is given most attention by the farmers of the Ohio River bottoms and second bottoms and of the limestone ridges. Many farmers in other parts of the area follow a certain form of rotation, often without thought of improving their lands or increasing the yields of crops.

A rotation commonly practiced on the Ohio River bottoms and terraces is as follows: First year, corn with cowpeas or crimson clover second year, corn, vetch, or rye; third and fourth years, red clover and timothy. If the ground is poorly drained or sour alsike clover is

commonly sown. Where the field is high and well drained corn stubble is often sown to wheat and grass.

Rotations for getting land sodded for mowing are practiced as follows: On bottom land, corn two years, then red clover and timothy; on hillside land, corn one year, then red clover and timothy; on crests of hills and ridges, corn the first year, wheat the second year, oats the third year, and then clover and timothy. A rotation used in bringing new land into pasture is: Corn, followed by wheat with redtop and bluegrass. The redtop is sown as a nurse crop for the bluegrass. Orchard grass and white clover sometimes form part of the grass mixture.

In the tobacco districts a rotation used on new land is: First year, tobacco; second year, tobacco; third year, wheat and clover, with bluegrass if pasture is wanted, and timothy if intended for hay. Very often the clover is turned under and the same rotation repeated.

The fertilizers most commonly used in the area are bone meal, acid phosphate, ground phosphate rock ("floats"), nitrogen-phosphate mixtures (often a 14 per cent phosphoric acid and 2 per cent nitrogen mixture), and commercial mixtures ranging usually from 8 to 10 per cent phosphoric acid, $1\frac{1}{2}$ to $2\frac{1}{2}$ per cent nitrogen, and from 4 to 8 per cent potash. Some lime is used on acid soils and in some cases upon grass. Bone meal, ground phosphate rock, acid phosphate, and phosphate-nitrogen mixtures are used for wheat in quantities varying from 100 to 400 pounds per acre. Complete fertilizers are used for tobacco and truck crops. Basic slag gives good results with timothy. Bone meal and floats are good for any kind of sod. There are many farmers who do not use commercial fertilizers at all and many others who use them sparingly and indiscriminately. There is no question that they are profitable on certain soils and with some crops.

Manure is used to a great extent upon the terrace soils and uplands for corn. Stock is often fed upon the field from which the hay is cut.

Very little nitrogenous fertilizer is used, and the growing of leguminous crops is becoming more popular every year. Sorghum and cowpeas sown together are profitable, the cowpeas at the same time improving the land.

The agricultural practices on the whole are fairly well suited to the conditions in the area.

Much of the efficient labor of the farms has been attracted to adjoining counties by the opening of large oil fields. The wage paid in the oil field is about \$2 a day for the same class of labor that commands \$1 to \$1.25 a day upon the farms and \$1.50 to \$1.75 upon public works. The ordinary price paid for labor in the interior uplands is \$20 to \$25 month, or 75 cents a day with board. Farm hands along the Ohio River receive from 25 to 50 cents more a day than in other parts of the area.

The labor as a rule is efficient but rather scarce. Much of the work is done by the farmer and his family. Laborers hired by the year are usually furnished houses, gardens, and pasture.

The farms as a rule are small and most of them are operated by the owners. In the southern part of the area much of the tobacco is grown on rented land. One-half the crop is the usual rental on limestone soils, where the owner furnishes team, tools, and land, and the renter the seed and labor. Upon the bottom land the owner furnishes land only and gets one-half the corn and hay. Rentals, however, are adjusted to suit the circumstances. Limestone land and river-bottom land are not usually rented, especially where they are kept in a high state of cultivation.

Many suggestions can be made pointing to the improvement of the agriculture. In a country where such a large number of people are interested in stock raising the maintenance of good bluegrass sods is important. The use of sodium nitrate as a top dressing will often be found valuable in rejuvenating an unproductive sod. Stable manure can be and is used to a limited extent on grass but it is not so quickly effective. Liming is beneficial to sod, but it should be done before the grass has too completely disappeared, in which case reseeding is the only remedy. Many of the steep hillsides should remain in forest and it would be advantageous to plant some of the present steep pastures that show signs of washing in locust. If allowed to remain in pasture it is only a question of a short time before erosion will remove much of the surface soil.

The use of legumes such as cowpeas, soy beans, and vetch should be more general. These crops are used to some extent by the farmers along the Ohio River terraces, but are not in common use in the hill sections. By the use of legumes the cost of fertilizers is reduced to a minimum. Upon the hill land the keeping of as much live stock as a farm will support, about 3 head per acre of good grazing land, is strongly recommended. A good rotation to follow in continuous cropping is (1) corn, (2) oats or wheat, (3) clover, cutting first crop and turning under; follow with potatoes.

If orchards are situated upon a soil type that is well suited to sod, the maintenance of a strong sod grazed by hogs or sheep is recommended. But upon light soils the modern method of cultivating the orchards is preferred, using vetch or clover for cover crops.

SOILS.

Nineteen distinct types of soil are found in the Point Pleasant area. These types represent three different physiographic regions—the uplands, terraces, and flood plains.

On the basis of differences in origin and certain physical characteristics the several types are grouped in nine series. The several mem-

bers of each series have the same general appearance and the same general composition, but each differs from the others in texture.

The following table gives the soil types as grouped according to topographic position and origin.

	ORIGIN.	SOIL TYPE
Upland residual soils.	Limestone.....	Brooke clay loam.
	Coarse-grained sandstone.....	Dekalb loamy sand.
	Fine-grained sandstone, arenaceous shales, and gray shales. }	Dekalb silt loam.
	Red calcareous shales.....	Upshur clay.
	Red calcareous shales and gray shales. }	Upshur silty clay loam.
	Sandstone, arenaceous shales, gray, and red shales. }	Meigs clay loam.
Stream terrace soils (second bottoms, old alluvium mainly).	Rock outcrop, usually sandstone. }	Rough stony land.
	Ohio River.....	Wheeling silt loam.
		Wheeling fine sandy loam.
		Wheeling fine sand.
		Wheeling sandy loam.
		Wheeling gravelly loam.
Kanawha and small streams... }	Tyler silt loam.	
	Tyler silty clay loam.	
Ohio River high terraces and Teays Valley alluvium. }	Holston silt loam.	
Flood plains (first bottoms, recent alluvium).	Ohio, Kanawha, and other streams. }	Huntington loam.
		Huntington silt loam.
		Moshannon silt loam.
		Moshannon clay.

The soils of the upland vary from Rough stony land (mainly rock outcrop and steep stony areas) to heavy clay, the immediate surface portion being predominately silty. These have been formed by the disintegration and decomposition of the rocks of the Dunkard, Monongahela, and Conemaugh series of the Upper Carbonic system, consisting of stratified, thin, recurrent beds of sandstone, arenaceous shales, soft red calcareous shales, yellow, gray, and greenish shales, limestone, and to a very small extent coal and bituminous shales. Of these rocks the sandstone, red shales, and limestone are by far the most important, both in extent and influence upon the soils.

The sandstones occur in strata varying in thickness from 10 to 100 feet, with an average of about 20 to 40 feet, and are interbedded with the other rocks, of which the red calcareous shales form the greater portion.

Where the last-named rocks predominate the resultant soil type is the Upshur clay. It is found largely developed where the Creston Red Beds of the Lower Dunkard outcrop over the eastern and central part of Jackson County, northeastern Mason, and the western part of Putnam. A few developments of this formation are found south of the Kanawha River in Mason County. The Upshur clay found in other parts of the area usually occurs in small bodies and is derived from the thin and widely separated beds of red calcareous shales of the Upper Dunkard, Monongahela, and Conemaugh series. The Upshur clay is somewhat calcareous, but perhaps not as much

so as the general run of the type to the north of the Point Pleasant area.

The Upshur silty clay loam has the same Indian red clay subsoil as that of the Upshur clay, but the surface soil averages more nearly gray in color. The type occurs upon low hills along the Ohio River. The topography is not steep and weathering has taken place to a considerable depth. The surface portion of this type resembles somewhat that of the old alluvial type, Holston silt loam, but there is no such conclusive evidence that the material is of alluvial origin.

Where the red shales are less in evidence and the sandstones, arenaceous shales, and gray shales are found the weathered materials are more or less mixed and the soil is varied by patchy occurrences of different colored and to a lesser extent different textured types. This rather variable soil is mapped as Meigs clay loam, a type occurring in nearly all parts of the area, though most extensively developed in the southern part, where the rocks of Monongahela and Conemaugh form the main proportion of the outcrops. The Meigs clay loam of this area includes less Upshur clay than in the Parkersburg and Spencer areas to the north.

The weathering in place of the fine-grained sandstone, arenaceous shale, and gray shales gives rise to the Dekalb silt loam. It usually occurs in fairly level areas as the result of the breaking down of massive strata of the first-named rock or is supported by such strata.

The Dekalb loamy sand is formed by the weathering in place of coarse-grained sandstones and is usually found upon ridge tops. It is developed to a comparatively small extent. The Dekalb soils in general are not naturally strong soils.

The Nineveh limestone, near the top of the Dunkard, the main limestone formation of the area, gives rise to the Brooke clay loam. This formation has a maximum thickness of about 50 feet and though mainly pure limestone includes several interbedded strata of shale. The resultant type is the strongest upland soil in the area and is much more extensively developed here than in the adjoining areas surveyed.

The outcropping of massive sandstone strata gives rise to Rough stony land. Notable among these formations are the Waynesburg, Pittsburg, and Mahoning sandstone, forming the bases of the Dunkard, Monongahela, and Conemaugh formations, respectively. Rough stony land is poorly developed in this area and is of little importance.

The Parkersburg syncline¹ has much to do with the distribution of the soil types. The line of this depression passes through the area in a general northeast and southwest direction, entering the area near Beatysville, passing through Sandyville and to the west of Ripley, near Baden, Leon, and Upland. From the last place it passes south

¹ See West Virginia Geological Survey, Point Pleasant report.

parallel to the Mason-Putnam County line. The rock strata rise in both directions from the syncline with low dips, and the axis of the syncline rises gradually to the southwest.

Erosion is very active upon the exposed hillsides of the upland soil types. The Upshur clay upon the hill country adjacent to the Ohio River has also suffered severely from wash. Clearing and cultivation in this section began with the early settlement of the county.

Landslides are frequent upon the steep hillsides on the Upshur clay and Meigs clay loam. They usually occur during the spring rainy season and are probably caused both by the giving away of the underlying rock strata loosened by frost and by the saturation of the soil by water. These slides sometimes represent simply a settling or slipping of the soil a few feet, but often on steep hillsides the material is moved for considerable distances, causing more or less mixing of the soil, especially where there is some original variation in the material, which is frequently the case, and also bringing about an uneven surface condition. Roads and fences are often displaced by these slides.

The terrace soils along the Ohio River, represented by the Wheeling soils, are largely composed of glacial material transported from the glacial regions to the north. Five types of this series are found—silt loam, fine sandy loam, sandy loam, fine sand, and gravelly loam. This is the most valuable series of soils in the area. The silt loam occurs on the lowest of these second bottoms, the fine sandy loam about 10 to 20 feet higher, the sandy loam slightly higher, and the fine sand in the highest situations, frequently lapping up on the lower slope of the uplands as an apron. This last type has had its surface markedly influenced by wind action. The gravelly loam is found either at the level of the sandy loam or is the exposed gravel bed below the Wheeling silt loam.

The terrace soils along the Kanawha River and other smaller streams (Tyler series) have the appearance of being derived more largely from Dekalb soils than from the red soils like the Upshur, but the poor drainage condition to which they have been subjected has probably brought about changes in the material since deposition, assisting probably in the development of the light color and rather unfavorable structural conditions. These soils are locally called "Crawfish land."

Teays Valley,¹ the ancient valley of the Kanawha River, consists of beds of gravel resting upon bedrock covered by a thin stratum of sand or laminated clays and these in turn overlain by deep deposits of silt. The presence of laminated clay is evidence of lacustrine origin.² Where the silty mantle has been removed by erosion the exposed clays have given rise to the Tyler silty clay loam.

¹ See Charleston Folio U. S. Geological surveys.

² See Charleston and Huntington Folios, U. S. Geological Survey.

The brown silt loam derived from the Teays Valley deposits has been classified as silt loam. In the old river channels and on some of the high old terraces between Ravenswood and Point Pleasant back from the Ohio River the soil is so similar to the Holston silt loam that it seems best to include it with this type.

These high terraces have suffered considerably from erosion, and in many places have been cut through to bedrock, leaving only a few small areas of the old alluvium. This erosion has been most active in case of the flat-topped ridges back from the Ohio River, between Ravenswood and Mason. The Holston silt loam here resembles the Dekalb silt loam in many respects, but is usually heavier and more productive.

The Ohio River bottoms proper, the Huntington soils, are all subject to overflow; but the highest of these, the Huntington loam, is inundated only by very high freshets. These are very valuable agricultural soils.

The high bottom land along the Kanawha River, represented by the Moshannon series, is subject to overflow once in about every four or five years. Much of the Moshannon has poor drainage, owing to the numerous slight depressions. The Moshannon silt loam is a first-bottom soil subject to overflow. It has a distinctive reddish-brown to chocolate-red or Indian-red color, due to the abundance of material washed from the red upland soils, as the Upshur clay. When this type has received much wash from limestone land, the Brooke clay loam, it seems to be more productive than elsewhere.

The bottom-land soils are all fairly well drained except, of course, when overflowed and are very productive. Along the smaller streams they are more liable to overflow during the growing season than along the rivers. The bottom lands are best adapted to corn and grass and produce good yields each season without the aid of fertilizers.

The following table gives the names and areas of the several soil types shown in the accompanying maps:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Meigs clay loam.....	419,264	51.7	Brooke clay loam.....	4,928	0.6
Upshur clay.....	145,856	18.0	Tyler silty clay loam.....	4,864	.6
Dekalb silt loam.....	74,752	9.2	Moshannon clay, erosion phase ¹	4,608	.5
Huntington silt loam.....	29,248	3.6	Huntington loam.....	4,480	.5
Holston silt loam.....	25,856	3.2	Wheeling fine sandy loam.....	3,584	.4
Tyler silt loam.....	23,424	3.0	Wheeling fine sand.....	1,280	.2
Moshannon silt loam.....	19,776	2.7	Wheeling sandy loam.....	1,152	.1
High lying phase.....	2,496		Wheeling gravelly loam.....	768	.1
Upshur silty clay loam.....	20,288	2.5	Dekalb loamy sand.....	448	.1
Rough stony land.....	15,296	1.9			
Wheeling silt loam.....	9,152	1.1	Total.....	811,520	.....

¹ Includes some Holly clay.

UPSHUR CLAY.

The soil of the Upshur clay is a dark reddish brown or dark Indian red heavy clay loam to clay about 5 inches deep. The subsoil is a plastic and tenacious heavy red clay, becoming more compact as depth increases. The surface cracks badly when dry, and deep fissures are found in sunbaked surfaces. Upon the hilltops the type is usually of the deep red or Indian red color, while the hillsides are more nearly of a brownish-red color. The hilltop phase represents the stronger of the two phases, for that upon the hillsides is very often mixed with light-colored sandstone and shale soil. Most of the type occurs on the hillsides. It is not quite so heavy in this area as in the adjoining areas already mapped. Spots of Meigs clay loam, too small to map, are found occasionally scattered through the type.

In many places limestone fragments and concretions are found upon the surface and throughout the profile. In other places fragments of iron ore are found.

The Upshur clay is formed through the weathering in place of red and greenish colored calcareous shales of the Upper Carboniferous beds. The type is found largely developed in Jackson County, in the eastern part of Mason County, and the northern part of Putnam County. Typical developments occur upon the hillsides of the country adjoining the Ohio River and its tributaries in Jackson County. Where the Creston Red Beds outcrop the Upshur clay is the predominant soil type.

The calcareous shales from which the type is derived are soft and weather very rapidly and deeply. The soil in other parts of the area, being derived from other formations than the Creston Red Beds, is not altogether typical and occurs only in small detached spots.

The Upshur clay is a productive soil and supports a fine bluegrass sod. Wheat yields 10 to 25 bushels, corn 30 to 60 bushels, oats from 20 to 25 bushels, and hay 1 to 2 tons per acre. Wheat is grown to some extent upon the ridge tops, but the oat acreage is very small. Tobacco is grown and gives fairly good yields upon new land. Clover and leguminous crops are not grown to any great extent.

The type is too heavy for potatoes and most vegetables. It is not especially adapted to apples, peaches, or small fruits, although they are produced on a small scale for home consumption. The trees seem to be very subject to disease, and little success has been had in commercial orcharding.

The type is very difficult to cultivate and erodes badly where exposed. For these reasons it should be mainly kept under sod, and every precaution taken to keep the sod in good condition. Liming and the application of manures and of nitrate of soda will be advisable for this purpose. The type furnishes good grazing land and it is

largely upon it that the cattle industry of the country has been developed.

Much care should be taken to plow this soil when in the right moisture condition. If plowed too wet it clods badly and serious injury to the soil results. Plowing should be done in the fall or in January or February, so that alternating freezing and thawing may pulverize the soil thoroughly. Spring plowing is all but impossible, owing to the cold, damp nature of the type. Manures, lime, legumes, and cover crops should be used to improve the physical condition. Commercial fertilizers in the form of bone meal or floats (ground phosphate) should be used with wheat when preceding grasses. If wheat is to follow wheat or is to be followed by a cultivated crop, a more soluble form of phosphate should be used as "acid phosphate."

Nearly all the type is cleared of its hardwood growth and most of it is in pasture. It is valued at \$20 to \$75 an acre.

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

Mechanical analyses of Upshur clay.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
24621, 24623.....	Soil.....	2.3	3.8	2.1	5.4	12.3	41.4	32.4
24622, 24624.....	Subsoil.....	.0	.3	.6	4.4	1.9	32.4	60.4

UPSHUR SILTY CLAY LOAM.

The soil of the Upshur silty clay loam¹ is a grayish-brown to light-red silty clay loam about 8 to 12 inches deep. The soil grades imperceptibly into the subsoil, which is a heavy red silty clay loam to silty clay, to 24 inches, where it becomes a heavy plastic clay of Indian red color. The surface color over a large part of the type is not very different from that of the Dekalb silt loam, but the subsoil has a typical Upshur color.

The type is derived from red shales, with some fine-grained sandstone. It occurs on the more gently sloping hillsides and rounded hilltops where weathering has taken place to a considerable depth. Very few fragments of shale and sandstone and no limestone fragments or concretions are found.

The type is developed mainly upon the sides of the low hills back from the Ohio River, between Ravenswood and New Haven and along Sandy and Mill Creeks. Typical developments occur north of Fairplain in Jackson County and in the vicinity of Board in Mason County.

¹ Small areas of this soil occur in the Parkersburg area, but owing to the small size they were included with the Dekalb silt loam.

In this area the type embraces a considerable extent, making it an important soil. It has a wide adaptation, combining the good qualities of a fruit and trucking soil with those of a general farming and grazing type.

It is a good fruit soil, especially for apples, and some splendid orchard sites are included in the type. It is an easy soil to cultivate and though not so strong as the Upshur clay, it produces good general farm crops such as corn and wheat. It supports a strong bluegrass sod. The productive capacity of the type falls about half way between the Upshur clay and Dekalb silt loam.

The soil is usually deficient in organic matter, and this should be supplied by growing clover and cowpeas and by the turning under of cover crops.

Nearly all of the type is cleared and most of it is in pasture. But the proportion of its area under actual cultivation is much higher than in the case of the Upshur clay. The original forest consists principally of oak, hickory, and walnut. Pine and locust form the second growth. Owing to the gently rolling topography, the ease with which the type is cultivated, and the wide adaptation and productiveness the agricultural value is relatively high, ranging from about \$20 to \$40 an acre.

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

Mechanical analyses of Upshur silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24617, 24619.....	Soil.....	0.1	0.5	0.6	2.5	2.9	68.2	25.0
24618, 24620.....	Subsoil.....	2.0	1.8	1.5	4.4	6.6	39.2	44.6

DEKALB SILT LOAM.

The soil of the Dekalb silt loam is a gray to grayish-brown light silt loam about 8 to 10 inches deep. The subsoil is a pale yellow, fairly heavy compact silt loam to silty clay loam, which becomes slightly heavier as depth increases, sometimes passing into silty clay below 30 inches. In places the lower subsoil has a slight Indian red cast. Such areas are inextensive and really represent a gradation toward the Upshur

The Dekalb silt loam is an upland residual type and is formed by the weathering in place of massive, fine-grained sandstones and shales.

The topography of the type is level to gently rolling, weathering has taken place to the depth of 6 to 10 feet, and very few fragments

of shale or sandstone are encountered in the soil to a depth of 36 inches. Drainage is usually good and in some places excessive.

The Dekalb silt loam is fairly well developed in the Point Pleasant area. A belt, broken by other soils, is found on the low flat ridge tops in the southern part of Jackson County and extends into Putnam County, following the outcropping of the Waynesburg sandstone. Typical areas occur around Kentuck, Paradise, and Hugo. A considerable area is found in the vicinity of Upland, Mason County, and well-developed areas occur on the low hills back from the Ohio River south of Letart. Small bodies occur in all parts of the area, usually as flattened ridge tops or shelf land.

The Dekalb silt loam is not naturally a strong soil and in nearly all parts of the area it has been impoverished by constant cropping. Very few instances were noted where the soil was not deficient in organic matter. It is easy to cultivate, owing to the loose structure of the soil, and responds readily to commercial fertilizers, manures, and the turning under of green crops or other organic matter. It also shows wonderful improvement following crops of the legumes.

Nearly all of the general farm crops of this section are grown upon the type. Except where fertilizers are used or where the type has been improved by careful tillage the yields are generally rather low. Wheat produces 10 to 20 bushels, corn 15 to 50 bushels, oats 20 to 30 bushels, potatoes 100 to 150 bushels, hay 1 ton, and tobacco from 800 to 1,000 pounds per acre. Grass does not make an especially vigorous growth and very little of the type is in pasture or mowing. The clovers do not thrive, but other leguminous plants, such as cowpeas, soy beans, and vetch, do well. The type does not produce as heavy yields of tobacco as the other heavier soils, but gives a good grade of Bright Burley. Tobacco is grown mostly upon this type in the southern part of the area. This is also a good soil for light truck, but the industry has never been developed. Vegetables are produced for home consumption.

The Dekalb silt loam is one of the best fruit soils of the area, especially for apples. The topography is well suited to orcharding. The trees make a vigorous growth. Peaches, pears, and plums do fairly well, but are only grown for home use and local markets. Small fruits, such as strawberries and raspberries, do well, but are grown very little.

A number of suggestions could be offered for the improvement of the type. Fertilizers should be used for wheat, tobacco, and all crops that make a heavy draft upon the soil. For wheat, corn, and oats about 200 to 300 pounds per acre of a brand analyzing 10-2-4 would likely prove profitable, while an application of from 300 to 600 pounds of the same grade would be beneficial in tobacco culture.

Cowpeas or other legumes should be used in all rotations. The soil shows decided improvement from the turning under of such crops as cowpeas, vetch, and rye.

The use of fertilizers relatively high in potash would be profitable in connection with the production of peas and beans. Barnyard manure is particularly helpful to all crops and should be used as much as possible. The original forest growth consisted largely of white oak, chestnut oak, and chestnut. Most of this has been removed and the type brought under cultivation. Chestnut predominates among the few trees that are left. The type is known locally as "chestnut land."

The Dekalb silt loam is valued at \$20 to \$30 an acre.

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

Mechanical analyses of Dekalb silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
23704, 24587, 24589, 24607.	Soil.....	0.2	1.0	1.1	4.4	4.0	75.3	13.6
23705, 24588, 24590, 24608.	Subsoil.....	.2	.8	.9	3.8	5.8	63.3	25.0

DEKALB LOAMY SAND.

The soil of the Dekalb loamy sand to a depth of about 8 inches is a light-brown to dark yellowish-brown loamy sand, loose and open in structure. The dark color is due to organic material and is proportionate to the organic content. The subsoil is a pale-yellow to yellow loamy sand or very light sandy loam which below 20 inches becomes sandier and coarser in texture. Partially decomposed sandstone of the parent rock is encountered in some places at about 30 inches below the surface, but the rock usually lies below 3 feet.

The type is formed by the weathering in place of a massive, coarse-grained sandstone and is found in this area only upon or near the crests of ridges. The rolling topography and open structure of the subsoil cause excessive drainage, and crops often suffer for lack of moisture during dry spells.

The type covers relatively small areas and is found in its most typical and extensive development south of Arlee, in the southern part of Mason County. A few small, scattered areas are found near the Mason-Cabell County line. Other areas occur south of Belgrove, near the Roane-Jackson County line. One isolated spot is found at Santown, in Mason County, where the subsoil has a slight reddish cast.

The Dekalb loamy sand is of low agricultural value. It is naturally not a very strong soil and is decidedly inclined to droughtiness. Fair crops of corn, wheat, oats, and rye can be obtained by liberal use of barnyard manure or commercial fertilizers high in nitrogen. Cowpeas do very well and are recommended for rotations aiming at an improvement of the soil. They can be used to good advantage in such rotations and if turned under will improve the structure of the soil, making it more retentive of moisture. An acreage application of 300 to 400 pounds of a fertilizer mixture analyzing about 8-2-4 is a splendid application for wheat, oats, and a number of vegetables, especially following cowpeas or other legumes. Where no leguminous crop has preceded the nitrogen content should be increased or an application of 75 to 125 pounds of sodium nitrate made as a late side application. Garden crops do well, especially tomatoes, garden peas, radishes, beans, and potatoes.

Peaches, apples, pears, and small fruits do exceptionally well upon this type. Peaches pay better than any other fruit.

Grass gives poor results, the yields being light and the stand uncertain. The type should not be counted upon as well suited to grazing, but should be used for orcharding and the production of early vegetables and some general farm crop. This type gives a very high grade of tobacco, but the yields are low.

The native growth is largely pine, chestnut, and poplar. Many locust trees are seen in abandoned fields.

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

Mechanical analyses of Dekalb loamy sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24585.....	Soil.....	0.4	11.4	31.6	27.7	5.8	15.1	7.7
24586.....	Subsoil.....	.0	16.7	33.5	24.3	7.0	11.4	7.3

MEIGS CLAY LOAM.

The Meigs clay loam is a rather variable soil derived from fine-grained sandstone and gray and red shales. It occupies steeply rolling country—high hills, narrow ridges and slopes where the runoff is rapid and consequent erosion rather severe.

The type really represents undifferentiated Dekalb and Upshur soils, with considerable intermediate (Dekalb-Upshur) soil. These soils are so intricately associated and occur in such small areas that it would be impracticable to separate them. It is difficult to say whether the Dekalb, the Upshur, or the intermediate soil predomi-

nates over the whole of the area of this type, although there are many places where one of these is developed more extensively than the others.

Of the Dekalb soil included in the Meigs clay loam the silt loam type predominates over the smoother areas, as on shelf or benchlike situations and on the tops of ridges, and the silty clay loam on the slopes. Most of the Upshur is represented by the clay type, although there is considerable Upshur silty clay loam.

The intermediate type averages a grayish-brown silt loam to silty clay loam underlain at 2 to 8 inches by yellowish silty clay loam which at about 20 to 24 inches grades into a dull red or mottled Indian-red and yellow clay. Not infrequently the surface portion of the intermediate type is gray to pale yellow Dekalb silt loam or silty clay loam, while the subsoil is Upshur clay. In many places along the slopes there has been more or less mingling of Dekalb and Upshur material by slips and colluvial action.

That portion of the type lying just below the Nineveh limestone is more or less influenced by colluvial material from the limestone, usually to the benefit of the soil from an agricultural standpoint. Partially weathered sandstone and shale fragments are scattered over the surface and disseminated throughout the soil section of much of the type.

"Slips," or landslides, are common in this type. They have been an important factor in causing variation in the soil. The drainage of the Meigs clay loam is excessive, especially where the underlying rock comes near the surface, causing no little injury to crops in dry spells. Erosion is so active that a very considerable proportion of the type—the steeper slopes—should never be plowed, but left in forest or used for pastures.

The type occurs in large areas in the eastern part of Jackson County along the Roane County line, and extends out into the central and southern parts of the county, mainly upon the ridge tops. The type is largely developed in the east-central and southern parts of Mason County and in all parts of Putnam County it is the predominant soil.

Much of this type in Jackson County is in forest, owing to the large area of adjacent soils better adapted to agriculture. But in other parts of the area much of it is cleared and is in pasture. Very little of the type is under actual cultivation. Cultivated crops should only be grown on the gentler sloping areas. A considerable part of this land can, however, be used for grass and pasturage. The type is naturally productive, and would be a very desirable soil but for its unfavorable topography which precludes cultivation or the use of improved machinery over extensive areas. Corn, hay, and tobacco are the principal crops. Corn produces 15 to 45 bushels per acre

according to season and care of cultivation. Wheat, 6 to 20 bushels, averaging about 10 bushels, and hay from three-fourths to 1 ton per acre. Clovers do not give good returns, but cowpeas do exceedingly well and should be grown more extensively. Vegetables are grown for home use only. Tobacco is given a good deal of attention on the type and gives good yields, about 1,000 pounds per acre being the average yield. Fresh land is nearly always used for this crop. Blue grass grows naturally upon the type in nearly all parts of the area. A strong sod is developed capable of supplying good pasturage except during long dry spells. The chief drawback is that the sod does not last. The grass gradually thins out, rarely holding a good stand and giving away to broom sedge or other vegetation. More effort should be made to check advancement of undesirable vegetation by reseeding and cutting out of brush and by making broadcast applications of lime and probably phosphatic fertilizers.

Phosphatic fertilizers should be used with cultivated crops. Bone meal also (300 to 500 pounds per acre) should be used when possible for crops intended to be followed by grass.

Locust trees spring up very quickly in abandoned fields. The growing of these for posts and other uses should prove profitable. The utilization of areas most susceptible to washing for such purposes should certainly receive more attention.

Apples, peaches, pears, plums, and cherries do well, but only the smoother crests of hills and ridges and the gentler slopes and shelf-like situations should be used for fruit. Commercial orcharding ordinarily would not pay upon the steep hillsides. Grapes do well upon this type. Good vineyard sites are numerous.

Blackberries and raspberries are not grown to any considerable extent, but make good yields when given the proper care. Apples would probably be found to pay better on the type than other fruits. The Ben Davis does exceptionally well.

The natural forest growth is largely oak, hickory, and walnut, with chestnut upon the higher phases. Oak and locust are the predominant second-growth species.

The type is valued at from \$10 to \$20 an acre.

BROOKE CLAY LOAM.

The surface soil of the Brooke clay loam as typically developed is a grayish-brown to yellowish-brown heavy clay loam, 3 to 6 inches deep. It is friable when dry, and very plastic and sticky when wet. It cracks badly on drying and packs in the roads with a smooth, glistening surface. Fragments of bluish-colored limestone, varying in diameter from 1 inch to several feet, are found scattered on the surface and in a few places render cultivation difficult.

The subsoil is a pale yellow to yellowish-brown heavy plastic and tenacious clay to about 20 to 30 inches, where the texture becomes

lighter and often the parent limestone is encountered. Fragments or unweathered portions of this limestone are of common occurrence throughout the soil mass.

The Brooke clay loam of the Point Pleasant area is derived from the weathering in place of the Nineveh limestone, which is an extension of the same formation that gives rise to this type in the southern part of Wood and the western part of Wirt County. The formation has a maximum thickness of about 50 feet near the northeast boundary of Jackson County and thins toward the west. In places it is interbedded with shale and sandstone, but the greater part of the soil is derived from pure limestone. Along the Wirt County line the type is found upon the crests of ridges and hills above the 1,000-foot contour line. The formation dips slightly toward the Parkersburg syncline. The type is found at the lowest levels in the area of the syncline and probably reaches its lowest horizon at Browning, where it occurs at about 980 feet. The formation rises to the west from the syncline and the last western remnant of the formation occurs on Utah Hill at about 1,050 feet elevation. This is not an extensively developed soil, being found only in the northwestern part of Jackson County.

Just below the lower strata of the Nineveh limestone a thick bed of greenish-red calcareous shale is found. Where the material derived from the two formations is intermingled, a light-brown phase of the type is encountered. Lying on the crests of high hills and ridges, the drainage of the Brooke clay loam is good. It conserves moisture in amounts favorable to good crop growth, there being very little suffering from drought. Care should be taken not to cultivate when the soil is wet enough to be sticky, as puddling or severe baking is likely to follow. However, on account of the high lime content, clods usually crumble down much more rapidly than in case of similar heavy soils lower in lime. The best time to plow the type is in the late fall or during January or February, not so much to take advantage of the winter freezing as to prepare the land in time to secure the proper seed-bed condition for spring planting. Delayed plowing in the spring often prevents the proper preparation of the soil until the season is too far advanced.

Erosion is largely held in check by the excellent bluegrass sod covering much of the type.

The Brooke clay loam is the strongest upland soil in the area. It produces good yields of the general farm crops without the use of commercial fertilizers. Tobacco probably gives the best returns of any crop grown. From 1,000 to 1,200 pounds per acre is generally secured, although as high as 2,000 pounds is not unusual.

A very high grade of Bright Burley tobacco is grown on this land. It is upon this type that the tobacco industry in Jackson County is largely maintained.

Wheat yields from 15 to 35 bushels per acre, but it is a rather expensive crop to handle on this high-lying type of soil. Corn

yields range from 40 to 60 bushels per acre, and oats from 30 to 60 bushels. Vegetables and potatoes are grown with success, but mostly for home consumption. Apples do not thrive, the trees for some reason being short lived. Peaches give good results, varieties like the Elberta and Crawford being most profitable. Cherries and plums also do well. Such fruits as blackberries and raspberries are grown only in a limited way.

Clovers, cowpeas, and soy beans flourish. Alfalfa also does well when once established, but considerable trouble is encountered in getting a good stand. Timothy yields from 1½ to 2 tons of hay per acre and the pasturage is good even during dry seasons. Bluegrass sod lasts for an indefinite period. Fields were seen that were 40 years old and still in good condition.

The raising of live stock on a type so well suited to this industry could not but give profitable returns, the greatest drawback being the extent of the type. Sheep produce a good grade of wool. Cattle make a vigorous, healthful growth and can be profitably handled without finishing on corn. The growing of pure-bred stock for breeding purposes is strongly recommended.

The agricultural practices are mainly well suited to the soil and the farmers in general are using modern methods. A common rotation is tobacco two years, followed by wheat and then by clover. The growing of more leguminous crops and the turning under of cover crops or other vegetable matter is recommended to improve the physical condition of the soil.

Commercial fertilizers do not give profitable returns, except with tobacco.

The original forest of hardwood has been nearly all cleared away and the most of the type is in pasture. It is valued at about \$30 an acre. This estimate is for farms including some hillside areas of other inferior soil types. Farms of this soil exclusively would be valued much higher.

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

Mechanical analyses of Brooke clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24581.....	Soil.....	1.5	9.7	7.3	13.8	6.7	38.3	22.4
24582.....	Subsoil.....	.0	.4	1.0	3.7	.7	44.7	49.5

ROUGH STONY LAND.

The Rough stony land comprises the rocky cliffs and steep hillside land upon which the abundance of rock and steepness of slope preclude cultivation. Such areas occur largely where strata of hard, massive sandstone outcrop. The formations giving rocky cliffs are

principally the Waynesburg and the Pittsburg sandstones. Areas are also derived from the lower Dunkard, Monongahela, Mahoning, and Charleston series of rocks. Other small detached spots occur in various parts of the area. Some of these are too small to be shown on the map.

Rough stony land is worthless agriculturally and should be left in forest, as most of it is at the present time. The principal growth is oak and spruce pine. Rhododendron and laurel are found in some places.

HUNTINGTON SILT LOAM.

The Huntington silt loam consists of a brown to dark-brown melow silt loam which gradually becomes lighter in color, passing at about 12 inches into light-brown, slightly compact silty clay loam. In places the soil is slightly sandy, especially in stream channels. Minute flakes of mica are common throughout the soil section. The soil in some of the lower places or swales where water stands longest after overflows is heavier than the typical soil and shows considerable cracking upon drying. Faint grayish mottling is sometimes seen in the subsoil of the poorer drained areas.

Occasional small fragments of shale and sandstone are found on the surface and in the underlying material, especially in the type as developed in the bottoms of the smaller streams. In many places along the smaller streams beds of gravel are found 2 to 4 feet below the surface.

The Huntington silt loam is an alluvial soil and occurs only in the first bottoms of streams. It is subject to frequent overflow and consequent repeated addition of alluvial sediments.

The topography is usually level. A slight undulation is seen here and there, owing to occasional depressions or swales and slight swells. Notwithstanding the level topography and low position, the drainage is usually very good, and only a few areas need artificial drainage. The frequent inundations continually add fertile sediments rich in organic matter, making the use of fertilizers or manures unnecessary. The land can be cropped year after year without showing any signs of impoverishment. However, it should not be plowed when wet enough to be decidedly sticky, as clods are apt to be formed, although injury from this source never lasts for any considerable time. Where there is considerable wash from the red Upshur and Meigs soils the type has a reddish cast, making it difficult to draw boundaries between this and the reddish Moshannon soils. The Huntington silt loam as developed along the Ohio River is of a darker color than that along the smaller streams and is much freer from rock fragments. The soil here is considered the most valuable portion of the type; for one reason, because overflows are not so common during the growing season.

The Huntington silt loam is considered the best corn land of the area and about one-third of the entire acreage of the type is planted to this crop each year. The yields range from 40 to 100 bushels per acre. In that portion of the area that lies to the south of the Kanawha River, tobacco is grown extensively upon this type. While the yields are large, the color is dark and the quality of the leaf is inferior to that grown in the uplands. There is considerable danger of losing the tobacco crop upon the areas along the small streams by floods in June or July. Wheat, oats, and rye lodge badly and are not extensively grown.

Some of the type is too heavy for potatoes, but upon the better drained lighter areas both Irish and sweet potatoes give splendid results. Broom corn is grown to some extent, mostly in Sandy Creek and Mill Creek bottoms. Sorghum is grown upon this type in small patches in all parts of the area, giving a bright-colored sirup. Good crops of timothy are grown, but there is some danger from lodging. A number of other grasses do well and afford excellent grazing even during dry seasons.

"Iron weed" seems to be the greatest menace to pastures upon this land. It is necessary to keep such noxious weeds well under control, for if once well established they are very difficult to eradicate. The type produces good garden and truck crops, especially tomatoes, cucumbers, and cabbage.

Orchards should never be located upon this type, as the situation is not suited to the healthful growth of fruit trees. The native trees, largely sycamore, maple, elm, and beech, have been removed and the type is in mowing or in cultivated crops.

The price of land of this type of soil ranges from \$50 to \$100 an acre.

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

Mechanical analyses of Huntington silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24603.....	Soil.....	0.0	0.1	0.6	4.5	5.9	68.6	20.0
24604.....	Subsoil.....	.0	.0	.2	1.8	8.9	64.6	24.4

HUNTINGTON LOAM.

The soil of the Huntington loam, to a depth of about 10 to 15 inches, is a dark-brown loam, open, friable, and loose in structure. The subsoil is slightly lighter in color and a little heavier in texture than the soil. The occasional slight ridges found in areas of this type are noticeably lighter than the average, the content of fine and

very fine sand being somewhat greater in such positions, while the soil in the swales is much higher in silt than in the predominant type. This type lies somewhat higher than the Huntington silt loam, but it too is subject to overflow, though not so often as the silt loam. These occasional inundations serve to maintain the productiveness of the soil. Crops are rarely damaged by overflows.

The topography is mainly level. There is a slight undulation due to the presence of occasional low ridges and shallow swales. The drainage conditions in the main are excellent. There are a few low spots where tiling or ditching could be done to advantage.

The Huntington loam occurs in narrow strips here and there along the Ohio River, about 40 to 50 feet above the stream. It is found in its most typical development in the bottoms near Ravenswood.

The type is easily cultivated, but has a slight tendency to clod when plowed too wet. This is not a serious drawback, however, especially with the lighter phase, as the clods are very easily pulverized.

Wheat, oats, and rye give good yields and are grown to some extent, notwithstanding the tendency to lodge. Corn yields an average of about 60 bushels per acre. About one-third of the type is used for this crop. Tomatoes, sweet potatoes, and Irish potatoes do better here than on any other type in the area. Irish potatoes yield about 150 bushels per acre. Grasses and forage crops grow luxuriantly, but the type is too valuable to be used for pasturage or for forage crops, except the legumes grown in rotation with other crops. Heavy yields of ensilage could be secured and undoubtedly would pay with dairying. There is little need of fertilizers or manures. Lime would probably benefit the poorer drained swale areas.

The value of this type ranges from \$100 to \$150 an acre. This high price would warrant a considerable outlay to bring all poorly drained areas into good condition, even if expensive tiling were necessary.

The original forest growth, consisting largely of walnut, beech, and sycamore, has been removed and the type is practically all under cultivation.

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

Mechanical analyses of Huntington loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24597, 24599.....	Soil.....	0.0	0.4	4.5	27.8	15.1	38.6	13.4
24598, 24600.....	Subsoil.....	.0	.3	5.7	32.1	19.2	28.3	14.8

WHEELING SILT LOAM.

The soil of the Wheeling silt loam is a friable brown silt loam to silty clay loam about 10 to 12 inches deep. The subsoil is a light-brown to yellowish-brown friable but slightly compact silty clay loam. This becomes lighter in color and slightly more compact as depth increases. Faint grayish mottling is noticed in the lower subsoil in the poorer drained situations.

The type occurs on second and third terraces along the Ohio River, where it represents material deposited by the river when it was flowing at much higher levels. The material is believed to consist largely of glacial particles. This is borne out by the frequent occurrence of beds of glacial gravel that underlie much of these terraces. A certain amount of the material, of course, comes from nonglaciaded regions and in places colluvial wash is in evidence along the outer margin of the terraces near the foot of the uplands.

The type occurs interruptedly along the Ohio River, the largest developments being in Mercers bottom, near Ravenswood, and to the north of Point Pleasant. The topography is level to very gently undulating in places. Some deep gullies are seen near the bluff lines or drops to lower levels. Much of the original formation has been cut away by the river. The drainage, except for a few swales and level areas, is excellent. The gravel beds underlying a large part of the type favor perfect underdrainage. The areas lie above overflow even during the high spring freshets.

The Wheeling silt loam is the strongest type of the Wheeling series, and has received more attention than any other member of this series. Much of it has had its organic matter content reduced under a system of constant cropping without returning sufficient vegetable matter to replace that lost through hard use. This practice is largely responsible for the low yields obtained in some places.

The type is a good general farm-crop and vegetable soil. It supports a good sod of grass under all conditions, and legumes, such as cowpeas and clover, flourish with about equal success. Irish potatoes give profitable returns and a large acreage of this crop is put in every year. The average yield ranges from about 150 to 200 bushels per acre, while a yield of 300 bushels is not unusual. Tomatoes also do well, but are grown more extensively upon the lighter Wheeling types. Cabbage, beans, asparagus, spinach, cauliflower, and onions should do well. Corn yields about 50 to 75 bushels per acre; wheat 15 to 35 bushels; oats 20 to 40 bushels; buckwheat 15 to 20 bushels; and hay 1 ton to 2½ tons per acre. Apples give very good results, especially the Grimes Golden and Rome Beauty. The fruit is said not to color up as well as on some of the upland soils, though it has an excellent flavor. Very few orchards, however, have been set. Considerable nursery stock is grown on the type.

The type is not in need of commercial fertilizers, but should receive liberal applications of organic manures, such as barnyard refuse and cowpeas or clover turned under green. The legumes improve the soil materially for succeeding crops like corn, wheat, oats, and potatoes. The spots that show gray or drab mottling in the deep subsoil are in need of tile drainage and lime.

The soil is not difficult to handle, being easily cultivated and easy to keep in a very desirable mellow tilth.

The Wheeling silt loam is a highly desirable agricultural soil. It is all cleared and under cultivation and is held at from \$75 to \$150 an acre, according to improvements. Very little is for sale.

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

Mechanical analyses of Wheeling silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24639, 24641.....	Soil.....	0.1	0.8	1.3	3.2	8.2	59.1	27.3
24640, 24642.....	Subsoil.....	.1	5.6	6.5	4.0	9.9	49.6	24.0

WHEELING FINE SANDY LOAM.

The soil of the Wheeling fine sandy loam is a light-brown to brown mellow fine sandy loam, about 12 or 14 inches deep. There is a gradual change into a lighter colored or yellowish-brown slightly compact subsoil which has nearly the same texture as the soil to a depth of about 30 inches, where it becomes somewhat lighter.

The type occurs as second and third terrace interruptedly along the Ohio River. It is found in largest areas and is most typical developed north of Point Pleasant, in Mercers bottom, and south of Willowgrove. The type was deposited by the Ohio River upon former flood plains that now stand above overflow. The surface is somewhat undulating, owing to the frequent occurrence of slight ridges, the tops of which are sandy, while the intervening depressions are silty. The drainage is good, but not excessive under usual seasonal conditions. Crops, however, have a slight tendency to suffer during protracted dry spells.

This is not as strong a type as the Wheeling silt loam. It is deficient in humus to a very noticeable degree. The use of commercial fertilizers in fairly liberal amounts will be found beneficial to potatoes, tomatoes, and melons, as well as for the general farm crops like wheat and oats. Leguminous crops, especially cowpeas and soy beans, should be used in rotations with the general farm crops and with vegetables. The type is easily cultivated and little difficulty is experienced in handling it. The low yields are usually due in a

large measure to the depletion of organic matter. Crops like cow-peas and rye should be turned under to remedy the deficiency. The average yields under favorable conditions are: Wheat 15 to 35 bushels per acre, and sweet or Irish potatoes about 150 bushels per acre. Rye does well, and oats fairly well. The type is not adapted to grass and makes very poor mowings. Corn does only fairly well. The soil makes good crops of melons, tomatoes, and a number of other vegetables. A considerable area of this type is planted to melons each season.

All the type is cleared and under cultivation and is valued at about \$100 to \$125 an acre.

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

Mechanical analyses of Wheeling fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24635, 24637.....	Soil.....	0.8	8.2	7.7	29.8	16.0	28.4	8.9
24636, 24638.....	Subsoil.....	1.1	8.3	7.0	30.8	11.6	31.7	9.2

WHEELING SANDY LOAM.

The soil of the Wheeling sandy loam is a light-brown to brown medium to coarse rather light sandy loam, 10 or 12 inches deep. A small quantity of gravel is found in the soil and scattered upon the surface, but the proportion is not sufficient to affect the character of the soil. The subsoil is a yellowish-brown light sandy loam containing a slightly larger per cent of gravel than the soil. Below 30 inches the gravel content increases and the material has almost the texture of a gravelly sandy loam.

The topography is level to gently undulating, giving good surface drainage, while the gravel bed lying from 4 to 10 feet below the type promotes underdrainage.

Much of the material forming this soil is glacial in origin. It was deposited when the Ohio River was flowing at a higher level than now.

The type occurs in oblong areas parallel to the Ohio River, on the second bottom terrace, lying from 40 to 80 feet above the present water level and above overflow. It is found in its most typical development in Mercers bottom, Ravenswood bottoms, near Graham Station, and to the north of Point Pleasant.

In agricultural value the type stands next to the Wheeling silt loam. It produces good crops of truck and general farm crops. Large areas of the type each year are planted to melons. Good crops of tomatoes are grown. Potatoes, cabbage, onions, and beets are paying crops.

Rye does better than any other cereal. Wheat when well fertilized yields from 25 to 30 bushels per acre. Grasses as a rule do not flourish, and very little of the type is in mowing.

About 200 pounds of an 8-1-4 fertilizer is used with heavy truck crops, but for ordinary farm crops little or no commercial fertilizer is used. The growing of legumes is generally practiced and gives excellent results. Fruits do well upon this type. The use of fertilizers high in phosphorus and potash are recommended for crops that make heavy draft upon the soil. The use of leguminous and cover crops and stable manure is also recommended.

All of the type is cleared of its natural forest growth and nearly the entire acreage is planted to cultivated crops each season.

Land of this type of soil is valued at \$75 to \$125 an acre.

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

Mechanical analyses of Wheeling sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24627, 24629.....	Soil.....	3.0	26.3	30.7	7.5	6.7	18.4	7.1
24628, 24630.....	Subsoil.....	2.4	27.9	33.4	7.8	6.0	15.1	7.2

WHEELING GRAVELLY LOAM.

The soil of Wheeling gravelly loam, usually about 10 or 12 inches deep, is a brown to dark-brown gravelly loam of loose open structure. The subsoil is a light-brown or yellowish-brown gravelly loam containing a larger percentage of gravel than the soil. Below 3 or 4 feet is encountered a gravel bed that extends to a depth of more than 10 feet. Gravel is scattered over the surface and disseminated through the soil mass in quantities ranging from about 30 per cent in the soil to 50 or 60 per cent in the subsoil. The fragments range in size from very small to about 1 inch in diameter and consist largely of rounded quartz, with some quartzite, granite, sandstone, and other rocks. The interstitial material is silty in character and slightly heavier in the soil than in the subsoil.

The material composing the Wheeling gravelly loam is probably mainly from glacial sources and represents the alluvial deposits of the Ohio River when it was flowing at a higher level. The type occurs in small but well-defined areas on the high terraces of the Ohio River. The most typical development is that near Willowgrove. Small areas also occur below Mason and Spilman.

Level to gently rolling topography is characteristic of this soil. Even in the level areas the open structure and presence of underlying

gravel beds give to the type thorough to excessive drainage. During dry seasons crops suffer for want of moisture. In wet seasons, when crops on other heavier soils suffer severely from excessive moisture, good results are had on this land.

The type is not naturally productive, but has been built up by use of manure, lime, cowpeas, and the incorporation of organic matter by plowing under cover crops. As a result the yields are surprisingly good for a type of this character. Wheat yields from 15 to 30 bushels, and corn from 40 to 50 bushels per acre. Oats and rye do well when the seasons are not too dry. Irish potatoes yield 100 to 150 bushels per acre. Melons and tomatoes are paying crops. Cowpeas and a number of other leguminous crops grow luxuriantly. The type is well suited to apples, the fruit having a fine flavor, though not as good a color as could be desired. Small fruits such as cherries and plums do well also.

The present method of handling the type seems to be about the best system that can be used. By turning under cover crops the soil is made much more retentive of moisture and then changed from what might be considered a good wet-season soil to a soil capable of giving good returns with a large number of crops under varying seasonal conditions.

Although the type contains a high percentage of gravel, this does not interfere with cultivation. Deep plowing can be easily accomplished.

The type is valued at \$75 to \$125 an acre.

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

Mechanical analyses of Wheeling gravelly loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24625.....	Soil.....	16.1	16.2	8.3	9.4	4.0	26.8	18.9
24626.....	Subsoil.....	16.3	15.0	8.4	8.0	5.6	27.4	19.0

WHEELING FINE SAND.

The Wheeling fine sand is a brown or light-brown incoherent fine sand about 12 inches deep. It is loose and open when dry and rather compact when wet. The surface has a grayish appearance when thoroughly dry and a decided brownish cast when wet. The color is also an indicator of the organic content, the gray soils being markedly deficient in vegetable matter. The subsoil is a yellowish-brown incoherent fine sand, becoming lighter in color as depth increases.

The type occurs as undulating or sloping land next to the upland here and there along the Ohio River. The most typical areas are

found northwest of Ravenswood and between Spilman and Point Pleasant.

The materials composing the Wheeling fine sand have probably come chiefly from the glacial region, as in case of the other Wheeling soils. The dunelike surface unquestionably is due in part at least to the action of winds. Some areas are derived from material that has been blown up the lower slopes of the uplands for some distance, the soil in such places being much deeper than over the remainder of the areas.

Drainage is excessive, owing to the loose, open structure and low organic-matter content of the soil, and crops suffer from lack of moisture, even during moderately dry seasons. The turning under of green crops is practiced to make the type more drought resistant.

Cultivation is naturally very easy, requiring very light draft for deep plowing. It is best suited to the production of melons and early vegetables. A large area is planted to melons yearly, and these yield greater profit than any other crop. The type is not suited to general farm crops or heavy truck crops. The well-drained conditions and open sandy nature of the soil make it warm up early in the spring—a feature that favors the production of early vegetables like garden peas, radishes, and lettuce. Sweet potatoes give excellent yields, but have a tendency to grow in a stringy shape. Irish potatoes do not give as heavy yields as on the other Wheeling types, but for an early crop this soil is the exact kind required. Fair crops of rye are obtained where not planted too thick. Other grain crops give very poor returns.

The type can be prepared for planting earlier than the other types of the area, as the wet, cold springs cause little delay. It is advisable to use commercial fertilizers. A mixture high in phosphoric acid and potash should be chosen and the nitrogen supplied through the growing of leguminous crops. If very soluble forms are used, the fertilizer should be applied as a top dressing during the growth of the plants.

Nearly all the type is cleared and under cultivation and is valued at \$90 to \$100 an acre.

TYLER SILT LOAM.

The soil of the Tyler silt loam is a grayish-brown fairly heavy and slightly compact silt loam, about 10 inches deep. The subsoil is a yellowish-brown compact and slightly plastic heavy silt loam or silty clay loam to silty clay. Drab and gray mottlings, with occasional dark-brown or black iron oxide colors, are frequently encountered below 20 inches.

The type occurs as second-bottom or terrace land along the smaller streams and in the ancient river beds, where it is probably a lacus-

trine deposit. The particles are very fine and have a smooth feel. It is known locally as "soap land." Areas are found along Sandy and Mill Creeks in Jackson County, and along the Kanawha River. Small bodies are also found in all parts of the area as second bottom, lying usually from 30 to about 100 feet above the lowest bottoms. The material comprising the type is probably derived largely from the lighter colored upland soils of the region, such as the Dekalb, although poor drainage conditions probably account in part for the development of the lighter color.

A few areas are noticeably sandy, representing probably depositions in more rapidly running water. The grayish mottling in the subsoil is due to poor drainage conditions.

The type is underlain in many places by sandstone, which sometimes lies within the 3-foot section. Areas in the valleys of streams emptying into the Ohio River were probably laid down about the same time as the Wheeling soils, the material being derived, however, from a different source.

During dry spells the surface of the type becomes grayer and more compact. Cultivation is very difficult, whether the type is wet or dry, it having a strong tendency to clod when wet and being all but impossible to plow when dry. Many forms of clod-breaking machinery are employed in its cultivation. The roller seems to be the most popular. The type in general, especially the lower, flatter portion, is acid and in need of underdrainage and lime.

Of the general crops, grasses do best upon the Tyler silt loam, and a large area is in mowing and pasture. Timothy yields $1\frac{1}{2}$ to 2 tons of hay per acre. Corn produces only fair crops. The average yield of wheat is very low, but where drainage conditions are good and some attention has been given to building up the type 20 bushels to the acre is not unusual. Truck crops can not be grown to advantage, and only in a few places upon the lighter phase do gardens flourish. Fruits, especially apples, do well on the higher lying terraces, and many large orchards are found. Tobacco does fairly well, and is grown on this type to some extent in the southern part of the area along the Kanawha River and in Teays Valley. Leguminous crops can not be grown to advantage in the present condition of the type. Drainage and lime are very necessary before any method of upbuilding can be successful. After this is done, if it is followed by deep plowing and the incorporation of as much organic matter as practicable, the formation of a deep loamy soil will result, upon which nearly all the field crops of this section can be grown successfully.

All the original growth, largely beech, oak, and poplar, has been removed. The price of land of this type of soil varies from \$50 to \$100 an acre.

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

Mechanical analyses of Tyler silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
24613.....	Soil.....	<i>Per cent.</i> 0.2	<i>Per cent.</i> 1.8	<i>Per cent.</i> 2.3	<i>Per cent.</i> 3.6	<i>Per cent.</i> 1.5	<i>Per cent.</i> 72.8	<i>Per cent.</i> 13.2
24614.....	Subsoil.....	.2	.8	1.0	1.5	1.1	57.9	37.4

TYLER SILTY CLAY LOAM.

The Tyler silty clay loam is a gray to grayish-brown compact silty clay loam, underlain at about 10 or 12 inches by a rather plastic silty clay of a grayish-brown or pale yellow color, sometimes slightly mottled with gray in the lower portion.

The material represents old alluvium. It occurs in Teays Valley, near the mouth of Sandy Creek, where it is known as "soap hill," and along Oldtown Creek.

This land is also locally styled "crawfish land." It is a rather clammy, cold-natured soil of only moderate productiveness. It is best suited to grasses, although with liming and the liberal incorporation of vegetable manures good yields of wheat and fair yields of corn can be secured. Some of the flatter areas need drainage.

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

Mechanical analyses of Tyler silty clay loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
23706.....	Soil.....	<i>Per cent.</i> 1.3	<i>Per cent.</i> 4.2	<i>Per cent.</i> 3.8	<i>Per cent.</i> 5.0	<i>Per cent.</i> 7.8	<i>Per cent.</i> 50.1	<i>Per cent.</i> 27.7
23707.....	Subsoil.....	.3	1.4	1.0	1.0	9.6	44.9	41.5

HOLSTON SILT LOAM.

The soil of the Holston silt loam, to a depth of 10 or 12 inches, is a yellowish-brown or light-brown, slightly compact, friable silt loam. The subsoil is a brownish-yellow to yellow, friable, heavy silt loam to silty clay loam, becoming very compact and approaching a silty clay loam in texture in the lower part of the profile. Practically no water-worn pebbles or fragments of sandstone or shale are found in the soil or subsoil. Beds of laminated clays are found in places usually 10 to 50 feet below the surface, and occasionally exposed in large areas giving rise to a heavy phase of the Tyler silty clay loam. According to Campbell these clays were deposited in the valley of a stream

which formerly flowed through Teays Valley.¹ Prof. I. C. White has suggested that the deposits were made in a glacial lake which existed in this region during the glacial period.²

Very little residual material is encountered in the type and it is found only where the original bedrock has been exposed by erosion. The original deposit has been dissected to some extent by erosion, giving the type a gently rolling topography. However, level terraces covering a considerable area are found usually supported by massive sandstone strata.

The drainage is usually good, except in spots where the beds of laminated clay or sandstone strata prevent free underdrainage. These spots are usually acid and have the drab or gray mottlings in the deep subsoil. They are of small extent and their unfavorable condition can be easily remedied by tile drainage and liming.

The type occurs developed in the ancient streamways and upon the ancient terraces of the Ohio and Kanawha Rivers. The largest areas of the type occur in Teays Valley and in the northwestern part of Mason County, between Point Pleasant and New Haven. Ancient high terraces occur between Ravenswood and Millwood and are represented by the low, flat, uniform ridge tops back from the Ohio River. The type usually occurs from about 100 to 200 feet above the present first bottoms of the large streams and 650 to 750 feet above sea level. It is formed largely of the wash from sandstone and gray shale formation, little red material entering into its composition.

The Holston silt loam is not a strong soil, but is easily tilled and readily brought to a high state of cultivation. It produces good crops of wheat, oats, rye, corn, tobacco, potatoes, peas, beans, and hay. Wheat yields from 15 to 25 bushels per acre, corn from 20 to 60 bushels; oats from 20 to 30 bushels; potatoes from 150 to 200 bushels; tobacco from 800 to 1,200 pounds; and hay from 1 ton to 2½ tons. Cowpeas, soy beans, vetch, and rye do well, and are used to some extent in rotations. Clovers do not thrive and consequently are grown only to a limited extent. Wheat is grown extensively, but the other cereals with the exception of corn are grown in small quantities. Potatoes are an important crop, the acreage being second only to that on the Wheeling soils. It is also a good truck soil, producing fine crops of nearly all the vegetables grown in the area, especially tomatoes, cabbage, onions, and beans. A very high grade of Bright Burley tobacco is produced. The soil gives a tough, leathery leaf used largely for plug wrapper, for which a good price is readily obtained. The yields are not so heavy as upon the bottom-land or limestone soils, but the quality more than makes up the difference. Tobacco is grown upon this type on a large scale in Teays Valley.

¹ Campbell, Huntington Folio, U. S. Geological Survey.

² White, I. C., Proc. A. A. A. S., 1883, vol. 32, p. 212.

The Holston silt loam is the best fruit land in the area. Apples do better than the other fruits, but all varieties grown in this section of West Virginia seem to do well. The trees make a thrifty growth and the fruit has a high color and fine flavor. This is especially true of the phase of soil found on the low hills back from the Ohio River. These ridges furnish ideal orchard sites, having perfect air drainage and being level enough to permit the use of spraying machinery. It is largely upon this type that the apple industry in the vicinity of Ravenswood and Letart is developed. Ben Davis, Rome, Beauty, and York Imperial are the varieties grown largely in commercial orchards. Of the small fruits strawberries do especially well.

Fertilizers are used to a larger extent upon this type than on any other soil in the area. This is largely due to the fact that the land was cleared early in the settlement of the country and has been cropped heavily. For wheat, 200 to 400 pounds of an 8-2-4 mixture or 200 to 300 pounds bone meal or 200 to 250 pounds ammoniated phosphate is used. For tobacco, 400 to 600 pounds of a 12-2-4 has been found satisfactory. For corn stable manure is usually employed. A top dressing of 150 to 250 pounds of nitrate of soda is sometimes used on oats, wheat, and corn with good results.

The turning under of cover crops has been practiced of late years by many of the leading farmers and has done much to build up this type. The more general use of leguminous crops is recommended.

The original forest growth, consisting largely of oak, hickory, beech, walnut, and chestnut, has been practically all cleared away and the type is generally under cultivation.

The Holston silt loam is a very desirable soil for general farming, fruit, tobacco, and trucking and presents a rare opportunity for special or diversified farming. Its nearness to cheap and efficient transportation makes it one of the high-priced types in the area. Very little of the type is for sale, but prices generally quoted range from \$60 to \$100 an acre.

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

Mechanical analyses of Holston silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
24591.....	Soil.....	0.3	1.0	1.2	4.2	3.0	78.5	11.2
24592.....	Subsoil.....	.0	.7	.9	4.5	5.4	69.5	18.6

MOSHANNON SILT LOAM.

The soil of the Moshannon silt loam is a reddish-brown to dark Indian red or chocolate-red mellow silt loam about 10 to 12 inches deep. The soil, if cultivated wet, hardens to a certain extent on drying, causing

the formation of clods in plowing. When plowed in the proper moisture conditions, an excellent mellow tilth is secured. Unlike the Huntington silt loam, there is generally a distinct line of demarcation between the soil and subsoil. The subsoil is a fairly compact friable chocolate-red or Indian red to reddish-brown heavy silt loam, becoming more compact in the lower portion. Beds of sandstone and shale fragments are frequently encountered at about 2½ to 4 feet. A few fragments are scattered over the surface and disseminated throughout the soil and subsoil, but not in sufficient quantities to offer material hindrance to cultivation.

The Moshannon silt loam is an alluvial first-bottom soil composed largely of material washed from the Upshur soils and the Meigs clay loam. It is found largely in the eastern part of Jackson County, where the Upshur and Meigs soils are extensively developed.

The topography is mainly level and the drainage good. That portion of the type next to the foot of the uplands is more undulating and includes some colluvial wash.

The Moshannon silt loam has the general physical properties of the Huntington silt loam, but it is a slightly stronger soil, with the probable exception of that portion of the Huntington developed in the Ohio River bottom.

Corn yields from 50 to 80 or 100 bushels per acre. Broom corn does well. Wheat and oats are not quite as likely to lodge as upon the Huntington silt loam. Yields of from 1 to 2 tons of hay per acre are easily made. Good pasturage also can be had on this land. Tobacco is not grown extensively, the product being about the same as on the Huntington soils, that is, a rather strong, thick leaf. Leguminous crops do well and yield heavy crops of forage.

The original tree growth, largely sycamore, elm, and beech, has been removed and nearly all of the type put under cultivation. Land of this type is valued from \$30 to \$75 an acre.

High lying phase.—The soil of the high lying phase is a dark brown to reddish-brown silt loam to silty clay loam about 10 to 14 inches deep. Below this there is a gradual change to a slightly compact reddish brown silty clay loam to silty clay.

This phase occurs in narrow strips along the banks of the Kanawha River, extending on both sides, with only a few breaks, the entire course of the stream within the area surveyed. It lies higher than the contiguous soils of the Kanawha first bottoms and is better drained. It was formed by the deposition of silt and clay during high overflows. The type lies about 40 to 50 feet above the low-water mark of the stream, and is subject only to occasional overflows. These occur during the spring freshets once in about five to seven years. A few spots are found where the soil contains a relatively large proportion of fine sand, but these are of small extent.

The topography is level to gently undulating. The occasional overflows serve to renew the fertility. Overflows during the growing season are rare. The type is of good texture and structure and is easily cultivated. It is the best type in the Kanawha bottoms, and produces from 65 to 75 bushels of corn, 12 to 15 bushels of wheat, and from 1 ton to 1½ tons of hay per acre, without the use of fertilizers. Oats do not give good results and wheat has a tendency to lodge. Tobacco is grown to a small extent upon this type in Putnam County and good results have been obtained with the Yellow Burley. Melons, potatoes, and truck crops do well, giving the best results upon the lighter phases of the soil. Commercial fertilizers do not give sufficient increase in yields to warrant their use. All the type is cleared and under cultivation and is valued at \$100 an acre.

The following table gives the average results of mechanical analyses of typical samples of the soil and subsoil and single analyses of the soil and subsoil of the high-lying phase:

Mechanical analyses of Moshannon silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
Typical:		<i>Per cent.</i>	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
24609, 24611...	Soil.....	0.2	0.8	2.1	9.5	6.9	62.6	17.8
24610, 24612...	Subsoil.....	.1	.5	2.2	12.0	11.2	48.3	25.4
High-lying phase:								
23698.....	Soil.....	.2	1.0	1.3	4.0	3.6	60.8	29.0
23699.....	Subsoil.....	.4	1.6	1.6	3.7	17.7	45.7	29.4

MOSHANNON CLAY, EROSION PHASE.¹

The Moshannon clay, erosion phase, is a variable soil occurring on a series of slight ridges and in intervening depressions. The soil in the depressions is a compact gray to grayish-yellow silty clay loam to silty clay underlain at 5 to 10 inches by compact clammy silty clay, mottled with gray or drab and brown, with rusty-brown and black concretions in the lower portion. The soil has poor structural properties, is poorly drained, and best suited to grass. In dry seasons cracks are abundant.

On the slight ridges the soil is usually a compact chocolate-brown silty clay loam, which quickly grades into silty clay. At about 18 to 24 inches it is underlain by silty clay mottled chocolate-brown and drab. This is a much better soil than that of the depressions, being well drained and well suited to corn, grain, and forage crops; but the two are so intimately associated that usually different agricultural usage can not be made of them. However, some of the

¹ Includes some Holly clay.

broader swells are used for corn and grain, while the depressions are left in grass. It is not practicable to show these variations on the map, on account of the small areas and their intricate arrangement.

The soil is found in the high bottoms of the Kanawha River, where overflows occur usually not oftener than once during a period of four or five years. The phase usually lies somewhat lower than the more uniform soil, the Moshannon silt loam, next to the river, and is more subject to overflows. On the outer margin it is bordered either by higher lying bottom lands or terraces or by the upland slopes; but for the slight depressions and swells the surface is level.

This phase of the Moshannon clay is very difficult to till, owing to the prevailing heavy character and also to the cold, moist condition of the soil in the depressions. Most of the type is undrained and is used for pasturage and hay. Where drained, fairly good results have been obtained with other crops, such as oats, corn, and wheat, especially on higher portions. Yields of from 1 ton to 1½ tons of hay per acre are secured. Considering the difficulty of cultivating land of this character and the expense of underdrainage, it is believed that the soil can be used more profitably for hay and grazing than for other purposes. Applications of lime would materially better the condition for most crops.

The native timber growth, consisting largely of beech, sycamore, and elm, was cleared away during the early settlement of the country.

The Moshannon bottom soils, as a whole, are valued at \$100 an acre; but this soil if bought in separate tracts would be valued at a much lower figure.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the erosion phase of the Moshannon clay:

Mechanical analyses of Moshannon clay, erosion phase.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	<i>Per cent.</i>
23702.....	Soil.....	0.3	2.2	2.7	5.6	1.6	46.3	41.1
23703.....	Subsoil.....	.0	2.0	1.6	2.6	.7	45.7	47.3

SUMMARY.

The Point Pleasant area comprises Mason, Jackson, and Putnam Counties and covers an area of 1,268 square miles in southwestern West Virginia.

The elevation ranges from 500 feet to 1,400 feet above sea level. For the most part the upland is broken and rough, with narrow valleys, but many flat-topped ridges are encountered and the valleys along the larger streams are comparatively broad. The Ohio River

receives all the drainage from the western part of the area and the rest goes first into the Kanawha and then into the Ohio River.

Most of the population is engaged in farming. There are no large manufacturing interests, and the mining is confined to a very small area.

The farms are usually small, and operated to a large extent by the owners.

Farm labor is scarce, much labor being absorbed in the oil regions of adjoining counties. Most of the efficient labor has drifted to the oil fields, where much better prices are paid, averaging about \$1 a day higher than upon the farms.

Point Pleasant, the principal town of the area and county seat of Mason County, has a population of about 3,000. Ravenswood and Ripley, in Jackson County, Winfield, Hurricane, and Raymond City, in Putnam, and Mason, in Mason County, are other small but important towns in the area.

The area is well supplied with transportation facilities, both rail and water. The principal market for farm produce is Pittsburg, Pa. Wheeling, Parkersburg, Huntington, and Charleston, W. Va., and Gallipolis, Ohio, are the smaller markets.

Climatic conditions are favorable to both stock raising and general farming.

Corn, wheat, tobacco, and hay are the staple crops of the area. Oats, buckwheat, sorghum, and sweet potatoes are grown to a limited extent. Some truck is grown, mainly potatoes, tomatoes, and melons, along the Ohio River terraces. Many beef cattle are raised, especially in the hill sections. Other kinds of stock are raised on a smaller scale. Dairying is not highly developed.

Apples are grown commercially to some extent, and other fruits on a smaller scale for home consumption and local markets.

The area lies wholly within the Appalachian Plateau and is divided physiographically into upland, terrace, and flood plains. On the upland occur the Meigs, Upshur, Dekalb, and Brooke series, derived from the weathering in place of sandstones, sandy shales, red and gray shales, and limestone of the Upper Coal Measures.

The alluvial soils of this area are more extensively developed than in any other area of West Virginia. The Wheeling, Tyler, and Holston series are found upon the terraces. The Wheeling series is derived largely from glacial material, while the other terrace soils seem to be derived largely from Dekalb or closely associated material. The bottom land or flood plain is represented by the Huntington and Moshannon series.

The Meigs clay loam is more extensive in area than any other type, but is less extensive than mapped in other areas of West Virginia.

The type makes fair grazing land and should be used almost exclusively for pasture.

The Upshur clay is very extensive and an important soil type. It is a limestone soil and makes excellent pastures. The more level areas are cultivated and produce good crops of wheat and corn.

The Upshur silty clay loam covers a much smaller area than the clay. It is not quite as strong, but supports a good sod. It is easy to cultivate and is a good fruit soil.

The Brooke clay loam is the strongest upland soil in the area. It furnishes good grazing and produces good yields of hay, tobacco, wheat and corn. It is not adapted to fruit or truck.

The Dekalb soils are not naturally strong, but are easily handled and respond readily to fertilizers. They are good truck and fruit soils, especially the silt loam. Neither of the types makes good pasture or mowing lands.

Rough stony land occurs in such small bodies that it has little effect upon the agriculture of the area.

The light types of the Wheeling series, sandy loam, fine sandy loam, fine sand, and gravelly loam are good truck soils and respond readily to proper management. The Wheeling silt loam is a strong type, well adapted to general market and heavy truck crops. It is the best potato soil in the area.

The Holston silt loam is a good truck and fruit soil and is also well adapted to general farm crops. It grows good apples and a fine grade of plug wrapper tobacco. It is easily built up and responds readily to good treatment.

The Tyler series, represented by the silt loam and silty clay loam, are good grass soils and fairly well adapted to general crops and fruit. They are difficult to handle, owing to their heavy texture and poor drainage.

The Moshannon silt loam is a strong soil type, producing heavy yields of corn and furnishing good yields of hay and pasturage.

The Moshannon clay, erosion phase, produces good crops of wheat, corn, and hay, but is difficult to handle. Some areas are best suited to pasture and hay production and very little attempt is made to produce cultivated crops upon them. This soil as mapped includes some areas of Holly clay.

The Huntington silt loam is best adapted to corn and over half of its area is planted to that crop each season. In the southern part of the area tobacco is grown successfully.

The Huntington loam is subject only to occasional overflow and is well suited to truck and general farm crops.

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