

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE OHIO AGRICULTURAL EXPERIMENT STATION,
CHARLES E. THORNE, DIRECTOR.

SOIL SURVEY OF MEIGS COUNTY, OHIO.

BY

F. N. MEEKER AND G. W. TAILBY, JR.

[Advance Sheets—Field Operations of the Bureau of Soils, 1906.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1908.

[PUBLIC RESOLUTION—No. 9.]

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

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

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

Approved, March 14, 1904.

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

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., June 18, 1907.

SIR: A soil survey of Meigs County, Ohio, was undertaken in the summer of 1906 for the purpose of ascertaining the kind and distribution of the soils occurring there and of studying the crop adaptations of these soils. The work was done in cooperation with the Ohio Experiment Station, Prof. C. E. Thorne, director, and the results will be of value to that station as showing the soils occurring upon one of the test farms of the station located within the county. I transmit herewith the report and map covering this area and recommend their publication as advance sheets of Field Operations of the Bureau of Soils for 1906, as provided by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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MAP.

Soil Map, Meigs County sheet, Ohio.

SOIL SURVEY OF MEIGS COUNTY, OHIO.

By F. N. MEEKER and G. W. TAILBY, Jr.

DESCRIPTION OF THE AREA.

Meigs County is situated in the southeastern part of the State of Ohio and comprises 283,520 acres, or about 443 square miles. Its northern boundary is a straight east and west line separating it from Athens and Vinton counties. Directly east of Meigs County and

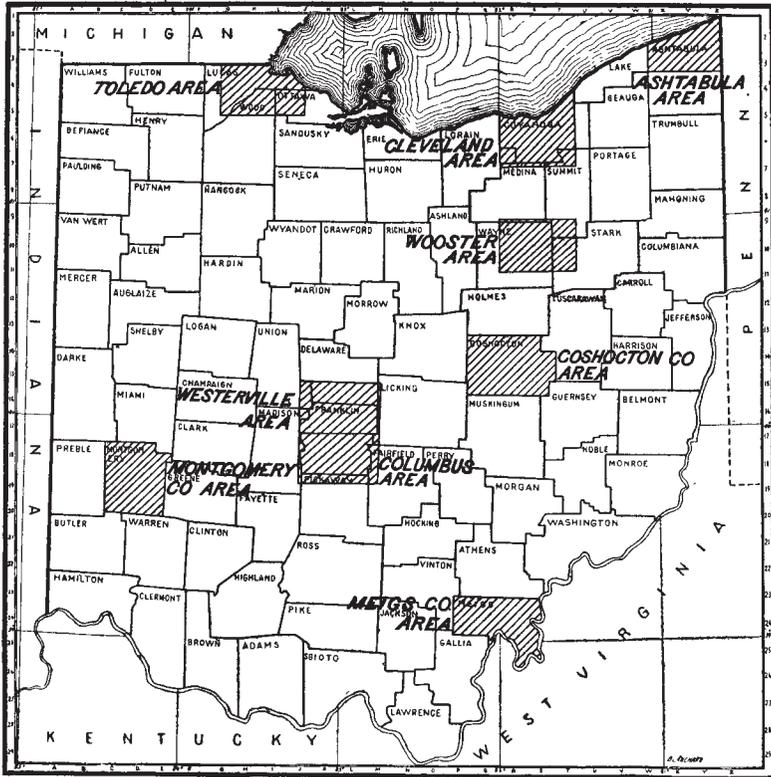


FIG. 1.—Sketch map showing location of the Meigs County area, Ohio.

also south of approximately its eastern half is the State of West Virginia, from which it is separated by the Ohio River. The remaining part of the southern boundary is a straight east and west line, south of which is Gallia County. To the west are Gallia and Vinton

counties, both separated from Meigs County by a straight north and south line. From east to west the county is about 29 miles long. The distance from boundary to boundary in its western part, in a north and south direction, is 13 miles, while the corresponding distance in the eastern part is about 21 miles.

A large part of the surface of Meigs County is very rough and broken. The hills often converge to sharp peaks, while the tops of the divides are in many cases only a few rods wide. The hillsides are often very steep, and the valley bottoms are generally very narrow. Outcrops of sandstone are often seen on the hillsides, the disintegration of which rock gives rise to scattering sandstone fragments. Generally speaking, however, the roughest and most broken part of Meigs County is along the Ohio River and for a few miles back from it. Here the hillsides are usually very steep and rocky, there being many outcrops of sandstone. In many cases steep and rough sandstone ledges follow the Ohio River for miles, very close to its bank, and along the steep valley sides of the larger tributary streams the same outcrop may be followed for some distance back from the river.

In the western and northwestern parts of the county the topography is more gently rolling. Two other smaller areas having the same topography are found farther to the east. One of these is in the vicinity of Tupper's Plains, in the northeastern part of the county, while the other is around Five Points, 4 miles north of Syracuse.

The most valuable farming land in Meigs County is the Ohio River bottomland, found in irregular stretches from Racine to Reedsville. Some of it also occurs in the vicinity of Middleport. Its greatest width is about three-fourths of a mile, while in many places along the river it does not occur at all. The most noticeable feature of these bottomlands is that they are, in many places, made up of remarkably well defined terraces, the height of one terrace above another varying from 5 to 25 feet. Above the so-called first bottom are very often two terraces, locally known as second and third bottoms. The condition just described is very well illustrated about $1\frac{1}{2}$ miles northeast of Applegate, Ohio.

The Ohio River receives the drainage waters of the entire area. It has an average width of slightly less than a quarter of a mile and forms nearly one-half of the boundary of the county. The largest stream flowing through the area is the Shade River. This stream rises in Athens County to the north and crosses the northern boundary line of Meigs County about 11 miles west of the Ohio River; thence it flows in a very winding course in approximately a southeasterly direction, reaching the Ohio River about a mile southwest of Long Bottom. This river has two quite large branches. The larger of these, known as the West Branch of Shade River, drains the northern part of the county and empties into Shade River about 1 mile north of Chester.

An important tributary to this latter stream is Kingsbury Creek, flowing into it from the west. The other main branch of the Shade River, also important, is known as the East Branch. It drains the northeastern part of the county and flows in a southeasterly direction, emptying into Shade River at Keno. Two other smaller streams draining the same part of the county are Indian Run and Sugar Camp Creek, both of which flow to the southeast into the Ohio River. The principal stream in the western part of the county is Leading Creek. This stream crosses the northern boundary of the county $5\frac{1}{2}$ miles east of the northwest corner and flows in approximately a southeasterly direction, emptying into the Ohio River only a short distance below Middleport. Little Leading Creek has its headwaters near Harrisonville and flows to the south, emptying into Leading Creek just south of Rutland. Raccoon Creek flows across the extreme northwestern corner of the county in a southwesterly direction into Vinton County, and thence in a southeasterly direction through Gallia County into the Ohio River. A considerable portion of the southwestern part of the county is drained by Strongs Run and Williams Run, both of which are tributaries of Raccoon Creek, entering that stream to the southwest of Meigs County. In the southeastern part of the county the principal streams are Yellow Bush Creek, Johns Run, Tanners Run, and Old Town Creek, all of which empty into the Ohio River. All of the principal streams, with their numerous smaller tributaries, furnish good natural drainage for the whole county. Melting snow and heavy rains cause them to overflow at times, but along none of them are there any swampy areas needing artificial drainage.

The early settlers of Meigs County came from States to the east, mainly from Pennsylvania, Virginia, New York, and the New England States. Early records show that a considerable number also came from Germany, England, Scotland, Ireland, and Wales. Nearly all of these sought the area for the purpose of farming. The present population is made up mainly of the descendants of these earlier settlers, together with those who have come to this county from other parts of the State. The most important foreign element in the county at present is German. A considerable number of Germans live in the locality of Syracuse and in the region north of this place. A small percentage of the population of the county is colored, the largest part of which is to be found in Pomeroy and Middleport and in and around the village of Rutland. This colored element first came to Meigs County about 1862. Only a very few of these people, in the vicinity of Rutland, have farming interests, the most of them finding employment in coal mines and in salt works. The entire area surveyed is comparatively thickly populated, especially the western and northwestern parts, where the land is not so sharply rolling and is therefore better

adapted to farming. Naturally settlement in the more hilly sections in the eastern and southeastern parts of the county is more sparse, since the soils are less valuable. The population of the county at each decennial period, commencing with 1820, was as follows: 4,480 in 1820; 6,158 in 1830; 11,452 in 1840; 17,971 in 1850; 26,534 in 1860; 31,465 in 1870; 32,325 in 1880; 29,813 in 1890; and 28,620 in 1900.

Meigs County was organized January 21, 1819, and was named after Return J. Meigs, who was governor of the State of Ohio from 1810 to 1814. In 1820 three appointed commissioners first located the county seat within the limits of what is now the village of Middleport. Later, in 1822, the county seat was located at Chester, and in 1841 it was changed again; this time to Pomeroy, where it is at the present time.

Pomeroy is a thriving town of about 4,600 inhabitants. Middleport, the next town in size, is also an enterprising place with a population of about 3,500. These towns are about 2 miles apart and are located in the southern part of the county, on the Ohio River. Other smaller but thriving places of the county located on the river are Minersville, Syracuse, Racine, Letart Falls, Long Bottom, Portland, and Reedsville. Three important villages in the northern part of the county are Tupper's Plains, Harrisonville, and Downington. Chester is in the east-central part, and in the western part are Rutland, Langsville, Dexter, and Carpenter, which are located on or near the Kanawha and Michigan Railroad.

An important local industry is coal mining. Near Pomeroy, Minersville, and Syracuse are several large mines, and one has recently been started near the village of Rutland. Besides these larger mines there are many country coal banks throughout the western half of the county, from which a great deal of coal is obtained for local use. Statistics show that the production of coal in this county in 1904 was 212,395 long tons and in 1905 was 370,587 tons. The principal markets to which this coal is shipped are Cincinnati, Louisville, and Columbus. Some is also shipped to Chicago and other northern markets.

The manufacture of salt is another important industry. In Pomeroy there are four large salt furnaces. Minersville and Syracuse each have a furnace also. These furnaces usually run about 300 days in the year. Three of them at Pomeroy each produce about 225 barrels a day, while a fourth produces from 300 to 325 barrels. The furnaces at Minersville and Syracuse each produce about 200 barrels a day. The salt obtained is of a grade for general domestic use and is shipped both by rail and boat to points in southern Ohio, Indiana, Kentucky, Tennessee, and Alabama.

Meigs County is well supplied with transportation facilities. In the western part is the Kanawha and Michigan Railroad, which affords ample means for transporting all products from this section of the county to the larger markets to the north. This road extends northwest from Middleport through the important villages of the western part of the county into Athens County and thence on to Columbus. Another line, the Hocking Valley Railroad, runs from Pomeroy along the river through Middleport to Gallipolis, Gallia County, and thence northwest to Toledo by way of Columbus. Reaching from Middleport to Racine is an electric line, connecting all intervening points along the river with these two places. This line is equipped to carry freight as well as passengers. In West Virginia, on the opposite bank of the river, is the Baltimore and Ohio Railroad, which follows the river from Parkersburg, just to the northeast of Meigs County, to Kenova to the southwest. Good transportation is also afforded by steamboat lines which ply the river between important points to the northeast and southwest.

Meigs County has a fairly good system of public roads connecting all of the local shipping points with all parts of the area, and substantial bridges have been built over the streams. In the most hilly sections of the county, however, the roads are in many places very rough, and during the winter and after continuous rains are very heavy, especially where they pass over areas of red clay. During the summer months they are usually in better condition.

Pomeroy and Middleport, together with the points along the river to the southeast as far as Racine, and the villages in the western part of the county along the Kanawha and Michigan Railroad, constitute practically all of the local markets of the area. The principal agricultural products of the county are wool, potatoes, wheat, and corn. Of these wool is the most important. It is hauled to some of the local markets and is thence shipped, mainly by rail, to eastern markets, principally Philadelphia and New York. Some live stock is shipped from the area, mainly to Pittsburg. From the southeastern part of the county potatoes are shipped, mainly by boat, to points along the river to the southwest. The production of wheat and corn within the area is but little more than is needed for home consumption.

Excellent means of communication is afforded by telephones throughout the whole county. Not only are all of the villages connected in this manner, but practically every farmer in the county has a telephone. Each farmer owns his own instrument and a share in a line leading to some exchange or central point. In this way the total annual cost to the farmer for maintaining good service is very small. It is compensated for many times by the convenience had through the service.

CLIMATE.

Considering the latitude, the climate of Meigs County is mild. The average annual temperature is about 53° F. January and February are the coldest months, with an average temperature of about 29° F. For the greater part of the winter the ground is not frozen, and winter plowing is practiced by some of the farmers, usually in February and March. This practice lessens the amount of work to be done later in the spring, and the alternate freezing and thawing of the plowed ground is a material benefit in the preparation of a seed bed. Occasional periods of colder weather, usually caused by west and northwest winds, occur during the winter, but these are of short duration. Very seldom does the mercury drop below zero. The average lowest temperature for Pomeroy for the years 1901 to 1906, inclusive, is 1.33° F. below zero. Very little snow falls during the winter and this melts quickly, seldom remaining on the ground more than a few days. July and August are the warmest months of the year, the mean temperature for these two months being about 74° F. The thermometer seldom goes above 100° F., the average highest temperature for Pomeroy, for the six years ending with 1906, being 97.6° F. Thus the range in temperature for the area is about 100° F.

The following table, compiled from the records of the Weather Bureau, shows the normal monthly and annual temperature and precipitation at the stations given, based on records for five years. Pomeroy is in the southern part of the area. Marietta is about 23 miles to the northeast, while Thurman is about 11 miles southwest of Meigs County:

Normal monthly and annual temperature and precipitation.

Month.	Pomeroy		Marietta.		Thurman.	
	Tempera- ture.	Precipi- tation.	Tempera- ture.	Precipi- tation.	Tempera- ture.	Precipi- tation.
	° F.	Inches.	° F.	Inches.	° F.	Inches.
January.....	29.8	1.78	29.8	2.07	30.5	2.29
February.....	28.5	^a 2.50	29.2	2.82	28.8	2.52
March.....	46.9	3.41	46.2	3.99	47.7	3.84
April.....	49.7	3.42	51.7	4.05	51.6	3.23
May.....	64.3	3.23	65 0	4.36	65.1	3.57
June.....	70.5	4.99	70.0	5.35	70.9	5.53
July.....	75.7	2.55	75.2	3 13	75.7	3.37
August.....	72.7	2.86	72.8	2.90	74.3	2 65
September.....	65.6	1.56	66.7	^a 2.23	68.9	1 71
October.....	54.9	2.53	55.7	2.50	56.9	^a 2 97
November.....	42.6	1.87	43.2	2.07	^a 43.8	2.04
December.....	32.3	3.05	32.7	3.74	32.2	3.83
Year.....	52.8	33.75	53.2	39.21	53.9	37.55

^a Obtained from records covering four years. Record for one year lacking.

The above table shows that the annual rainfall is about 37 inches and that it is well distributed throughout the year.

The growing season for crops in Meigs County is about 178 days, as shown by the following table giving the dates of the last killing frosts in spring and the first in the fall:

Dates of first and last killing frosts.

Year.	Pomeroy.		Marietta.		Thurman.	
	Last in spring.	First in fall.	Last in spring.	First in fall.	Last in spring.	First in fall.
1901.....	Apr. 23	Oct. 5	Apr. 5	Oct. 25	Apr. 23	Oct. 4
1902.....	Apr. 14	Oct. 15	Apr. 15	Nov. 9	Apr. 15	Oct. 15
1903.....	Apr. 24	Oct. 24	Apr. 5	Oct. 24	Apr. 24	Oct. 25
1904.....	Apr. 22	Oct. 24	Apr. 21	Oct. 24	Apr. 21	Oct. 16
1905.....	Apr. 19	Oct. 13	Apr. 19	Oct. 13	Apr. 19	Oct. 13
1906.....	May 10	Oct. 11	May 10	Oct. 11	May 10	Oct. 11
Average dates.....	Apr. 24	Oct. 15	Apr. 18	Oct. 23	Apr. 24	Oct. 14

AGRICULTURE.

The early settlers in Meigs County came in search of new homes and farming lands. One of the first settlements made was at Hobson, just below Middleport, in 1798. Here the settlers raised corn, wheat, potatoes, and pumpkins. Very early settlements were also made in the country around Portland, Chester, and Rutland, and before the year 1820 many others had been started throughout the county, mainly by people from States to the east. As early as 1815 stock raising for beef purposes was engaged in to a slight extent in the southwestern part of the county, although wild animals often proved very troublesome. At that time the best markets were Pittsburg and Philadelphia, to which points the stock was driven overland. In about 1833 hay was produced to some extent in the same part of the county, both for home use and for market. The principal local market then was Pomeroy, where the mining of coal was first begun. Hay was, at that time, also sold to some extent to buyers who shipped mainly by boat to Cincinnati and New Orleans. Wheat and corn, the two principal grain products of the county, have been grown almost from the time of the first settlement here, and statistics show that there has been a gradual increase in production of the two crops up to the present time. Hay has never been an important product of the county, but, according to statistics, its production has also increased gradually. Oats are grown to a much less extent at present than formerly. This crop does not seem to be well adapted to the climate of this locality. Rye reached its maximum production in Meigs County in the late fifties. Since that time it has not been used so much as food, and this has resulted in a decrease in its production. Some buckwheat was grown up to about 1880, but in later years practically none of this grain has been produced.

Fruit growing became an important industry in this county at quite an early date. Apples, peaches, and pears, grown at first from seedlings, were planted as early as 1831, mainly in the southwestern part of the county and along the Ohio River. Later standard varieties were introduced. At the present time apples are grown in practically all parts of the area, but the most important section for this fruit is its western part. The Rome Beauty and the Ben Davis are by far the most important varieties, both being grown very successfully and finding ready sale. At the present time most of the peaches are grown in the southwestern part of the county, and the principal variety is the Elberta, preferred because of its good shipping qualities. Since 1894, at which time considerable interest was manifested in the production of this fruit, many orchards have been abandoned. On account of early frosts only an occasional crop could be obtained one case being noted where from this cause only three crops out of nine were secured. Disease, principally the peach yellows, has also attacked many trees, and peach borers have proved troublesome.

Nearly all small fruits, such as strawberries, blackberries, and raspberries, can be grown successfully within the county. Very few grapes are grown. A considerable nursery business is carried on in Meigs County. During the year 1905 there were 21 nurseries in the county, covering an area of 120 acres. Four of these, covering 29 acres, handled general nursery stock, which includes trees, shrubs, and berry plants. The remaining 17, with an acreage of 91 acres, grew berry plants only. The nursery business in this county started about 1850.

An industry which is and has been very important in this area from an early date is that of sheep raising. It is at the present time the most important business engaged in by the farmers. Some of the very early settlers owned a few sheep, but it was not until about 1840 that, in the southern part of Rutland Township, the industry was really started. The principal breeds first raised were Cotswold, Southdown, and Leicester, all of which were imported from Europe. At the present time practically none of these are raised. The markets soon demanded a finer and better grade of wool than could be obtained from these, and as a result in about 1856 the Spanish Merinos were introduced. No other breeds were brought into the county until after the civil war, when from about 1868 to 1870 the raising of both Delaines and Shropshires was first begun. It was thought best to replace the Spanish Merino with Delaine blood, since the latter were then considered desirable for mutton as well as wool. For practically the same reason the Shropshire breed was introduced, as at that time the prices for wool were low. The Delaines were obtained from near Canton, in this State, while the Shropshires were

brought from Indiana. About 1896 the Rambouillet sheep were introduced into the county from the northern part of the State. This is a fine wool type. They are large, healthy sheep, well adapted to the climate of Meigs County. At the present time all of the breeds introduced since the war and also the Spanish Merinos are raised in the county both for mutton and wool, though principally the latter. The Delaines are probably the most universally raised. The principal difficulty in connection with this industry is the trouble experienced with dogs. For this reason few sheep are kept near any of the towns.

Another quite important industry dating from an early day in Meigs County is that of raising beef cattle. The principal breed which is and has been used for this purpose is the Shorthorn. Horses, mainly of the draft type, have also been raised in this area to a considerable extent within the last five years, a large number being shipped from the county each year.

The only creamery in the county is at Racine. It receives about 3,000 pounds of milk daily from farmers mainly in the southeastern part of the county. Its maximum capacity is 5,000 pounds a day. The farmer pays 3 cents a pound for separating, making, and selling the butter. If this charge is more than sufficient to net the stockholders of the creamery 10 per cent on their investment, the surplus, whatever it be, is returned to the farmer as a dividend. The greater part of the stock is owned by the farmers themselves. Thus they not only make a profit of 10 per cent on their investment, but also receive any dividends issued. This creamery began operations in July, 1906, and is working on a paying basis. It has about 115 patrons. A fine grade of butter is made, a large part of which is sold in Pomeroy and Middleport. A considerable quantity is shipped to Parkersburg and some to Pittsburg. The milk produced for this creamery and throughout the county is from common grade cows. Considering the large areas in the county which can only be used for pasture, it would seem that the production of milk for creameries in other parts of the county should prove a profitable industry.

It is a well-recognized fact among the farmers of the county that a large part of the hilly section is well suited to raising sheep, since the soils seem to be well adapted to the growing of bluegrass. The red clay land of the hilly section is considered to be the best for wheat, while the sandy land of the hilly section is thought to be well adapted to the growing of fruit. The lowest bottomland along the Ohio River is mostly used for corn, while the bottom types found at higher levels are quite generally used for Irish potatoes and truck crops. At Carpenter is located a test farm, established by the Ohio experiment station, the object of which is to study the agricultural problems of the hilly sections in this part of the State. Various

experiments are tried each year, the results of which are published in bulletin form.

The crop rotation system quite generally practiced throughout the area is as follows: 1, corn; 2, wheat; and 3, timothy and clover, which latter crop is usually cut for two seasons, after which the field is again plowed for corn. In many cases, however, the hay crop is allowed to continue until the timothy and clover are displaced by a natural growth of bluegrass. When oats are grown they generally follow corn, and during the succeeding seasons other crops follow in the order just given. In the southeastern part of the county, on the Ohio River bottomlands, where a large proportion of the potatoes are produced, the most common crop rotation is: 1, wheat; 2, timothy and clover or cowpeas; and 3, potatoes or corn.

Over a comparatively large part of the area the agricultural methods are those which look forward to obtaining a good bluegrass pasture for sheep raising. The soils of the area used for general farming purposes are in most cases of such texture as to permit of easy cultivation. Very soon after corn has been cut the land is usually prepared for wheat. After the corn has either been drawn from the field or placed in shock rows, a disk harrow is used, lapping half. The ground is then thoroughly worked with both a harrow and a plank drag until a good seed bed is obtained. The grain is sown by drill, usually from October 1 to October 15, which seems to be late enough to escape the Hessian fly and not so late as to subject the plants to damage from frosts. The upland soils are usually not so productive, and on account of this a great deal of commercial fertilizer is used, principally on wheat land. The most of the barnyard manure is usually placed on corn land. In many parts of the county considerable difficulty has been experienced of late years in obtaining good crops of clover and on account of this cowpeas are now being used in the southeastern part quite extensively. It often occurs that the clover comes up in patches, and after the hay has been cut from these, about June 1, the field is at once prepared and sown to cowpeas. This latter crop is ready to be cut for hay about September 1. Most farmers grow cowpeas for hay, planting the field to corn or potatoes the following year. Instances have been noted where the crop has been plowed under green in the fall and also where it has been allowed to remain on the ground and not plowed under until the land is prepared for corn the following spring. The last method has seemed to give the best results.

Hired laborers are practically all white and the supply is not always sufficient to meet the demand. Nearly all of the colored laborers of the county find employment about the towns and villages, mainly in coal mines. Comparatively few laborers are hired for long periods, but in such cases they are usually paid from \$15 to

\$25 a month. During the busiest seasons of the year the daily wage is from \$1 to \$1.50 with board.

About 25 per cent of the farms of the area are operated by tenants, who rent mostly on a share basis. Usually, if the owner furnishes seed, work animals, and tools, he receives two-thirds of the crop, and when he furnishes the land only he receives one-third of the crop. Where the owner possesses both land and tools the tenant commonly buys one-half of the stock, such as sheep, cattle, and hogs, furnishes all work animals, and one-half of the seed, and receives as his share one-half of the net proceeds. In the southeastern part of the county the tenant often furnishes team, tools, and one-half of the fertilizer, and the owner the seed and half the fertilizer, and each gets half of the crop. Very few farms are rented on a cash basis. Whenever this is the case the consideration varies considerably, depending upon circumstances. One case was noted where a farm was rented for one year for \$1 an acre.

According to the census of 1900, the average size of farms in Meigs County is 80.8 acres. According to the same authority the number of acres in farms is 261,153, of which 204,486 is improved land. The average valuation per farm, including farm buildings, implements, machinery, and live stock, is about \$2,500. Throughout the hilly sections of the county the land values vary from \$10 to \$35 an acre. Much of the bottomland along the Ohio River is considered to be worth \$100 an acre, and that along the smaller streams from \$60 to \$75 an acre.

Throughout the county the common complaint is that clover does not do well. Liming the soil is to be recommended as a possible remedy for this condition, and great care should also be taken to obtain good seed. As much barnyard manure should be saved as possible, and this should be distributed promptly on the land instead of being allowed to accumulate. Another thing which can be well recommended is the more general practice of systematic crop rotation. In order to prevent the erosion of the soils on the hillsides it would seem best to keep the steepest of them in forest and others in sod, as far as possible. A very common weed pest which is found throughout the entire area is locally known as "stick weed" (*Aster ericoides*). The best methods for eradicating this pest are mowing, grazing with sheep, and practicing a proper crop rotation.

SOILS.

Ten soil types have been recognized in the area, varying from a loose incoherent sand to a very stiff heavy clay. In some cases the types pass very gradually into each other, so that it is difficult to define their limits, while in other cases the boundaries are sharply

defined. The most of the soil types are not naturally of high agricultural value, although the soil in those parts of the area where the topography is less rough produces very good crops when properly managed. All of the more extensive types are formed directly from the disintegration of the underlying geological formations.

The map accompanying this report represents the different types in color, while the following table gives the name of each type and its actual and relative extent:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Meigs clay loam.....	114,432	40.4	Rough stony land.....	4,928	1.8
Dekalb silt loam.....	105,408	37.3	Wheeling silt loam.....	2,432	.2
Upshur clay.....	17,216	6.6	Wheeling fine sandy loam....	1,984	.2
Huntington silt loam.....	16,704	6.2	Wheeling fine sand.....	640	.1
Dekalb sandy loam.....	12,096	4.4	Total.....	283,520	.....
Wheeling gravelly loam.....	7,680	2.8			

The entire area of Meigs County falls within the limits of the Coal Measures of the Carboniferous period. The soils of approximately the eastern two-thirds of the county are formed from the disintegration of the geological strata of the Upper Coal Measures, while those of the western one-third are formed from the strata of the Lower Coal Measures. The outcrop of the Pomeroy seam of coal (the Pittsburg seam No. 8), the base of the Upper Coal Measures, passes through the county in the vicinity of Rutland in about a southwest and northeast direction. This seam of coal dips to the southeast about 25 feet to the mile. The strata of both the Upper and Lower Coal Measures in this part of the State are those of shale, sandstone, coal, and limestone, of which the first two are by far the most important from a geological standpoint. Many strata of sandy shale are to be found. In the eastern part of the county no outcrops of limestone have been noted. In the western part a few outcrops of this rock have been seen, but in no case does it occur in sufficient extent to influence the soils materially.

The soils are formed mainly from sandstones and shales. Of the two, however, the sandstones have very much less influence upon the character of the soils than do the shales, and the greater part of the surface of the area has a silty soil. Clay also occurs as a surface soil in many small, irregular areas, and also is often found underlying the more silty material. It owes its formation mainly to the red shales of the Coal Measures, which strata occur as quite important geological formations both above and below the Pomeroy seam of coal. The Pittsburg and the Waynesburg are the two principal sandstone formations of the Coal Measures occurring in this area. The Waynes-

burg sandstone occurs in the eastern part of the county, mainly as outcrops along the steep, narrow stream valleys or gorges, so that it does not have any very great influence upon the soils of this part of the county. This formation has a thickness of from 30 to 50 feet. The Pittsburg sandstone of the Upper Coal Measures, as well as other sandstone strata of the Lower Coal Measures, outcrop in the western part of the county and here influence the character of the soil to some extent. The Pittsburg sandstone has a thickness of from 40 to 80 feet.

The heavy red clay soil occurring in the area belongs to the Upshur series. With this exception the upland types, all of which contain a large percentage of silt, have yellow subsoils. Two types of the Dekalb series occur—Dekalb silt loam and Dekalb sandy loam; the other upland type, the Meigs clay loam, is closely associated with the Dekalb soils. Rough stony areas have been indicated as Rough stony land. As will be seen by reference to the soil map accompanying this report, the Dekalb silt loam and the Meigs clay loam are the types covering the largest area.

The bottomland along the smaller streams, as well as the first bottom along the Ohio River, has been classed as Huntington silt loam. This type is overflowed frequently and is being formed by the deposition of materials washed from adjoining hills and from that part of the country along the course of the Ohio to the northeast.

In the eastern and southeastern parts of the county along the Ohio River are to be found four members of the Wheeling series of soils, namely, Wheeling silt loam, Wheeling fine sandy loam, Wheeling gravelly loam, and Wheeling fine sand. A small area belonging to the same series occurs in the vicinity of Middleport. All of these soils, with the exception of the Wheeling fine sand, are known locally as river bottom types, and in many cases along the river are formed into very distinct terraces. Beginning with the lowest bottom along the river, which is known as "first bottom," the other terrace levels above are known as "second" and "third" bottoms. The vertical distance between these levels, where the terraces are well developed, is from 15 to 25 feet. From the position and character of these terraces it is evident that the material composing them has been transported from long distances by the river in earlier times, when its current was stronger and its water level higher than at present. The Wheeling fine sand, although material evidently transported to this locality by the river, generally has quite a sharply rolling topography and occupies a position intermediate between the highest terrace of the river bottom and the upland hilly types of the area. It is windblown material. It is not an uncommon thing for the river to overflow the first bottom, but only very infrequently does

the water reach the level of the higher terraces. A very high rise of the river occurred in the winter of 1884 and also in the winter of 1898. Except at times of high water all of the Wheeling series of soils are quite well drained, and this is usually the case with the Huntington silt loam, the first bottomland soil along the river. There are to be found over it no wet or swampy areas, and the normal water level of the river is from 10 to 15 feet below the level of the type.

Excluding the Wheeling fine sand, the bottomland soils are the most valuable of any found in the area. They are naturally strong soils, this being especially true of the Huntington silt loam. Of the Dekalb series the Dekalb silt loam is best adapted to agricultural purposes. The Upshur clay is a strong soil, but difficult to work.

DEKALB SILT LOAM.

The soil of the Dekalb silt loam, to a depth of from 7 to 8 inches, is a fairly compact, grayish-brown silt loam, the particles of which feel very smooth between the fingers. The subsoil, to a depth of 36 inches, is a compact but friable yellowish silt loam. Through both soil and subsoil comparatively few rock fragments occur. The description given is that of the typical Dekalb silt loam as found in the area. A phase of the type, however, differs from it in the texture and structure of the subsoil. In this phase the yellowish silt loam reaches only to a depth of about 24 inches, beneath which is a clay loam to clay, usually red in color. It may sometimes also be of a mottled-red and yellow color. In many instances heavy red clay occurs as the lower subsoil of this phase of the type, and over some parts of it, near areas of Upshur clay, it is even found occurring at depths varying from about 14 to 24 inches. These areas last mentioned are of small extent and have therefore not been mapped as a separate type.

The Dekalb silt loam is distributed over a large part of Meigs County in very irregularly shaped areas. Quite an extended area is found in the northwestern part, and farther to the east, near Tupper's Plains, Five Points, and Racine, it occurs to a considerable extent. With few exceptions, it has a gently rolling topography. It is well supplied with streams, which results in a good surface drainage. Some instances have been noted where underdraining with tiles has proved very beneficial. The practice can well be recommended for the type, especially over the more gently rolling areas. Few places are to be found in the Dekalb silt loam where it has been damaged seriously by erosion.

The Dekalb silt loam is derived from the shales and shaly sandstone of both the Upper and Lower Coal Measures. In many places along road cuts the underlying disintegrating shaly rock may be seen at depths varying from 4 to 6 feet, and in such places many fragments

of shale and shaly sandstone may often be found. The largest part of both the soil and subsoil is made up of silt and clay derived from the disintegration of underlying shales.

The Dekalb silt loam is one of the most extensive upland types, and although it is not naturally a strong soil, it is readily put in good tilth, and fair yields are obtained upon it. Wheat, corn, and hay are the principal crops. Potatoes and oats are also grown to some extent. Wheat produces from 10 to 25 bushels per acre, with an average of about 15 bushels. Corn produces from 20 to 60 bushels to the acre, with an average of about 35 bushels. Hay yields from 1 to 2 tons to the acre, with an average of about 1½ tons. Oats commonly yield about 30 bushels and potatoes about 100 bushels to the acre. The type does not seem to be well adapted to the production of this last crop. Apples and peaches, and also small fruits such as strawberries and raspberries, do well.

The crop yields obtained are only secured through the use of fertilizers, mainly commercial fertilizer, which is sown with the wheat crop. Barnyard manure is generally placed on corn land. Clover does not seem to do well upon this type. It is to be suggested that liming the soil may improve this condition. Great care should also be taken to obtain good seed.

The original forest growth was mainly white oak. At present the principal forest trees found upon the type are red and white oak, walnut, and hickory. The greater part of the type is under cultivation and, on account of its topography, is well adapted to agriculture. It has a value of about \$30 an acre.

The following table gives the average results of mechanical analyses of fine-earth samples 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>
16026, 16028.....	Soil.....	0.2	2.4	2.4	4.8	4.5	72.9	12.9
16027, 16029.....	Subsoil.....	4	2.0	2.5	4.9	6.8	50.8	23.2

MEIGS CLAY LOAM.

The Meigs clay loam is known in some parts of the county as "shaly land" or as "slaty land." It is closely associated with the Dekalb silt loam. The soil is a grayish-brown silt loam to clay loam, varying in depth from 2 to about 7 inches. Over the surface and throughout the soil are often found fragments of grayish-yellow shale or shaly sandstone. On the small hilltops the soil is sometimes somewhat lighter in texture. The subsoil, to a depth varying from 10 to 20 inches, is generally a compact but friable yellowish silt loam to clay

loam, below which depth it usually grades into a quite brittle clay, extending to a depth of more than 3 feet and generally having a yellowish or mottled yellowish red and yellow color. In some cases red clay may occur in the lower subsoil at depths varying from 24 to 36 inches. Small pockets of brownish-yellow sand, as well as fragments of shale and shaly sandstone, occur through the subsoil. It very often happens that shale rock is to be found at depths varying from 2 to 3 feet.

Within the bodies of this type are to be found many areas of Upshur clay too small to be mapped. Over a part of the type the topography is gently rolling enough to permit of easy cultivation, and in such areas a good tilth is easily obtained. The Meigs clay loam occurs in very irregularly shaped areas over the greater part of the county. In the southeastern and southwestern parts it is the most prominent type. Its topography, in general, is hilly and rough, but over some comparatively small areas it occupies well-rounded hilltops. A large part of it occupies steep hillsides, and in many places the soil is badly washed. Many small, narrow stream valleys occur throughout the type, and the drainage is good.

Like the Dekalb silt loam, the Meigs clay loam is derived from the shales and sandstones of both the Upper and Lower Coal Measures. Shaly rock fragments and shale rock in place are very often seen in road cuts.

A small part of the type is cultivated. It is not naturally a strong soil, but fairly good crop yields are obtained by use of fertilizers. The principal crops are corn, wheat, and hay, which are generally grown in the order given. Corn produces from 15 to 50 bushels per acre, with an average of about 25 bushels, and wheat from 10 to 25 bushels per acre, with an average of about 12 bushels. Hay yields from three-fourths to 1 ton per acre. Small fruits, such as strawberries and raspberries, do well, and apples and peaches do fairly well on the type.

The greater part of the Meigs clay loam is best adapted to pasture land. The principal grass used for this purpose is bluegrass. In many cases it occurs as a natural growth, but in others methods are used for obtaining it. Among some of the best farmers of the area it is a common practice to sow bluegrass with clover seed on wheat ground in the spring. Nothing is done to the field in the fall after the wheat is cut, but, for the following season at least, it is cut for hay, after which it may be used as pasture. The bluegrass gradually takes possession of the field and within three or four years a good pasture is generally obtained. Another method of establishing this kind of pasture has been noted. About September 1 the ground is plowed and a good seed bed is prepared, after which a mixture of redtop and timothy is sown. After this bluegrass sods about the

size of one's hand are dropped over the field about 6 feet apart each way. These take root and spread, and in the following spring clover is sown on the field. A crop of hay is cut each season as long as the field produces a sufficient crop, and afterwards it is used as bluegrass pasture. Good results seem to have been obtained by this method.

The original timber growth upon this type of soil was mainly white oak, maple, walnut, and poplar. At present it is principally locust, red oak, hickory, and walnut. The price of this land ranges from \$10 to \$25 an acre.

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

Mechanical analyses of Meigs 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>
14988, 16040.....	Soil.....	0.7	2.5	1.2	3.4	10.2	53.4	28.3
14989, 16041.....	Subsoil.....	.5	3.3	1.3	2.5	9.3	40.2	42.5

DEKALB SANDY LOAM.

The soil of the Dekalb sandy loam to a depth of about 8 inches is a grayish-brown fine to medium sandy loam, of open texture. The subsoil is a yellowish fine to medium sandy loam. On small hilltops or narrow ridges it often happens that sandstone rock is encountered at depths varying from 24 to 36 inches, and in such cases both the soil and subsoil are usually somewhat lighter in color and coarser in texture. In some instances where the type occurs on hillsides along the small stream courses the texture of both the soil and subsoil is also found to be somewhat coarser than the average of the type.

The Dekalb sandy loam occurs in many small, irregularly shaped areas mainly in the northern and southwestern parts of the county, the largest areas being found in the latter part. The type occurs mainly as rolling hilltops or as rather steep hillsides along the smaller stream courses. On account of both texture and topography it is well drained. Very few instances were noted where erosion had damaged the fields.

The geological formations from which this type is derived are those of fine to medium grained sandstones occurring mainly in the Lower Coal Measures. All of the strata are comparatively thin and for this reason the Dekalb sandy loam is found poorly developed in this area. During the process of disintegration and erosion the resulting materials from both the sandstones and shales have been mingled together to such an extent that it is often difficult to determine upon a dividing line between the Dekalb sandy loam and Dekalb silt loam or Meigs clay loam. As found on the hillsides along

the stream courses the type is, in part at least, made up of sandy materials washed from the adjoining hilltops.

The Dekalb sandy loam seems to be best adapted to the growing of fruit, such as apples, peaches, and pears. Small fruits, such as strawberries and raspberries, also do well. Some of the best fruit farms of the area are found upon this type. It is also well adapted to general farming purposes, good crops of wheat, corn, potatoes, and hay being produced upon it. Very few oats are grown. Wheat yields from 12 to 20 bushels per acre, with an average of about 15 bushels, and corn from 30 to 60 bushels, with an average of about 40 bushels. Potatoes usually yield from 100 to 150 bushels to the acre, with an average of about 125 bushels, and are considered of very good quality. Hay produces from 1 to 1½ tons to the acre. Over some parts of the type the growing of tomatoes is an important industry.

The fertilizer practice upon this type of soil is similar to that upon the Dekalb silt loam and Meigs clay loam, the commercial fertilizer being sown with the wheat crop and the barnyard manure being used mainly upon corn ground. Where clover does not do well, liming the soil might prove beneficial. It is suggested also that the growing of cowpeas might materially improve the soil, especially if the vines be plowed under.

The original timber growth upon the type was mainly chestnut, white oak, poplar, and walnut. The principal trees found upon it at present are chestnut, locust, maple, and elm. The type has a valuation of from \$20 to \$30 an acre.

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

Mechanical analyses of Dekalb 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>
16034, 16036.....	Soil.....	0.9	7.4	16.7	31.4	5.7	26.9	11.4
16035, 16037.....	Subsoil.....	.2	4.2	9.9	32.2	7.0	32.1	14.7

UPSHUR CLAY.

The Upshur clay is known throughout the county as "red clay land." The soil, to a depth varying from 1 to 4 inches, is an Indian red clay to clay loam, through which small limestone fragments are occasionally scattered. The subsoil, to a depth of over 3 feet, is a very heavy plastic clay of the same color as the soil. In the most of the type there is but slight difference between the texture of the soil and subsoil, both of which are often badly cracked, the cracks varying in width from one-fourth to three-fourths of an inch and extending downward in many cases to a depth of a foot.

In a large number of instances where the Upshur clay grades into the Dekalb silt loam or Meigs clay loam heavy red clay is found underlying a gray silt loam, the latter usually being about 6 inches in depth. These areas, however, have been mapped as Upshur clay, since they are not of sufficient size or importance to warrant mapping as a separate type. In the northwestern part of the county are found several small areas of a dark-gray clay to clay loam, varying in depth from 2 to 4 inches. Upon the surface are very often to be found limestone fragments, varying in size from one-half an inch to about 3 inches in diameter. The subsoil consists of a very heavy plastic dark-gray clay. These small areas have also been mapped as Upshur clay on account of their limited extent. In nearly every case they are closely associated with the Upshur clay, and the mechanical analyses of the typical Upshur clay and the phase just described show that they are practically the same in texture.

The Upshur clay is found in nearly all parts of the hilly sections of the county and usually occurs in small areas on hilltops or hillsides. The largest areas occur in the northwestern part of the county in the vicinity of Carpenter. The topography is generally sharply rolling, although the soil is sometimes found on rather gently rolling hilltops. The surface drainage is usually very good. Several instances were noted where the soil has been badly eroded.

The typical Upshur clay is probably derived mainly from the disintegration of the red shales of the Coal Measures, which may be seen outcropping in road cuts. In the Lower Coal Measures of this region a few thin layers of limestone occur. These outcrop in the western part of the county, where to some extent they may influence the formation of this type of soil. The dark-gray clay phase is probably derived from both the shales and the limestone.

Good crops of wheat, corn, and hay are produced upon the Upshur clay. It is considered the best wheat land in the area. Oats are grown to some extent. Practically no truck crops or potatoes are produced upon it. Both apples and peaches do well. Wheat produces from 15 to 25 bushels, with an average of about 18 bushels, and corn from 30 to 60 bushels, with an average of about 40 bushels, per acre. Hay yields from 1 to 2½ tons, with an average of about 1½ tons, and oats about 30 bushels per acre.

The most undesirable feature of the Upshur clay is the difficulty of cultivation. On this account it is generally plowed in the latter part of February or early March, at a time when the ground happens to be thawed sufficiently. Thus the plowed ground is later subjected to alternate freezing and thawing, which results in making the heavy clay comparatively loose and mellow and giving a much better seed bed at planting time. If not plowed before the spring the soil is very likely to clod and bake badly. In some cases it is

plowed in the fall, but winter rains have a tendency to pack it or to cause it to run together, thus making it difficult to work into a good seed bed in the spring. This difficulty is, however, overcome to a large extent if the ground plowed is in sod. In order to prevent erosion on this type it would seem best to keep it in grass as much of the time as practicable, especially where it occurs on hillsides.

The tree growth upon the Upshur clay is mainly hickory, locust, and walnut. The value of the land varies from \$25 to \$35 an acre.

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

Mechanical analyses of Upshur clay.

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>
14992, 16068.....	Soil.....	0.5	2.0	1.4	3.7	4.6	42.7	45.1
14993, 16069.....	Subsoil....	.3	2.8	2.8	7.8	7.3	37.4	46.9

The following sample contains more than one-half of 1 per cent of calcium carbonate (CaCO_3): No. 16069, 9.53 per cent.

HUNTINGTON SILT LOAM.

All of the bottomland along the smaller streams of the area and the lowest bottom along the Ohio River have been mapped as Huntington silt loam. As the type occurs along the river, it is known as "first bottomland." When cultivated it usually breaks up into a loamy friable condition, but along the river some cases have been noted where it shows a tendency to clod. The soil to a depth of about 12 inches consists of a brown compact silty loam to silty clay loam. The subsoil to a depth of 3 feet is a somewhat lighter brown clay loam in which the sand content becomes slightly greater as depth increases. The preceding description is that of the typical Huntington silt loam. Over small areas along a number of the minor streams both the soil and subsoil of the bottomland are more sandy than the average of the type. Only a few such cases were noted along the Ohio River. These more sandy areas have been mapped as Huntington silt loam, since on account of their small extent it was not considered advisable to establish a new type.

The most of the type, as it occurs along the Ohio River, is found in the southeastern part of the county. Its topography is generally level, though in a few cases it is very slightly rolling. Here the bottom is usually from 10 to 15 feet above the water level. Ordinarily the land is overflowed about twice a year, high water usually occurring in February or March and again in July. Several instances were noted where tiling has proved very beneficial, and this method of draining the type is to be recommended.

The Huntington silt loam owes its origin mainly to recent deposition of alluvial material by the streams. In a few cases along the

smaller stream courses, however, it is somewhat colluvial in origin, being formed in part by material washed from the adjoining hillsides.

The principal crops are potatoes, corn, and hay. Garden vegetables and sorghum also do well. Potatoes are grown mostly on that part of the type found along the smaller streams and yield about 100 bushels to the acre. Corn yields from 40 to 80 bushels per acre, with an average of about 50 bushels. The best crops of corn are usually grown on the river areas, where the yield is generally from 50 to 70 bushels per acre. Hay yields from 1 ton to 2½ tons per acre, with an average of about 1½ tons. A few small fields of alfalfa are seen on parts of this type less likely to be overflowed. In most instances it has proved a very profitable crop. It is suggested that liming the soil would probably lessen the chances of failure of this crop.

The tree growth on the type is mainly sycamore, soft maple, and elm. The value of this land varies from \$50 to \$100 an acre.

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

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>
16044, 16046.....	Soil.....	0.2	0.2	0.3	6.9	7.9	65.2	19.1
16045, 16047.....	Subsoil.....	.0	.2	1.1	17.8	9.8	48.8	22.4

WHEELING SILT LOAM.

The soil of the Wheeling silt loam to a depth of about 12 inches is a mellow, brown silt loam of a texture giving excellent tilth. The subsoil from 12 to about 16 inches is usually a somewhat lighter brown, compact, but friable silt loam, and from this depth to the lower limit of the profile—36 inches—a brownish-yellow friable silt loam is found, the structure becoming somewhat more compact as depth increases.

The type is best developed along the Ohio River as second bottom, the level of which is usually from 10 to 25 feet above the first bottom. This condition is well shown about 1½ miles northeast of Applegate. All of the type is found along the Ohio River, mainly in the southeastern part of the county, though some of it occurs in the vicinity of Middleport.

The topography of the Wheeling silt loam is level to gently rolling, and over its entire area the drainage seems to be fairly good. Gravel is found underlying parts of the type at depths varying from 7 to 15 feet, and this undoubtedly aids in removing any excess of water. Tiling is used in some cases with very good results. It is very seldom that any of the type is overflowed.

The materials composing the Wheeling silt loam are those deposited during past ages by the Ohio River, when its waters were at a much higher level than at present.

The type is best adapted to the production of potatoes, but also produces good crops of wheat, corn, and hay. Tomatoes are also very profitably grown upon the type. Potatoes yield from 100 to 200 bushels per acre, with an average of about 150 bushels; wheat, from 12 to 25 bushels, with an average of about 16 bushels, and corn from 35 to 65 bushels per acre, with an average of about 45 bushels. Hay is usually timothy and clover, the yield being from 1 ton to 2½ tons per acre, with an average of about 1½ tons. A few instances have been noted where alfalfa has been successfully grown, and it would seem that this crop should prove very profitable upon this type of soil.

Commercial fertilizer is quite commonly sown with wheat, while the barnyard manure is placed upon the corn ground. In some instances where good stands of clover have not been obtained cowpeas have been grown both for hay and for the purpose of maintaining the productivity of the soil. When cut for hay the yield is about 1½ tons to the acre. It is suggested that liming this soil might improve its condition for the legumes. In the case of clover great care should also be taken to obtain the very best of seed.

The type is valued at about \$100 an acre, and is practically cleared of all timber.

The following table gives the average results of mechanical analyses of the Wheeling silt loam:

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>
16032, 16050.....	Soil.....	0.2	0.8	0.8	2.3	8.9	73.6	13.0
16033, 16051.....	Subsoil.....	.1	.4	.2	1.7	10.6	67.1	19.6

WHEELING FINE SANDY LOAM.

The Wheeling fine sandy loam consists of about 10 inches of loose brown fine sandy loam, resting on a yellowish-brown fine sandy loam, which may become slightly heavier at 20 to 30 inches below the surface, though below 30 inches the texture again generally becomes more sandy. A good tilth is easily obtained upon this type.

The area of the Wheeling fine sandy loam is limited. Areas occur along the Ohio River in the southeastern part of the county, both upon what are locally termed the second and the third bottoms, but mainly upon the former, since only a comparatively small extent of the third terrace exists. These bottoms are often formed as very distinct terraces, having a level or slightly rolling topography. Both

the Wheeling silt loam and the Wheeling fine sandy loam are frequently found upon the second bottom, but upon the third bottom practically no other type than the Wheeling fine sandy loam occurs. In the locality of Letart Falls the terraces are not well defined, and the latter type extends to the river.

As a consequence of the texture of both soil and subsoil, the natural drainage of the type seems to be good. As in the case of the Wheeling silt loam, the gravel which underlies parts of this type undoubtedly aids in its drainage. High water from the river never reaches parts of the type and the lower areas very rarely.

From the position it is evident that the Wheeling fine sandy loam is an alluvial soil laid down during the past ages, when the waters of the river were at a considerably higher level than they are at present, while from the character of the material it would appear that it has been carried long distances before final deposition.

The Wheeling fine sandy loam is best adapted to the growing of melons and strawberries. Good crops of wheat, corn, potatoes, and hay are also produced, the latter being timothy and clover and cowpeas. Wheat yields from 10 to 25 bushels per acre, with an average of about 16 bushels; corn from 30 to 60 bushels, with an average of about 40 bushels, and potatoes from 100 to 200 bushels, with an average of about 125 bushels. Timothy and clover yields about 1½ tons of hay to the acre. Cowpeas are grown both for hay and for plowing under. Small fruits, such as raspberries and blackberries, do well on the type.

As upon other soils of the area, difficulty has been experienced in growing clover. It usually attains a good growth in the fall after the wheat is cut, but during the winter it often dies out to some extent, and in the following spring is likely to be found only in patches through the field. In such cases the hay is usually cut from these patches, after which the ground is at once prepared, in the latter part of June, and sown to cowpeas. In September the crop is cut for hay or plowed under. Some farmers allow the vines to remain upon the ground until the following spring before turning them under.

Practically all of this type is under cultivation. It has a valuation of about \$100 an acre.

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

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>
16058, 16060.....	Soil.....	0.1	0.6	2.0	32.6	19.4	36.7	8.6
16059, 16061.....	Subsoil.....	.0	.4	1.6	33.5	20.6	30.9	13.3

WHEELING GRAVELLY LOAM.

The Wheeling gravelly loam occupies a small part of the terrace lands in the southeastern part of the county. On account of its gravel content it is not so easily cultivated as the Wheeling fine sandy loam or Wheeling silt loam. To a depth of about 10 inches the soil is a brown gravelly loam. The gravel, a considerable quantity of which is found upon the surface, comprises from 30 to 60 per cent of the soil mass and is made up of waterworn pebbles varying in size from one-fourth inch to more than an inch in diameter. These pebbles are composed of granite, quartz, quartzite, and sandstone. The fine earth varies from a silt loam to a sandy loam. The subsoil to a depth of 3 feet is a brownish-yellow gravelly loam, the fine earth of which also varies from a silt loam to a sandy loam. From 30 to 60 per cent of waterworn gravel, similar to that found in the soil, is also found throughout the subsoil. No pebbles composed of shale are to be found in either soil or subsoil. It is often very difficult to make a boring to a depth of 3 feet on account of the pebbles encountered.

The Wheeling gravelly loam occurs in five different areas, the largest of these being just southeast of Greatbend. Two areas are near Portland, another is at Reedsville, and the smallest one lies about one-fourth mile north of Applegrove. All of this type is found in the Ohio River bottoms. Its topography is practically level, but owing to its texture it is well drained.

The origin of the Wheeling gravelly loam is similar to that of the Wheeling silt loam and Wheeling fine sandy loam, as the materials of which it is composed must have been transported to their present position by the Ohio River. The gravel has evidently been carried from glacial regions to the northeast, and this must have been when the current of the river was much stronger than now. It is a very noticeable fact that the gravel is finer the farther down the river it is found. At Reedsville the pebbles are often more than an inch in diameter, while in the locality of Middleport, where traces of the type are to be found, the pebbles are less than one-fourth of an inch in diameter. In several cases gravel has been encountered at varying depths in digging through other types which lie between the Wheeling gravelly loam and the river. In every case the gravel discovered has been at lower levels than that of the surface of the Wheeling gravelly loam. Thus it would seem as if much gravelly material had at one time been deposited by the river and that subsequently the same material had been removed and replaced by the materials which make up the soils now overlying the gravel.

All of this type is under cultivation. It is best adapted to the growing of watermelons and tomatoes. Wheat does fairly well, and corn produces fair yields if the season is not too dry. Practically no hay or potatoes are grown on the type. Wheat produces from 10 to 20 bushels, with an average of about 12 bushels, and corn from

30 to 45 bushels per acre, with an average of about 35 bushels. Barnyard manure is used largely in growing tomatoes and watermelons. The type has a valuation of from \$50 to \$75 an acre.

The following table gives the average results of mechanical analyses of fine-earth samples of the Wheeling gravelly loam:

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>
15566,16054.....	Soil.....	8.8	15.3	10.8	8.4	4.5	38.9	12.9
15567,16055.....	Subsoil.....	6.8	16.0	6.5	9.5	6.3	38.4	16.5

WHEELING FINE SAND.

The Wheeling fine sand has the smallest extent of any type in the county. The soil to a depth of about 11 inches is a loose brown fine sand. The subsoil to a depth of over 3 feet is a brownish-yellow sand of practically the same texture as the soil, becoming slightly lighter in color as depth increases. Naturally the type is very easily cultivated.

Nearly all of the Wheeling fine sand is found in three rather small areas. The largest of these occurs about 1½ miles southeast of Greatbend, another about 1 mile northeast of Letart Falls, and the other about three-fourths of a mile southeast of Portland. It occurs as intervening areas between the hilly upland types and the Ohio River bottom lands. Its topography is gently to sharply rolling. Small, rather steep hills are a prominent feature in some parts of the area mapped. The elevation of these hills above the level of the adjoining bottom land varies from 20 to 50 feet. On account of the texture of the material and the topographic position the drainage is good.

The Wheeling fine sand is composed of earlier deposits of the Ohio River, which have later been subjected to the action of wind. This latter action has given to the type its present topography.

The crops to which this soil seems best adapted are watermelons and tomatoes. Fairly good crops of potatoes, corn, wheat, and cowpeas are also produced. Early potatoes are generally grown, and the yield ranges from 60 to 125 bushels per acre, with an average of about 80 bushels. Corn yields from 30 to 50 bushels per acre, with an average of about 35 bushels. Wheat produces about 12 bushels to the acre. Rye is sometimes grown and yields about 15 bushels to the acre. Cowpeas are grown both for hay and for maintaining the productivity of the soil. They produce about 1½ tons of hay to the acre. All small fruits, such as strawberries and blackberries, seem to do well on the type.

Commercial fertilizer is the principal material used to increase the crop yields, though some barnyard manure is used also. It seems

necessary to use fertilizer of some sort, since the soil in itself is not naturally very productive. The growing of cowpeas is to be recommended as one of the best means of maintaining the productivity of this soil.

Practically all of the Wheeling fine sand is under cultivation. It is valued at about \$25 an acre.

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

Mechanical analyses of Wheeling fine 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>
15504, 16004.....	Soil.....	0.1	1.2	8.2	57.0	17.4	11.8	4.2
15565, 16065.....	Subsoil.....	.1	1.2	8.1	58.1	17.4	10.0	5.5

ROUGH STONY LAND.

All of those areas which, in the main, are so rough and rocky as to be of practically no value from an agricultural standpoint have been mapped as Rough stony land. The soil of these areas usually resembles that of the Meigs clay loam or Dekalb sandy loam. They are found throughout the county mainly as rocky hillsides along stream courses, and for the most part are covered with forest growth. The larger part of the type occurs in the vicinity of Middleport and Pomeroy. The topography of the Rough stony land is in many cases so steep that it would be impracticable to try to utilize it either for orchard or pasture. Outcrops of massive sandstone are often seen in such areas.

SUMMARY.

The area surveyed is located on the Ohio River, in the southeastern part of Ohio, and comprises about 443 square miles. Topographically it may be divided into two parts, namely, the hilly upland section and the nearly level bottomlands along the river. The former division comprises much the larger part of the area, and its topography varies from rather gently rolling to rough and hilly. Parts of the hilly sections along stream courses are so steep and rocky as to be of little value from an agricultural standpoint.

The climate is mild, and the rainfall is usually sufficient for the production of all crops grown. In many cases winter plowing is practiced. The entire area is well drained by numerous streams, the waters of which eventually reach the Ohio River. The largest streams passing through the area are Shade River in the northeastern part and Leading Creek in the western part.

The area is comparatively thickly settled. The two largest towns are Pomeroy and Middleport. There are several other smaller thriv-

ing towns in the county. The rural section most thickly settled is the western part. Very nearly three-fourths of the area is classed as improved land.

The raising of sheep for both wool and mutton is the most important agricultural industry. Beef production is also important. The principal crops are wheat, corn, and hay. Many good bluegrass pastures are found in the area, especially in its western part. Apples, peaches, and pears, all of very good quality, are produced. Potatoes, cowpeas, small fruits, watermelons, and vegetables are also successfully grown. Alfalfa, oats, rye, and sorghum are produced to some extent. From the local markets the wool is shipped, mainly by rail, to eastern markets, principally New York and Philadelphia. Live stock is shipped chiefly to Pittsburg, by boat and rail. Potatoes, produced in the southeastern part of the county, are shipped, principally by water, to southwestern points. The other products are used within the county.

Two railroads, the Kanawha and Michigan and the Hocking Valley, traverse the western part of the county and afford means for transportation of products to distant markets. Packet boats usually ply the river, regularly carrying freight to points both up and down the river. The public roads of the county are generally good during the summer months, but bad during the winter or after continuous rains.

The principal crop rotation is as follows: First, corn; second, wheat; and third, timothy and clover, the latter crop generally cut for two seasons and the field plowed again for corn. Commercial fertilizer is used quite generally throughout the area.

Farm labor is practically all white, and during the busiest seasons of the year the supply is not always equal to the demand.

Ten types of soils, varying in texture from a loose incoherent sand to a very stiff heavy clay, were mapped in the survey. Nine of these are agricultural types and used for general farming, pasture, and the growing of truck crops.

The Dekalb silt loam is the upland type of soil most generally used for farming purposes. It is not naturally a very productive soil, but produces fairly good yields if well fertilized. Commercial fertilizer is used principally. Wheat, corn, and hay are the leading crops. Potatoes and oats are grown to some extent. Apples and peaches and also small fruits, such as strawberries and raspberries, do well upon the type. It is valued at about \$30 an acre.

The Meigs clay loam is the rough and hilly upland type of the area, a large part of which is used as pasture. It furnishes good bluegrass. When cultivated and well fertilized, fair crops of corn, wheat, and hay are produced. Both tree fruits and small fruits do well on the type. It has a value ranging from \$10 to \$25 an acre.

The Dekalb sandy loam, though not well developed in this area, is quite well adapted to general farming. It seems best suited to the growing of both tree fruits and small fruits, some of the best fruit farms of the area being located upon it. It also produces good crops of wheat, corn, hay, potatoes, and tomatoes. The type has a value of about \$25 an acre.

The Upshur clay is the heaviest type in the area. It usually occurs on rather steep hillsides or hilltops, and because of this location and its texture it is difficult to cultivate. It is considered the best wheat soil in the county. Apples and peaches do well upon it. The principal crops are wheat, corn, and hay. Some oats are also produced. The Upshur clay has a value of from \$25 to \$35 an acre.

The Huntington silt loam includes all bottomlands along the smaller streams of the hilly section of the area and the first bottom land along the Ohio River. It is a very productive soil, but crops are sometimes damaged by overflows. It is best adapted to corn and hay. Potatoes and other vegetables are raised mainly along the smaller stream courses. The type is worth about \$100 an acre.

The Wheeling silt loam generally occupies the second bottom along the Ohio River and is valuable farming land. It is only very seldom that high water from the river reaches the type. It is well adapted to the growing of Irish potatoes. Good crops of wheat, corn, and hay (timothy and clover or cowpeas) are also produced. Tomatoes are also a profitable crop. This type has a value of about \$100 an acre.

The Wheeling fine sandy loam is another valuable type occurring as a part of the Ohio River bottomland. It usually occupies the position of second bottom, and high water from the river seldom reaches it. It is best adapted to the growing of watermelons and strawberries, but also produces good crops of corn, wheat, potatoes, and hay, the latter being timothy, and clover and cowpeas. Small fruits, such as raspberries and blackberries, do well. The type is valued at about \$100 an acre.

The Wheeling gravelly loam occupies only a very small part of the area mapped. On account of the gravel in the soil, it is somewhat more difficult to cultivate than either the Wheeling silt loam or Wheeling fine sandy loam. It is best adapted to the growing of watermelons. Fair crops of wheat and corn are obtained.

The Wheeling fine sand is of such small extent as to be of little agricultural importance. On account of its loose texture, it is leachy and droughty and not as productive as the other soils of the area. When well cared for, it produces fair yields of corn, wheat, potatoes, and cowpeas.

Rough stony land occurs on many of the hillsides along the stream courses. It is of little importance agriculturally.

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