

Soil Survey of Monroe, Brown, Lawrence, Martin, Orange, Washington, and Jackson Counties.

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The counties in this group occupy an area in central southern Indiana of about 3,000 square miles. The north line of this area is about 30 miles south of Indianapolis, and the southern boundary is about 15 miles from the Ohio. Transportation facilities are good, and the cities of Chicago, Indianapolis, Louisville, St. Louis and Cincinnati are easily reached, and several cities within the area are in a very prosperous condition and are the center of great industrial activity.

Geology of the Area.—The seven counties here treated lie for the most part in the driftless part of the State, and the surface rocks of the area belong to the Subcarboniferous or Mississippian Period, hence in the discussion of the soils of this section we are dealing principally with residual types. The Knobstone formation covers the whole of Brown and the eastern portions of Monroe, Lawrence and Washington and the greater part of Jackson County. This formation consists of shales and sandstones, and its general characteristics have been discussed under the subject of "Indiana Soil Types." The Harrodsburg, Salem and Mitchell limestones lie on the order named above the knobstone, or to the west of the knobstone area. Each of these comprise large areas in the counties of Monroe, Lawrence, Washington, and about 15 square miles of Harrodsburg are found in western Jackson, and the Mitchell covers more than a third of Orange County. The Huron group, a series of limestones, sandstones and shales, extend over western Monroe, Lawrence and eastern Martin and about one-half of Orange.

The Mansfield sandstone occurs to some extent in Lawrence, and covers large areas in Martin and Orange. The coal measures proper are confined to isolated patches and ridges in Martin County.

Very small amounts of glacial material occur in northern Monroe and Brown and is thinly distributed over the eastern half of Jackson, except in a few places, such as Chestnut Ridge, where

the material is ridged in a conspicuous manner. Also in eastern Jackson, a few square miles have their soils derived chiefly from the Devonian formation. About 250 square miles of alluvial soils are found in these seven counties.

Topography.—This area is a great plain of disintegration and degradation, the original rock surface having been removed by the processes of weather and stream erosion, and now present even, flat-topped ridges, divides and isolated knobs with a complex network of valleys, ranging in width from a few feet to several miles. That portion covered by the first ice invasion has been but little changed in its topographic features. This area thus presents the most rugged and picturesque of the State. The upland plateaus of the Mitchell form the most level portion within the area, and this limestone has its own topographic features, due to the presence of caves, sinkholes and underground channels. Taken as a whole, this block of counties may be considered a good agricultural section, with its great variety of soil types and the great range of adaptability. The cereals are grown to more or less advantage on all the types. The limestone soils give abundant yields of timothy, clover and the most beautiful blue grass pastures of the State. Fruit growing and truck farming are also carried on successfully on the various soil types. However, in the growing of crops, a large amount of commercial fertilizer is used to produce good results. The agricultural advantages and improvements are, on the whole, progressing very rapidly.

Drainage.—The drainage of this section is chiefly through the east and west forks of White River. The Patoka River carries the waters of southern Orange west to the Wabash. Southern Washington drains south through Blue River into the Ohio. The Bean Blossom carries the waters of northern Brown and Monroe into the west fork of White River; and Salt Creek, with its many tributaries, and Lost River carry the principal part of the southern drainage into the east fork. Most of the streams throughout the area are well supplied with gravel suitable for road metal and ballast.

MONROE COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Monroe County, named in honor of James Monroe, the fifth President of the United States, was organized in 1818. An old historical account of 1850 says: "There are in the county eleven grist mills, twelve saw mills, four oil mills, nine carding machines,

one foundry, one spinning, weaving and fulling machine, three printing offices, about twenty general stores and groceries, nine lawyers, ten physicians, and preachers too tedious to mention."

The population in 1830 was 6,578; in 1850, 13,000, and at the present time is about 22,000. The county contains 420 square miles. The civil townships are Bean Blossom, Washington, Marion, Benton, Bloomington, Richland, Van Buren, Perry, Salt Creek, Polk, Clear Creek and Indian Creek.

The principal towns are: Bloomington, Ellettsville, Stinesville, Clear Creek, Smithville, Harrodsburg. Other small villages and trading centers are Sanders, Kirksville, Buena Vista, Victor, Ketchem, Stanford, Hinsonburg, Mt. Tabor, Dolan, Hindostan, Unionville, Payne and Fairfax. Of these Sanders is a quarry town on the old line of the Monon, and Ketchem is a station on the new line. The villages of Stanford, in the western part of the county, and Unionville, in the eastern part, are both more than a mile from the line of the Indianapolis Southern Railroad, but each has a station by the same name. Victor and Hinsonburg are quarry districts; the others named are little more than country stores, and in few places postoffices are still kept.

Bloomington, the county seat, has a population of 10,000. It is growing very rapidly. A new court house of Oolitic stone is just nearing completion, and many other improvements are being constructed. The State University situated here has an enrollment of 2,000, and adds greatly to the business, thrift and general welfare of the city. Two railroads pass through the town. The C., I. & L. (Monon) in a north and south direction and the Indianapolis Southern in an east and west direction. An interurban line making Bloomington a junction point promises to be built during the coming year. The principal industries within the city are: quarrying interests, furniture factory, spoke factory, mitten factory, basket factory, milling and feed establishments, lumber and coal yards and various other industries which give employment to a large number of people. The town should continue to grow rapidly and improve in the most modern way, because of its varied interests and permanent population.

Ellettsville is a town of 800 inhabitants situated on the Monon Railway seven miles north of Bloomington. Its chief interests are in the stone quarry district, and it also serves as an agricultural trading center.

Stinesville has a population of three hundred, and was built up in the early days of the stone industry in that region, and new

developments in that section look favorable for a continued growth. A large stone mill operates within the village.

Smithville, eight miles south of Bloomington, has a population of 150, and is chiefly a trading center for an agricultural and quarry district.

Harrodsburg, twelve miles south of Bloomington, has a population of about 400, and is a thriving little village dependent on the surrounding country for its trade and business. The railway station is about one mile east of the town.

Clear Creek is a beautiful little village four miles south of Bloomington, and has a population of 100. It is also the center of some stone interests.

At present the county produces about 600,000 bushels of corn, an average yield of 40 bushels per acre; about 8,000 acres of oats, average 25 bushels; about 7,000 to 8,000 acres of wheat, average 16 to 20 bushels. The county usually ranks fourth or fifth in the State in acreage of timothy meadow, and is among the leaders in average yield. In 1905 the county produced 53,800 tons. In 1906 the acreage dropped to 20,000, and the average yield 1.1 tons. From 2,000 to 3,000 acres are given to clover, which yields about $1\frac{1}{2}$ to $1\frac{3}{4}$ tons of hay per acre, and about 500 bushels of seed. Among other crops the average acreage and yield are as follows: Potatoes 300 acres, average 50 to 60 bushels; tomatoes, a rapidly increasing acreage, 40 acres being grown in 1906, yielding over 5,000 bushels; peas, 5 to 10; watermelons, 10 to 15 acres; tobacco, 5 to 10 acres. The yield of apples in 1906 was about 60,000 bushels. A large yield of peaches is also produced. While Monroe produces large quantities of live stock, it is not a leading industry in the county.

SOILS.

Monroe has a greater variety of soils than any other county within the area touched by this survey. There are eight general types with various subdivisions of these which will be treated under the following description: Six of these soils are due directly to the weathering and disintegration of the underlying geological formations. The glacial area belongs chiefly to the part of an old glacial lake extending into the northwest part of the county; the other glacial soils are found along the Bean Blossom. The alluvial soils belong principally to the valleys of Bean Blossom and Salt Creek, and present a variety of types. The following table will show the extent of each of the general types:

Knobstone	130 square miles
Harrodsburg	77 square miles
Oolitic	26 square miles
Mitchell	89 square miles
Huron	59 square miles
Glacial	8 square miles
Alluvial	26 square miles
Clay	5 square miles

1. THE KNOBSTONE AREA.

The Knobstone soil of Monroe County covers a much larger area than any other type. It comprises a wide, irregular strip along the entire eastern side of the county and widens to the north, until all of Marion township is covered, and continues across the northern part with patchy areas reaching to the White River. In the southern part principally all of Polk township is covered with this type, and it continues with wide strips extending along the Salt Creek valley until the uplands of the Harrodsburg limestone are reached. Irregular patches of this soil occur throughout the eastern-central area and the stone outcrops several miles up the ravines of the stream. In many places the hills rise 150 feet or more above the drainage level and the slopes are very steep and the knob topography in general is well developed.

The characteristics of the soils are the same as given in the discussion of the Knobstone under the "Indiana Soil Types," and under Brown County in particular, in the following pages.

The public roads are in fair condition and several miles through the part of the area nearest the Harrodsburg contact have been improved with crushed stone and others with stream gravel. In the rougher parts the steepness of the slopes preclude economic hauling, and being distant from railroads thus prove a great drawback to the development of the area. Since the building of the Indianapolis Southern Railroad the lands in the northeast part of the county have about doubled in price and some developments are being made.

A small percentage of the lands are under cultivation, the greater part being grown up with second growth timber. Some good timber also remains; about \$10,000 worth of hoopoles and hickory bark was hauled into Bloomington during the spring of 1907, and thousands of railroad ties are also cut from this area. The average yield of corn is from 10 to 30 bushels. Little wheat is grown. Timothy and clover grow fairly well, but it is usually

difficult to obtain a good stand. The rapid and excessive growth of "white top" often renders the hay of poor quality. Very few vegetables are raised, scarcely sufficient to supply the local demand. Although few live stock are raised the people are often seen buying feed before the winter is over. The soil is capable of producing much greater returns than are now realized. Some fertilizer is used, but without any reference to the soil conditions. Bone meal and phosphates are the principal fertilizers used.

Fruits grow well on these soils, but very little has been grown. The best example of what can be done with fruit growing and vegetable farming in the rough part of this area has been demonstrated by Frank Morris, gardener and fruit grower, in Bloomington. Five years ago Mr. Morris bought twenty acres of this land, five miles east of Bloomington, paying only \$5 an acre. The surface is very rough and broken and was covered with a dense growth of second growth timber and shrubbery, and much hard work was required to prepare the ground for cultivation. Enough wood was, however, secured from the land to about pay for the land and the clearing. Over 25,000 strawberry plants have been set out on the hillsides and almost a thousand dollars have been realized from this investment. Several hundred young peach trees have been set out, also about 6,000 raspberry bushes, 700 dewberry bushes and a quantity of small fruit of all varieties. He expects to increase these numbers from year to year. A large quantity of vegetables are also raised on this tract.

This is only an example of the worth of the apparently worthless hill land of the eastern part of the county. Here are opportunities for many people in various lines of agriculture and truck farming, and extensive developments can here be made that will greatly repay the promoter and add much to the welfare of the county.

Arbutus Hill is the name given to a part of the same ridge on which Mr. Morris's fruit farm is located. Here, over a limited area, the trailing arbutus grows abundantly, and this is one of the few places within the State where it is found growing. It is a rare plant, known only in a few localities, principally Indiana, Michigan and New England. The soil of the Arbutus Hill is of a fine sandy loam of a yellow color. The arbutus has its roots imbedded very shallowly in the soil and appears to depend very largely on the leaf mold for its support.



Gullies in the clay and shales of the Knobstone, eastern Monroe County, near Stobo.



Gullies in clay and shales of Knobstone in eastern Monroe County, west of Arbutus Hill.

2. HARRODSBURG LIMESTONE.

The residual soils of the Harrodsburg rank third in area and probably second in general productiveness in the county. The soil has the general characteristics of the type, grading from light yellow to dark, with a deep dark red subsoil. The soil of this type, found within the immediate vicinity of Bloomington, and also in the vicinity of Harrodsburg, is of rolling topography and affords excellent agricultural land. In the northeast and south edges of the area the streams have cut back through the limestone and into the soft Knobstone below, and this part of the county is of much rougher topography. The soil is easily cultivated, natural drainage is good and a fair yield of most crops produced. A large amount of fertilizer is used. Corn yields about 50 bushels, wheat 15 to 30 bushels, timothy one and one-half to three tons per acre, and the hay is of a good quality. Oats grow very rank, but usually rust badly. Some alfalfa is grown and makes a good growth. It is an excellent soil for vegetable farming and the growing of small fruit. The native timbers are sugar, walnut, poplar, ash, beech, hickory and wild cherry.

The following table shows the results of mechanical analysis of the residual soils, and the sample of Harrodsburg soil, of which complete chemical analysis was made, given in the table under number 95, is a typical sample from the formation within the county:

MECHANICAL ANALYSIS OF HARRODSBURG RESIDUAL.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	{ 1½ miles north of Bloomington. }	Surface. . . . .	.0	.3	.5	2.0	8.0	89.4
		Subsoil. . . . .	.8	.2	.5	3.0	4.0	92
2	Near Harrodsburg.	Surface. . . . .	.0	.2	.8	4.0	9.0	86
2	Near Harrodsburg.	Subsoil.	2.0	.5	.5	3.0	3.0	92

The general farm improvements throughout the area are good. All the principal roads are well improved with crushed stone and stream gravel. Two railroads pass through the area. Excellent advantages are offered for truck farming and a number of persons are engaging in it to some extent. Potatoes will produce from 75 to 200 bushels per acre, sweet potatoes average 175 bushels; tomatoes, cabbage, beans, etc., give abundant yields. Small fruit gives



Strawberry Culture on the Harrodsburg soil. One mile east of Bloomington, Tenth Street Pike. Fruit farm of W. S. Pinkerton.



Side of new cistern in Harrodsburg formation showing changes from surface soil to solid stone with fragments of stone in compact subsoil. The line marked by the trowel is depth to which soil has been affected by roots of plants. One and one-half miles east of Bloomington.

large returns and considerable areas are being planted in larger fruits. The eastern border of the area, although somewhat rougher than the rest, is a good location for apple and peach orchards and for the growing of grapes, and the deep red subsoil will no doubt add to the flavor and richness in appearance of the grapes. The land can be bought at prices ranging from \$25 to \$150.

3. THE OOLITIC AREA.

The residual soils of the Indiana Oolitic limestone rank fifth in area within the county and hold first place in its agricultural advantages. The topography of the area is gently rolling, the slopes are long and fall gradually to the streams. The area extends in a north and south direction and the Monon Railway extends the full length of the area, and thus all parts are brought to within a short distance of the railroad facilities and towns of considerable importance. The principal part of the area lies within the immediate vicinity of Bloomington, and both town and country are greatly benefited by the advantages of the other. The improvements are good and up to date methods are used in the agricultural pursuits. The blue grass pastures afford excellent pasture. Clover and timothy grow well and yield from $1\frac{1}{2}$ to 3 tons of excellent hay per acre; wheat yields from 12 to 30 bushels; oats average about 45 bushels; some alfalfa is grown; also small areas of cow peas and soy beans. Dairying is carried on with profit; market gardening and the growing of small fruit is engaged in to a considerable extent, and the soils are well adapted to this kind of intensive farming. Potatoes will yield from 75 to 200 bushels per acre. Sweet potatoes, 100 to 300 bushels per acre. Small fruits make the best yields possible, and tomatoes will produce 5 or 6 tons per acre.

Large amounts of stable manure and commercial fertilizer are used. On account of its nearness to Bloomington and the great number of live stock raised, far more manure is secured than on other types, some farmers and gardeners keeping a team busy most of the year hauling manure from the city. There have been comparatively few fruit trees planted in the area, the chief reason being that greater and quicker returns are obtained from quicker growing crops.

The general characteristics of the soils are the same as those described under the general discussion of the soil types. The natural drainage within the area is good. Great advantages are of-

ferred for intensive farming. The city population, the large student population and the hundreds of families whose interests are in the factories and stone quarries, must buy, and the home-grown products are in greater demand than those shipped in from other places. But at present the demand is far greater than the production. Land sells at \$50 to \$150 per acre, but will yield good returns even at higher prices.

The following table will show the results of mechanical analysis of typical samples of the soils of this area, and the sample No. 94, in table of complete chemical analysis, is typical from this area:

MECHANICAL ANALYSIS OF OOLITIC RESIDUAL.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	Near Ketchams	1st foot (surface)	1.8	.9	1.1	.8	2.6	91.4
1	Near Ketchams	2nd foot (subsoil) .....	.0	.0	5.0	2.6	14.2	83.0
1	Near Ketchams	3rd foot (subsoil) .....	.0	.5	2.1	1.2	7.2	83.6
2	One mile S. Bloomington	1st foot .....	.8	1.0	.8	.9	5.5	93.8
2	One mile S. Bloomington	2nd foot .....	.5	.0	5.0	.9	5.0	89.0
2	One mile S. Bloomington	3rd foot	1.0	.2	4.0	2.0	5.0	92.0

Some of the old quarry districts in the area present some of the most excellent examples of soil formation. In the Big Creek quarries near Stinesville, and in the old Cleveland quarry near Harrodsburg, all gradations may be seen from the solid rock to the finest soil. Some of these are shown in the illustrations.

All the principal roads of the area are improved with crushed stone, chiefly from the Harrodsburg and Mitchell formation; these afford more durable stone for road purposes than the Oolitic. Very little timber remains, but the original timber was such as to indicate a very fertile soil—maple, walnut, beech, poplar, etc.

4. THE MITCHELL LIMESTONE AREA.

The residual soils of the Mitchell limestone rank second in area and about fourth in value. The topography of the region is rolling and covered by numerous sinkholes of all sizes; along the western border the region becomes somewhat abrupt and the general value of the soil declines considerably.

The surface soil is from six to eighteen inches in depth and consists of clay loam, grading from a light yellow to red. The subsoil is a somewhat darker color than that of the Harrodsburg



View in the old Cleveland Quarry, north of Harrodsburg, showing processes of weathering and soil formation. The small tree and some weeds are taking hold in the talus heap of new made soil.



View in same quarry showing low forms of plant life attacking surface of old stone giving spotted appearance.

and Oolitic areas, and it usually contains a large amount of chert. The soil becomes more shallow and the amount of chert and other impurities increase as the drainage line of sinkholes are reached. The soils are well drained by the underground channels and crops sometimes suffer from drought. Springs are abundant and furnish an excellent water supply. Clogged sinkholes are plentiful and offer good water for stock; wells are difficult to obtain.

Places where the soils are worn out and washed and become partially covered with sassafras and blackberry briars, are known as "the barrens" and cannot be made of much value for agriculture. The soils in general are fairly productive, but great care must be taken in their cultivation to keep them up to the standard. Large applications of stable manure render the soil very fertile, and this is due probably to two things: by adding a large amount of humus to the soil, and by rendering available larger amounts of the potash and phosphates contained in the cherty soils. Large amounts of commercial fertilizer are also used.

This soil is excellent for the growing of timothy and large acreages are raised; corn, except when well fertilized, is short, but can be made to produce 50-75 bushels. It is difficult to obtain good crops of clover. Some cow peas are grown on limited areas; wheat yields from 12-20 bushels, and in some cases 30 bushels have been reported.

Some dairying is engaged in and the soils produce good pasture, and sheep raising might be made a thriving industry. Several farmers are beginning to raise fine bred hogs and cattle, and the general improvement in live stock has made a marked change in the past five years.

In the more fertile parts of the area the farms are in a good condition. The public roads are being rapidly improved. The Mitchell limestone furnishes the best road metal within the southern part of the State.

The following table shows the results of the mechanical analysis of three samples of Mitchell soils:

MECHANICAL ANALYSIS OF MITCHELL RESIDUAL.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1 1 2 2 3 3 4 4	{ S. E. of Campbellsburg, Vernon Tp., Wash. Co. }	Surface light clay.....	.2	.1	1.3	1.3	11.2	86.5
		Subsoil.....	.0	.1	1.2	.5	18.6	77.2
	{ N. E. part Van Buren Tp., Monroe Co. }	Surface yellow clay.....	.0	.0	.0	1.2	2.1	96.5
		Subsoil.....	.0	.0	.0	.4	23.0	75.6
	{ Four miles southwest of Bloomington. }	Surface, 1st foot.....	.2	.0	3.0	2.0	10.0	85.5
		Subsoil, 2nd foot.....	2.0	.0	2.0	1.5	4.0	93.4
		Subsoil, 3rd foot.....	5.0	.3	1.0	.0	2.0	91.6

5. HURON SOILS.

The soil derived from the Huron group covers about sixty square miles in the west and southwest part of the county, principally in Indian Creek Township. The Huron group, being composed of extremely varied rocks, limestone, shale, sandstone, and conglomerate, weathers into very steep slopes, so that this portion of the county has a much rougher topography than the limestone areas. The difference in level of the hills and valleys is from 150 to 250 feet.

Owing to the varied nature of the rocks from which it is derived, the soil is not very uniform. Usually the surface soil is a yellowish sandy loam, underlain by a stiff white to yellow subsoil more clayey than the surface, but still containing a large per cent of sand. At a depth of 8 to 10 feet this subsoil grades into a soft white mucky shale, which has a very sour taste. In the valleys the subsoil is a coarse gravel composed principally of sandstone fragments.

Vegetation and Improvements.—The line between the limestone areas and the Huron group is sharply marked by a change in vegetation. The varied forests on the limestone soils give place to forests which are almost altogether red and black oak. The uncultivated fields grow up very quickly in wild daisies and sassafras. Persimmon trees are very plentiful in this area, although seldom found over limestone.

The soil is rather unproductive, easily exhausted, and washes badly. Much of the area is uncultivated and is overrun with second growth oak, the forests, which originally covered the slopes having been removed. The improvements are poor and the roads very bad, some of them almost impassable. The water supply is poor, except along the outcrop of the Huron limestone, where sev-

eral fine springs occur. This limestone is one of the best road metals in the State and is easily obtained. Its use on the roads of the area would bring about a wonderful improvement.

The following table shows the results of analysis of samples of the residual soils of the Huron area:

MECHANICAL ANALYSIS OF HURON RESIDUAL.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	{ Three miles S. W. of Har- rodsburg, Monroe Co. . . .	Surface sandy loam. . . . .	.2	.8	2.1	2.4	16.9	77.0
1		Subsoil. . . . .	.0	.3	3.1	1.7	10.3	84.6
2	{ S. W. Corner Indian Creek Tp., Monroe Co.	Yellow sandy loam. . . . .	.1	.0	.2	.3	25.6	74.0
2		Subsoil. . . . .	.0	.0	1.2	1.2	21.0	75.4

6. GLACIAL.

The glacial drift within the county is found principally in the northeast corner of the county and along the northern edge, with traces in a few places extending as far south as the Bean Blossom. Extending from Hubbard's Gap, in Marion Township, across the northern side of the county, the action of the glaciers is seen by the gravel covered places and the boulders scattered along the streams and the heaps of sand, gravel and till which lie against the northern hill slopes; however, over most of the glaciated area the drift covering is very thin and the influence on the soils is small.

Below Mt. Tabor and Gosport, and in some of the hills south and east of Mt. Tabor, are heavy deposits of sand and a similar sand is also found along the south side of Bean Blossom, about two miles east of Stinesville.

"That it was of glacial origin is attested by the fact that it is banded with erratic gravel. The sand here is cross-bedded, stratified, and, in several instances, finely laminated. The lamination and stratification, however, are not constant. Towards the top of this sand the stratification ceases. This top seems to have been of eolian origin. This sand was deposited as an outwash in front of the advancing glacier after it had filled the channel of Bean Blossom. That it was deposited in front of the ice-sheet is clearly shown by evidence that after its deposition the glacier passed over it, crushing it under its weight until now the sand is almost as compact as the Knobstone formation beneath it. Still further evi-

dence that the sand was deposited just in front of the ice-sheet is the fact that the Bean Blossom was filled at that point with ice. Had it been filled with sand instead of ice to the level of the present deposits, some remnants of the sand would still remain on the south side of the inner valley of Bean Blossom Creek, which is not the case. The sand in the vicinity of Mt. Tabor and Gosport is very fine and flourlike. It usually forms a loose or slightly compact, massive bed twenty or more feet in thickness. Occasionally it shows indications of stratification, but at no place is the stratification constant. In speaking of this sand Mr. Siebenthal says that it seems to have been deposited from high water resulting from a melting ice-sheet. It is, therefore, outwash material. How it came to be deposited as it is, however, is quite a mystery. The deposit is V-shaped, with the apex to the west. A limestone ridge separates its legs. On this ridge the sand is thin and suggests by its distribution that it might be eolian in origin. It seems clear, then, that the sand on the south side of the ridge must have come around the west end of the ridge instead of over it, and that the whole deposit was laid down in the slack water that accompanied the melting of the ice-sheet between Bean Blossom Creek and White River at the time of the high water that accompanied the melting of the ice-sheet. This opinion is strengthened by the fact that the sand plain gets lower and lower toward the east instead of higher, as it would had the sand come over the ridge. This conclusion is farther strengthened by the fact that this sand does not occur on the current, or south of Bean Blossom, as it probably would had it not been deposited in slack water. The sand, on the whole, seems to have been an eddy deposit.'*'

The Flatwoods.—The land known as the Flatwoods occupies a level tract of about $2\frac{1}{2}$ square miles northwest of Ellettsville. It is a part of an old glacial lake which extends for some distance over into Owen County. The area is surrounded by a ridge of higher land which terminates rather abruptly. This higher ridge shows evidence of glaciation, chiefly on the southern side, where many boulders lie against the slopes. The surrounding ridge is broken by gaps at Ellison Branch, McCormack Creek and at three or four other places where streams head up against this area and at the same level with them.

The soil consists of a variety of black mucks, white and yellow clays. The surface appears somewhat uneven, because of the areas

*Albert B. Reagen. Proceedings of Indiana Academy of Science, 1903.

of the limestone formation which rise above the level of the Flatlands.

The white or light yellow soils are the prevailing type and are locally known as the "White Turkey Gravel." These soils are a mixture of glacial material, residual wash and organic matter. Some glacial sand and gravel are intermixed and small iron concretions are numerous, due to the action of stagnant water leaching out the soils. The black muck soil occurs in some areas as the surface soil, but principally is the subsoil.

The drainage conditions are poor and in wet seasons corn crops are a failure. The average yield is about 40 bushels. Timothy grows well and gives large yields of hay. Oats in favorable seasons yield about 30 bushels. The soils become very hard and crack in dry weather. The soils are sour and sad and are in need of lime and potash. The average sized farm is about 80 acres. The improvements are fair and land sells for about \$40 to \$65 per acre.

A section of a well in the N. W. part of Section 31, Township 10 North, Range 2 West, shows the following nature of the soils and underlying materials:

Soil and clay	17 to 18 feet
Imbedded logs	1 foot
Clay	8 feet
Water-worn gravel	1 foot
Blue, sticky clay	8 feet
Limestone	

Also section of well in S. E. part Section 26, Township 10, R. 3 West:

Black mucky soil	8 feet
Sand and fine gravel.....	6 feet
Blue, sticky quick sand with logs, sticks and leaves	8 feet

"Prof. Collett suggests that the Flatwoods formed a portion of the preglacial channel of White River, the valleys of McCormack and Raccoon Creeks furnishing the portions connecting with the present valley of that river. A close examination of the region in question, however, shows this to be impossible.

"The Pleistocene terraces of Bean Blossom Creek clearly prove the preglacial valley of that creek to have been practically as it is at present. It is impossible to imagine how it could be cut down

to its present depth, while White River, into which it emptied, was running at a level approximately 150 feet higher than now, as it is alleged to have done. Moreover, the gorge of McCormack's Creek is clearly post glacial. And further, it empties into White River at least a mile below the upper end of the 'narrows,' whose existence it was brought forward to explain.

"A more reasonable explanation of the Flatwoods is that it is the site of a shallow glacial lake. This area in preglacial times must have been a region of sink holes, with drainage largely, if not wholly, subterranean, similar to the country which surrounds it, and to the region of caves and sinkholes west of Bloomington—in short, a region characteristic of the Mitchell limestone. When the glacier pushed down across these sinks, the excess of silt and sand choked up the underground outlets, and on the retreat of the ice-sheet the area was left covered by a thin sheet of water, probably from 20 to 30 feet in depth near the middle. Subsequently the drainage by way of McCormack's Creek was begun, resulting in the cutting of the gorge through which that creek finds its way to the river. The size of the drainage area and a fall of nearly 150 feet distributed over about two miles explain the steepness and narrowness of the gorge."*

7. ALLUVIAL SOILS.

The alluvial soils of Monroe County consist of about two and a half square miles of the White River valley, in the northwest corner of the county, the bottom lands and terraces of the Bean Blossom and Salt Creek and their tributaries and small areas in the south and western parts along the course of Richland and Indian Creeks.

The soil of the White River valley consists chiefly of a fine sandy loam of a dark color. It extends to from eighteen inches to several feet in depth, before any marked change occurs. It is a very productive soil, but on account of frequent overflows almost the entire area is planted in corn. Cut-off hills and lost ridges of the Subcarboniferous rise above the valley floor in a few places. The second bottoms to the east consist principally of glacial sand, together with some residual soils. Gosport is the trading center for this part of the county. The Vandalia and Monon Railroads furnish transportation facilities.

Bean Blossom is a meandering stream with an alluvial plain

*Hopkins and Siebenthal, 21st Annual Report, Department of Geology, 1896, 301-2.

which will average about one mile in width through the county. Numerous terraces rise along the valley slopes. The terraces range from five to fifty feet in height, those further up the creek being the higher. They range in size from small areas to a mile wide and three or four miles long; delta-like accumulations rim the edge of the terraces next the valley floor. The lower parts consist of sand and erratic gravel, with sand and fine gravel above, and sand, clay and loam overlying all. The benches proper seem to be due to the weathering of the soft shales and sandstones of the region. The stream clings closely to the southern side of its valley, as is also the case with all its tributaries. Numerous streams of small size enter the Bean Blossom from the north; and three or four streams of considerable size flow in from the south, the largest of which are Sheuffle Creek, Griffy Creek and Jack's Defeat; all of these have comparatively wide valleys. The soils are for the most part poorly drained and not fitted for a great variety of crops. Corn is the principal crop grown. Timothy grows well, and yields much hay, which is rather coarse in quality. Much of the valley is in grass and a large number of live stock are raised. In places the soil has lost its loamy texture and become very clayey and loses its best physical properties because of the large amount of water retained. The average price of land is about \$50. Very little tile draining has been done, but a thorough tiling would greatly increase the value of the land, and the soils could be made to produce from 75 to 100 bushels of corn per acre. In the spring of 1907, during the overflows, the Bean Blossom valley received a deposit of sediment about three inches in thickness over almost the entire area and thus its value for cultivation was much increased for that year, while in the Salt Creek valley at the same time practically all the surface soil to the depth of cultivation was swept away as far down as the junction of Clear Creek and Salt Creek. Farmers were much discouraged and crops were in a poor condition for that year.

The Salt Creek alluvial plain will average about a half mile in width. The soils are sandy clays, owing their origin to the upland formation. The subsoil contains numerous fragments of sandstone, and in the lower course geodes and fragments of limestone. Well defined low and high terraces occur along the valley of Salt Creek to a point below the Fairfax bridge. The Salt Creek has a large drainage area—three forks entering from Brown County and three principal streams from Monroe—Stephens Creek, Brummetts Creek, and Clear Creek in the south.



Recent terraces in Salt Creek Valley, southeast Stobo, Monroe County.



Salt Creek Valley, showing high terraces in background. Southeast Stobo, Monroe County.

Land can be bought at prices from \$20 up, according to locality and improvement. The upper part of the valley and the surrounding country are in a backward condition because of their great distance from towns and railroads.

Small barren spots are found, both in the Bean Blossom and Salt Creek valleys, due probably to the presence of saline shales. Swamps and bayous are also found along the course of both streams.

Richland Creek and Indian Creek have very narrow valley floors, but the second bottoms comprise considerable areas and the long, gentle slopes from the north and west add much to the agricultural value of the south and west part of the county. The Richland area is better improved than the Indian Creek valley. The soils of the former are derived principally from the slopes of the limestone area, those of the latter chiefly from sandstones and shales.

8. CLAYS.

The type here designated as clay and having an area of about five square miles includes those scattered areas of small extent in parts of the Knobstone and Harrodsburg regions where the surface soil has practically all been removed and the stiff clayey subsoil exposed. Such areas are of no agricultural value, except as for some deep-rooted fruits. The principal areas of this type are located in southern Marion Township, along the north side of the Bean Blossom, along Sheuffle Creek and in the vicinity of Dolan, Unionville and Stobo.

The clay of the Harrodsburg limestone is the typical stiff red clay. That from the Knobstone shales is usually of a bluish color, except on much weathered surfaces, where it becomes light yellow. Much of this clay would burn well for tile and in this way supply a great need of much adjacent land.

In addition to the clays mentioned above, considerable of the delta and bench formations in the lower Bean Blossom valley are composed entirely of stiff yellow clay and might be included in this type.

GENERAL SUMMARY.

The great variety of soils in Monroe County, with wide adaptation, make possible the successful carrying on of many branches of agriculture.

Canning factories should be established, and lands which are



Field of corn not planted until late in June, 1907, near Harrodsburg in the Clear Creek Valley. Well-matured before frost and yielding above the average.



Salt Creek Valley, east of Harrodsburg, Monroe County.

now scarcely paying expenses would be valuable feeders for such factories. Factories could well be maintained at several points and run all the year.

Several large groves of maple trees remain on the Harrodsburg, Oolitic and Mitchell areas and hundreds of gallons of molasses are made every spring.

There is great opportunity for extensive truck farming and fruit growing. Last year forty-five carloads of potatoes were shipped into Bloomington. The average yield in the county is low and only small areas are planted. There is enough extra space for the forty-five carloads. Practically all the fruit for market purposes, except strawberries, raspberries and blackberries, is brought in from distant points.

The Knobstone clays are well adapted to the growing of tomatoes and small fruits, and interested persons, with small capital, should be attracted to these cheap soils.

Large areas are in need of drainage and the large deposits of clay afford good material for the making of drain tile. At present the only kiln in the county is at Dolan, and it cannot nearly supply the demand, nor can they be hauled economically to the most needed places. For example, the writer, when working along the Salt Creek valley, saw a farmer hauling tile from Dolan's, a distance of twenty miles. He could haul but few for a load and about a fourth of these were broken when he reached home.

Wells are difficult to obtain throughout the entire county, except in the bottom lands, where water can be found at a depth of a few feet. For domestic purposes people are dependent chiefly on cisterns and springs. The best spring waters are found in the Mitchell formation; sinkholes and artificial ponds and streams furnish most of the water for live stock.

School advantages are good and the school enumeration is high. Rural routes serve about 7,500 people in the county. Good telephone systems lead to all points. There are in the county 875 miles of public road, with almost 200 miles improved with crushed stone or stream gravel. The stone industry is just now being fully developed and everything presents an encouraging outlook for the county, and the agricultural growth must necessarily be great to meet the demand.

BROWN COUNTY.**HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.**

Brown County was organized in 1836, and named after Gen. Jacob Brown, one of the heroes of the War of 1812.

In the early days there were several tanneries in the county doing an annual business of about \$50,000. The articles exported were principally leather, wheat, stock, hoop-poles, etc., to the value of \$100,000 annually.

In 1850, with a population of 4,000, there were about eight schools in the county, with 160 scholars, but at the present time the school enrollment is about 2,500 and the school facilities rank among the best in the State.

Brown County is twenty miles in length from north to south, and sixteen miles in breadth, and contains 320 square miles.

There are five civil townships: Hamblin, Jackson, Van Buren, Johnson and Washington. The population in 1900 was 9,727.

The principal towns are Nashville, Georgetown, Helmsburg, Trevlac and Elkinsville. Numerous other villages and country stores and postoffices over the county are: Christiansburg, Buffalo, Pike's Peak, Mt. Moriah, Needmore and Belmont.

Nashville, the county seat, is a small village with a population of about 400. Its progress has been hampered by the lack of railroad facilities. An excellent artesian well, drilled in 1899, furnishes a good supply of saline-sulphur water. The well is 530 feet deep, and when first drilled yielded a flow of about ten gallons of water per minute. It now, however, does not flow, but stands within a few inches of the surface and must be pumped. It has a temperature of 56 degrees F. The water is clear and sparkling, with hydrogen sulphide and carbonic acid gases. The "Nashville Sanitarium," a frame hotel and bath house, containing 24 rooms, was erected in 1900, and under the present management is open to guests the entire year. Since the completion of the Indianapolis Southern Railroad through the northern part of the county many visitors come to the sanitarium during the year. The accommodations are good and the rates low, and the quietness of the place makes this an excellent place for those desiring rest. Numerous places of interest are easily reached by drives or walks. Other mineral waters are found within the county. With better means of transportation, Nashville as a center, with the mineral waters and beautiful surrounding scenery, is in a position to receive many guests who may come for the benefit of health and recreation, and

also become a noted resort for picnic and pleasure parties. Helmsburg, the nearest railroad station, is five miles distant. A hack from Nashville meets all the trains.

Georgetown, or Bean Blossom, is a little village in the northern part of the county. It has a population of 260. Helmsburg is the railroad point.

Helmsburg and Trevlac are new towns on the Indianapolis Southern Railroad. Helmsburg is the station for Nashville. Formerly all merchandise for the county seat was brought in either by way of Columbus or Bloomington. Trevlac promises to be a thriving little village, and a number of summer cottages have been erected and a park is being arranged, and, with the picturesque scenery surrounding, it is expected that many guests will frequent this place to spend their summer vacations.

Elkinsville is a little village in the southern part of the county on the main branch of Salt Creek, and has a population of about 75. It is a trading center for southern Brown, and receives its merchandise by wagons from the line of the Southern Indiana Railroad through northern Jackson County.

General Improvements.—There are in the county 350 miles of public roads, with thirty miles improved with gravel. Many of the roads have been partially covered with creek gravel, and if they had been properly graded and drained, this improvement would have been permanent, but in the majority of cases the cost of improvement will be as much as on a new road. Excellent creek gravel occurs everywhere along the streams and in sufficient abundance to easily and cheaply improve every public road in the county.

Until 1906 the county was without a railroad. The nearest railroad stations were in Columbus on the east, Bloomington on the west, Morgantown on the north and stations of the Southern Indiana to the south. With the completion of the Indianapolis Southern, the business interests were revived and increased trade gave a brighter outlook for the county. A few rural routes go out from Nashville and others serve part of the county, coming from adjoining counties.

Agricultural conditions have not reached the highest standard. While the soil is not a rich soil, taken as a whole, there are large areas that are valuable farming tracts and could be made to produce well. The principal occupation has been to remove the timber from the thickly wooded hills, and sell for lumber, wood, hoop-poles, railroad ties, tanbark and hickory bark, and to cultivate sufficient land to yield grain and vegetables for home use, with per-

haps a few bushels to sell. Very little stock is raised. Under these conditions agriculture for many years made but little progress. With careful cultivation and fertilization the soils of this county may be made to yield abundantly. While few special experiments have been tried, careful investigation has shown that the "Knob Soils" are of value and not to be regarded as too poor to grow anything but briers and sassafras. An important thing in the cultivation of these soils is to prevent washing. The staple crops can all be made to give paying returns and the region is specially adapted to the growing of fruit.

The county now produces, according to latest statistics, about 400,500 bushels of corn, an average yield of about 30 bushels to the acre; wheat, 91,838 bushels, an average yield of about 15 bushels per acre; oats, 190,091 bushels, an average per acre of 38 bushels; timothy, 9,249 acres, with an average yield of about one and one-third tons; clover, 1,500, with a yield per acre about one and one-third tons, and also giving a fair yield of seed; alfalfa, 25 acres, has only been tried a few years. About 500 acres are planted in potatoes, with an average yield of 40 bushels. Very few tomatoes are grown. Peas, watermelons, cantaloupes, etc., would not total a good sized garden. A little tobacco is grown for individual use. For results on fruit growing, see paragraph on vegetables and fruits.

PHYSIOGRAPHY AND GEOLOGY.

Brown County, in its geological formation, is confined to the members of the Knobstone group, with slight modifications in places from stream action and glacial invasion, and on a few of the higher ridges in the western part there remain a few fragments of the reddish crinoidal Harrodsburg limestone. The soft sandstones, with the alternating shales, are easily eroded and a very rough topography has been developed, except in the southeast corner, where there is a large area of level table land. High level topped ridges, remnants of the old plateaus, stretch out for great distances. The slopes are high and steep, and numerous streams have cut "V"-shaped valleys down the slopes. Thus the knobstone plateau has been very perfectly dissected by the streams, which, with their small tributaries, form an intricate dendritic system of valleys. These valleys are unproductive, except where bottoms have been formed in them by the silting-up process.

The Knobstone strata absorbs water easily, but are practically impervious to circulating waters, and for this reason springs are

rarely found. Drinking water is mostly obtained from wells and is usually of a very poor quality. At the top of these impervious strata, however, is a natural spring horizon, and along this line springs are abundant.

The southern slopes, exposed to the action of the sun, and during the winter to constant freezing and thawing, are long and gentle, while those to the north are more abrupt, in many cases being steep bluffs. The Knobs attain their highest elevation, 1,147 feet, above sea level, in "Weed Patch Hill," southeast of Nashville. Several years ago a triangulation tower was erected on the hill; a government stone now marks this point. "Bear Wallow" hill, northeast of Nashville, is also another point of highest elevation. "As one ascends these higher elevations on some of the winding roads, knob after knob and ridge after ridge are unfolded to view, disclosing the knobstone topography in all its pristine beauty. The narrow valleys trend mainly east and west, making the slopes of the ridges north and south. The latter are everywhere eroded into many gulches and ravines. Here and there on some distant ridge can be seen a roadway, winding in and out in great spiral convolutions, like a great snake, stretched out in lazy, graceful curves. It is one of the most picturesque and rugged portions of the State, well worth the name of the "Switzerland of Indiana."

The part of the county north of the Bean Blossom Ridge is within the glacial limits. Some drift accumulations are found over this area, and extending over the slope of Bean Blossom Ridge to a height of almost 200 feet above the water in the streams. In general the topography and the soil have been but little modified by the drift. North of the boundary of Brown the knobstone area is practically all covered by glacial debris, and the strata are exposed only in the stream valleys and along the larger streams high bluffs are found.

In the western part of the county on some of the higher elevations, the soil is of a red, clayey texture, intermingled with chert geodes and crinoidal limestone fragments, due to the weathering of the lower impure members of the Harrodsburg limestone. Some geodes are also found in the upper knobstone.

The drainage of the county is chiefly by the Bean Blossom and Salt Creeks. The former, with its tributaries, drains the northern one-third of the county. The stream has a meandering course and with considerable areas of bottom land and low terraces. The principal tributaries are from the north and fall rapidly to the



Knobstone topography as viewed from east side of Weed-Patch Hill, Brown County.



Looking north across Salt Creek Valley at Nashville, Brown County.

main stream. For further description see Bean Blossom under Monroe County.

Salt Creek, the principal stream of the county, consists of three main branches—the “North,” the “Middle” and the “South” forks, which unite near the southwest corner of the county and flow through Monroe and Lawrence counties into the East Fork of White River. The entire stream is meandering in its course and there is but little valley except across the meander curves. The valley soils are usually wet, but with artificial drainage produce well. The narrow valleys, with their steep sides and winding streams, are subject to great overflows three or four times each year, and crops are often badly ruined. The main tributaries of the North Fork are: Jackson Creek, Lick Creek, Clay Lick Creek, from the north, and Henderson Creek and Schooner’s Creek from the southeast. All these streams contain considerable quantities of red stream gravel. The branches of the middle fork are: Crooked Creek, Little Blue Creek and Grave Creek, from the north, and Hamilton Creek and South Fork Salt Creek from the southeast.

SOILS.

The soils of Brown County are derived chiefly from the decay of the Knobstone strata, and consist of sands and clays. For this reason the soils of this area have become considered the poorest and most unimportant of any in the entire State. But as stated in a foregoing paragraph, these soils are not wholly bad and will admit of much profitable cultivation and improvement. The low price at which land may be bought offers abundant opportunity for the enterprising farmer who has not the means to secure land in a more fertile area. The net income from these cheap lands should be greater than in places where more money must be expended. However, special cropping systems are advisable and a large amount of experimental work should be carried on here by our agricultural schools and experiment stations.

Although the soils owe their origin chiefly to the same source, we find within the county a number of types which may be given as follows:

Knobstone residuals—

Clay	150 square miles
Sand and sandy loam.....	100 square miles
Harrodsburg limestone, clay.....	10 square miles
Glacial	50 square miles
Alluvial	20 square miles

THE KNOBSTONE RESIDUALS.

The clay is derived from the shaly members of the formation, and are usually of a light yellow color and grade in the subsoil into a stiff, mucky clay, usually of a brown color, or may be mottled yellow and brown.

A mechanical analysis of the soils show the following proportions:

MECHANICAL ANALYSES OF KNOBSTONE RESIDUAL.

No.	LOCALITY.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	Top of Weed Patch Hill.....	Sandy clay loam.	11.1	2.7	7.2	17.2	14.0	47.2
1	Top of Weed Patch Hill.....	Subsoil.....	7.6	2.2	8.7	12.0	9.6	58.8
2	3 mi. N.E. of Georgetown....	Brown loam.....	1.7	1.3	6.0	2.4	12.7	74.5
2	3 mi. N.E. of Georgetown....	Subsoil.....	2.5	.4	3.9	2.2	10.1	79.0
3	1½ mi. S.E. of Georgetown....	Clay loam.....	0.0	.7	5.3	9.1	18.8	65.2
3	1½ mi. S.E. of Georgetown....	Subsoil.....	25.0	2.8	5.4	4.0	19.2	40.2

Chemical Analyses of Two Samples of Knobstone Shales.

Silica (SiO ₂)	59.64	64.59
Titanium oxide (TiO ₂)	1.05	.30
Alumina (Al ₂ O ₃)	19.14	16.37
Combined water (H ₂ O)	14.36	3.71
Ferric oxide (Fe ₂ O ₃)	3.39	5.37
Ferrous oxide (FeO)	4.20	1.59
Lime (CaO)	0.26	.16
Magnesia (MgO)	2.31	1.56
Potash (K ₂ O)	3.53	4.24
Soda (Na ₂ O) .....	.80	.97

Many concretions of considerable size are found in the knob shales, but not of sufficient quantity to be of any value in the manufacture of iron, but when worn into creek gravel they make an excellent road metal. The reddish brown color of the soil in many places is also due to the oxidation of the iron received from the weathering of these concretions.

The Sand and Sandy Loam.—The sand areas are due to the sandstone found chiefly on the top of the series which in their disintegration yield an unproductive medium sand. The soil has a red color, due to the presence of iron and the subsoil grades into a coarse, gravelly sand, and in depth to a rather porous rotten sandstone. The true sand areas are small, but grade into the sand loam, usually at a lower level and due to the mixing of the disintegrating material of the thin bedded sandstone and alternating shaly portions. These sandy loams are usually of a brown color and contain a higher percent of organic matter than is found in the sand

areas. The sandy loam occupies numerous but rather small areas and grades into the clay, which is also of a somewhat loamy nature. The lines of demarkation between these soils are not well defined and the character of the soil, its natural vegetation and productions, justify the mapping as a single type under the knobstone group. All three types may occur on one farm or even in a single field, and accurate delimitation would not be practical.

The greater part of the original growth of timber has been removed and the knobs and slopes of the ridges are now thickly covered with second growth timber and underbrush. It consists chiefly of chestnut, black, white, scarlet, jack, post and red oak, beech, elm, walnut, hickory, sassafras and sumac, dogwood and red-bud, with an occasional maple, poplar, etc.

Corn yields on the average about 30 bushels; wheat produces 10 to 20 bushels; oats are only fair. Timothy and clover usually yield a fair tonnage, but are soon largely taken by red top and wire grass.

SPECIAL FARM PRODUCTS.

The possibilities of Brown County have been but little developed in this line. About 500 acres of potatoes are raised annually, but the average yield is only 32 bushels per acre. Until very recently no tomatoes have been grown, although the soil is very similar to that which gives excellent crops in other counties. Some tobacco is raised, the acreage running from 5 to 10 yearly.

The soil will not produce these crops without fertilization, but with proper care there is no reason why much larger yields of all these products should not be produced. On soil which has not been built up by clover from 800 to 1,500 pounds of fertilizer are required per acre. For tomatoes, the fertilizer should have the following constituents: Nitrogen, 4%; active potash, 6%; available phosphoric acid, 7%. For potatoes the amounts should be: Nitrogen, 3%; potash, 9%; available phosphoric acid, 6%.

FRUIT.

While Brown County does not lead in fruit production, it is well located and has a good soil for all sorts of fruits. At present the number of fruit trees in the county is about as follows: Apple, 75,000; pear, 5,000; plum, 3,000; peach, 15,000; cherry, 4,000. All these do well and yield good returns. While the fruit crop of 1907 was a total failure, in 1906 about 70,000 bushels of apples were produced, and the peach crop was correspondingly large.

Two of the largest orchards of the county are the Freeman and Waltman orchards, about one mile south of Georgetown. The Freeman orchard consists of about 75 acres and contains 700 bearing apple trees and 8,000 bearing peach trees. The orchard is well kept up and is sprayed four times each year. The apples are just beginning to bear well, producing about 600 bushels per year at present. An average yield of peaches is about 2,000 bushels. Over 4,000 peach trees were recently destroyed by forest fire. The Waltman orchard consists of 6,000 apple trees, 100 pear trees and 500 young peach trees. The average age of this orchard is about twelve years. Of an ordinary season the yield of apples averages about seven bushels per tree, the older trees producing as high as 12 or 15 bushels. The orchard is still increasing in yield. Both of these orchards have been successful from a financial standpoint, in spite of their distance from a good market. Helmsburg, on the new railroad, is about two and one-half miles from the orchards, and the returns will probably be larger in the future than they have been in the past.

Very little small fruit is grown for market, but many of the hill slopes are covered with wild blackberries and raspberries, and the cultivated fruit would certainly do well in these localities. One of the principal areas of strawberry culture in the State is located on the Knobstone soil near New Albany, where the crop yields the grower annually about \$300,000.

The principal factor in retarding the production of the varied farm products and of fruit, was the distance from good markets. The building of the Indianapolis Southern has removed this disadvantage from the north portion of the county and great development should be made. There seems to be an excellent opportunity for the location of a canning factory at one of the stations along the railroad or at Nashville. A factory which could can the different fruits, beans, corn, pumpkins, tomatoes, etc., could be kept running through the summer, and if hominy and sauerkraut were added to the list of products, almost the whole year. While one of the stations along the new road would be the better location as regards transportation, the factory could be located at Nashville and the finished product hauled to the railroad. The roads, although rather hilly, are in fair condition and would not prohibit this arrangement.

ALLUVIAL SOILS.

The alluvial soils of Brown County are found along the Bean Blossom and the various forks of Salt Creek. The total area is about 20 square miles. The greater part of the bottom land is in the meander curves. The alluvial soils in both areas are fairly productive but are difficult to drain.

The Bean Blossom soil contains considerable glacial material, and numerous geodes in the subsoil. The surface soil is a heavy brown clay loam. Along the stream are two sets of terraces. The first is the flat top of the old plateau, and stands high above the stream; the other is a more recent terrace, and rises 5-10 feet above the valley floor. These low terraces have in most cases been mapped with the valley. They consist of a very stiff white clay, which is wet and unproductive. Corn will sometimes yield 35 bushels per acre on this. It is too wet for timothy, wheat, or oats to produce well. Buckwheat and flax grow well on these terraces. These soils owe their color to the absence of both humus and ferric hydrate. The soil has been subjected to reductive maceration through the influence of stagnant water; reducing the ferric hydrate to ferrous salts, oxidizing away the humus and accumulating the form of inert concretions the lime, iron and phosphoric acid of the soil mass. This land is called "crawfish" land, and it is very common to see crawfish mounds thickly studded over such soils. This soil may be improved with green manure and the use of phosphate. The best land in the valley sells for \$50 and upward. The improvements are fair. Water for domestic use is obtained from wells dug in the valley flow, and water is usually found at about 8 to 10 feet. The water is not first-class, on account of surface seepage.

The Salt Creek valleys are low lying and wet. The clay soil, when wet, is very tenaceous and is of a dark brown color, but when it is plowed and becomes dry it is of a white color. If plowed when wet it is very hard to pulverize. Corn yields from 35 to 40 bushels per acre. In the upper valley, wheat will produce 10 to 12 bushels. During 1907 there were four floods that did great damage to the Salt Creek valleys, by carrying away almost the entire surface soil. The land sells from \$25 to \$55 per acre.

Along the foot hills is a strip of land a few rods in width which is very wet and mucky from the numerous springs and seepage water from the hills.



Looking east up the valley of the Middle Fork of Salt Creek, from
a point two and one-half miles west of Pikes Peak



Looking south from same point as above. The creek here
makes a curve to the south.

The timber growth of the alluvial soils consist of water and white beech, white walnut, sycamore, elm, ash, wild cherry, paw-paw, willow and locust.

GLACIAL.

About 60 square miles of northern Brown County lies within the drift covered region of the "first glacial invasion." The principal part of the glacial material lies against the northern hill slope, and only in a few places has any considerable amount been found south of the Bean Blossom Ridge. Over the greater part of the area the material has been carried down to the stream valleys and underlies the more recent stream wash material. It is from these stream deposits that are the source of the gold found in Brown County. As regards the upland soil, there are but slight modifications due to glacial material, except in small areas.

GENERAL SUMMARY.

In general the farmers of the county are satisfied with the returns from their land. The average price of land is from \$25 to \$35 per acre. The improvements range from poor to good. A small percentage of the uplands are under cultivation, and yield only fruit trees, hickory bark and railroad ties. In the greater part of the county the necessary thrift and energy is lacking to get the best results from the soil. Yet new machinery and farming tools are being brought into use and progress is being made; however, some corn is still planted by hand dropping and some wheat harvested with the cradle, and occasionally a yoke of oxen may be seen slowly wending their way into the county seat.

Red-top, wire grass, hog or steel weed, and plantin are very troublesome.

A good cropping system, with an abundant supply of manuring and a liberal supply of potash, together with the best care in cultivation to prevent washing the knobstone soils of this county, may soon be a paying investment. And with the introduction of the up-to-date methods of agriculture and husbandry, grazing, etc., Brown County may readily in twenty-five years more than double her agricultural wealth.

LAWRENCE COUNTY.**HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.**

Lawrence County was organized in 1818 and named in honor of Capt. Lawrence of the Frigate Chesapeake, who was killed in the battle with the frigate Shannon. In 1830 the county had a population of 9,237; 1850, 13,000; and at the present time has a population of 26,000.

The county contains 454 square miles, being 22 miles from east to west and 21 miles in length. The civil townships are Shaws-
wick, Pleasant Run, Perry, Indian Creek, Spice Valley, Marion, Bono and Flinn.

The principal towns are Bedford, Mitchell, Oolitic, Heltonsville, Huron, Avoca, Williams, Springsville, Tunnelton and Fort Ritter.

Bedford, the county seat, was laid out in 1826. It now has a population of 7,000. It is the center of trade for a large agricultural district, and is also the leading city in the quarrying, sawing and cutting of the Oolitic limestone.

Mitchell, in the south central part of the county, at the crossing of the B. & O. S. W. and the Monon Railroads, has a population of 1,772. It has a large country trade, being located on the level land of the Mitchell soil. The Lehigh Portland Cement Company has two large mills at this place.

Heltonsville, with 525 inhabitants, is in the northeast part of the county, on the S. I. Railroad. It is principally a trading center for this section of the county.

Tunnelton, Huron and Ft. Ritner are stations along the B. & O. S. W. They are trade centers for the farming population around them. All three have sawmills.

Springsville has a population of 270. It is in the northwest part of the county, on the B. B. branch of the Monon; is a trading center.

Williams is on the S. I. Railroad, near the Martin County line, and has 200 inhabitants. A large road metal and ballast quarry in the Mitchell limestone is just west of the village.

Oolitic, Peerless, and Dark Hollow, are villages in the vicinity of Bedford, which owe their existence to the stone quarries. Other stations and postoffices are Guthrie, Georgia, Yocky, Reeds, Shaws-
wick and Rivervale.

There are in the county 600 miles of public roads, with almost 400 miles improved with gravel and crushed stone.

The first improved roads were built in 1895. The stream gravel has been used far more extensively than the crushed stone, and gives good satisfaction. On many of the roads the gravel is used as a top dressing for the stone. Most of the roads south of the river are built of Mitchell limestone. Those west of Bedford largely of limestone, and practically all in the eastern part are of stream gravel. There is also much gravel along White River, but it is inferior to the creek gravel for road purposes.

The county now produces about 900,000 bushels of corn, with an average yield of 35 bushels per acre; 250,000 to 300,000 bushels of oats, average about 20 to 25 bushels per acre; 130,000 bushels of wheat, average 16 bushels; 15,000 acres of timothy are grown annually, which yields $1\frac{1}{4}$ to $1\frac{1}{2}$ tons per acre. About 3,000 to 3,500 acres of clover produce an average of 1 to 2 tons per acre and a total of from 450 to 600 bushels of seed. The acreage of potatoes is usually about 300 acres, and 40 to 45 bushels is an average crop. Of other crops about 10 acres of peas are produced; 100 of watermelons, and 2 to 5 each of tomatoes and cantaloupes. Between 30,000 and 40,000 bushels of apples are produced in fair seasons. More attention is being given to tobacco raising, about 30 acres being reported in 1905, and nearly 75 in 1906. Lawrence is an excellent fruit county and ranks fifth among the counties of the State in the number of plum trees, having about 16,000 trees. While not especially a live stock county, it ranks tenth in number of mules sold, about 700 annually. It also ranks among the leaders in its poultry production, which is about 35,000 dozens annually.

PHYSIOGRAPHY AND GEOLOGY.

Lawrence County.—“The rocks forming the surface of the county represent six geological epochs. The Knobstone covers the northern half of the northeastern fourth and a narrow strip along the eastern border. The Harrodsburg limestone forms the greater part of the eastern half, and where eroded through by the streams, has exposed the underlying Knobstone in a number of the valleys. The famous Indiana Oolitic limestone covers a narrow, irregular strip just to the west of the Harrodsburg. The Mitchell limestone occurs over the surface of a strip three to nine miles in width extending from northwest to southeast, just west of the center, the wider portion being in the area south of White River. The Huron Group covers large areas in the northwestern and southwestern portions, while the Mansfield sandstone forms the surface of some of the higher elevations in the extreme southwestern corner.

"On account of the presence of so many rock formations, the surface of the county is exceedingly diversified. The eastern and northeastern parts are undulating or gently rolling plateaus drained by deep, narrow valleys, the central region north of White River is hilly, and the western and southwestern is rough and broken. Each of these divisions is covered with a soil almost wholly formed from the decomposition of underlying rocks. We consequently find the soil in the first, tenacious clay and sand; of the second, a calcareous clay, and of the third, principally siliceous material, with an intermixture from both of the others. In that part of the county underlain by the oolitic and the Mitchell limestone, comprising a broad belt about 12 miles wide, passing centrally from northwest to southeast, sink holes are so numerous as to form a striking feature in the configuration of the surface.

"The East Fork of the White River, which, with its tributaries, drains the entire county, crosses the county from east to west in a very meandering course a little south of the center. It is a broad, clear stream, as large as the Wabash at Lafayette, and flowing with a rapid, strong current. From the north it receives Indian, Salt, Leatherwood and Guthrie creeks, while from the south enter Sugar, Fishing and Beaver creeks."*

SOILS.

Lawrence County has a great variety of soils, ranking next to Monroe in number. There are seven general types, with many local variations. Six of these general types owe their origin directly to underlying geological formations and the others to stream action. The following table will show the extent of each type:

Knobstone	75 square miles
Harrodsburg	90 square miles
Oolitic	15 square miles
Mitchell	175 square miles
Huron	65 square miles
Mansfield	10 square miles
Alluvial	25 square miles

1. KNOBSTONE AREA.

The Knobstone soils lie principally in the northwestern part of the county and along the streams of the eastern side. The general characteristics are the same as described under preceding

*W. S. Blatchley, Report 1905, 913.

counties. The close proximity of the Southern Indiana Railroad has brought about some advancement, but a large part of the area yet remains covered with a growth of shrubbery and second growth timber. Most of the large timber is gone, but large numbers of railroad ties are cut and hauled to Heltonsville and Norman. Land is valued at prices ranging from \$5 to \$50.

2. HARRODSBURG AREA.

The residual soils of the Harrodsburg limestone rank second in area in the county. The soils contain large numbers of geodes and chert fragments. In the central part of the area the surface is gently rolling, while around the edges the streams have cut down through into the Knobstone and etched their way back into the formation for several miles, in some cases leaving long, narrow ridges capped with the limestone. The soils are considered among the most productive in the county, and although the improvements are not good as in some other localities, great advancement is being made and the price of land is steadily advancing. The principal roads are improved with crushed stone and stream gravel of a most durable sort. Large amounts of commercial fertilizer are used. Corn produces about 50 bushels per acre, wheat 10 to 20 bushels, oats 30 to 40, and timothy and clover yield well. Little attention is paid to stock raising and only a small amount of fruit has been planted.

3. OOLITIC BELT.

The residual soils of the Oolitic belt of limestone do not cover as large an area as might be expected from the map, since, especially along the streams, the Oolitic forms little more than rock outcrops winding in narrow sinuous strips but producing very little soil. In the larger areas the surface is gently rolling and presents a most picturesque appearance. Generally the soils are productive and are cultivated in the best manner possible, and good improvements have been made in other localities. Where quarrying is the chief occupation, large areas have become practically worthless from an agricultural standpoint. Railroad facilities for the area are good and most of the public roads are well improved.

The following table shows the mechanical analysis of two typical samples of the soils of this area:

HANICAL ANALYSIS OF OOLITIC RESIDUAL SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay
1	Near Oolitic.....	Surface.....	.0	2.2	.6	5.0	.5	92.4
1	Lawrence Co.....	Subsoil.....	2.0	3.0	.5	.5	.5	93.5
2	S. E. Bedford.....	Surface.....	.5	1.5	.3	3.0	1.0	94
2	S. E. Bedford.....	Subsoil.....	3.5	2.0	.2	.2	3.0	90.5

4. THE MITCHELL AREA.

The residual soils of the Mitchell limestone occupy the largest area of any type in the county. The typical topographic features are best developed in the vicinity of the town of Mitchell. The area is that of an upland plateau, generally level, except for the presence of sinks. The sinkhole depressions are very numerous, and lying just north of the town of Mitchell is an area in which the sinks have been clogged and are filled with water and give the appearance of large marshes. Willows, cat-tails, water lilies and other water-loving plants grow in abundance, and bordering these sinks is the typical growth of sassafras and briars. Over most of the area the soil has greater depth than in Monroe County and the subsoil is more nearly free from chert and other impurities.

Large amounts of commercial fertilizer are used, also a great deal of stable manure. Corn yields about 50 bushels on the average, wheat 10 to 15 bushels, timothy and clover 1 to 2½ tons, and some clover seed is threshed. Small areas are devoted to truck farming. A great deal of fruit has been planted during the past five years, and the Indiana Experimental Fruit Farm is also located in this area, south of Mitchell, near the county line, and just east of the Monon Railroad. Here thousands of trees are planted, including several hundred seedling apple trees for experimental purposes. The greatest care is manifested in the care of the orchard, in pruning and spraying, and methods of handling the fruit. In 1907, when the fruit crop for Indiana was so near a failure, a large quantity of apples of the very best quality were raised in this orchard. Meetings of the State Horticultural Society are held here and the interest manifested and the results of the experiments should mean much for the county and the whole of Southern Indiana, as to the value of fruit growing.

The following table shows the results of mechanical analysis of the residual soils:

MECHANICAL ANALYSIS OF MITCHELL SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	N. E. of Springville.....	Surface.....	.8	1.5	1.5	.5	4.0	92.5
		Subsoil.....	4.0	2.5	1.5		5.0	89.4
2	S. E. of Mitchell.....	Surface.....	.2	.5	1.8	.5	3.0	93.0
		Subsoil.....	.5	.5	1.5		3.0	94.5

5. THE HURON AREA.

The Huron group, composed of limestones, shales and sandstones, weathers into a varied topography and gives a soil of varied texture and quality. The sandstones and shales predominate, so that the topography is as a rule much more broken than in the limestone belt to the east. The ridges extend principally from the northeast to the southwest and have long, moderate slopes to the southeast and very steep slopes to the northwest.

The soil is a yellow loam, usually very sandy from the disintegration of the sandstone layers. At a few feet in depth it usually grades into a white shale muck of strong acid reaction. Some iron ore concretions are often found in the subsoil. The soil is poor and much of it is untilled. Practically all the slopes are overgrown with second growth timber, in which oaks predominate.

Commercial fertilizer is necessary to produce good crops of the common cereals. Some fruit is raised and there is good opportunity for development along this line.

The improvements are poor and the roads in such bad condition that even if good crops could be raised it would be almost an impossibility to market them rapidly and economically. This condition is unnecessary, as the limestones of the group are excellent road materials and are easily accessible. The water supply is rather poor, although there are some good springs along the outcrop of the limestones.

Corn produces from 20 to 50 bushels, wheat 8 to 15 bushels, oats 25 to 30 bushels; clover grows well on the tops of the ridges and timothy thrives better on the slopes and lowlands. Three railroads pass through this area and there are chances for great de-

velopments along special lines in this area. Land sells at prices ranging from \$10 to \$50 per acre.

The accompanying photograph will show something of the topography of this area.



View in Huron topography. Overlooking Indian Creek from the west near the Lawrence and Martin County line.

6. MANSFIELD SANDSTONE.

The residual soils of the Mansfield sandstone comprise an area of about ten square miles in the southeast part of the county. These soils occur in irregular patches capping the highest hills. The typical soil is a yellow sandy loam, underlain by a more tenacious subsoil of a reddish yellow color, mottled with white.

These soils have always been considered of a poor quality for general farming purposes, but their value has been somewhat increased by some experimental work and the liberal application of fertilizers. Corn yields on the average about 30 bushels, wheat 10 to 12 bushels. The land is well adapted for grazing purposes, except in the driest seasons, when the ground becomes parched and water becomes very scarce. The Mansfield soils are described more fully under Martin County, where the formation is the prevailing type.

7. ALLUVIAL SOILS.

The alluvial soils of Lawrence County consist of the bottom land along Salt, Leatherwood, Guthrie and Indian Creeks and the east fork of White River; also a part of an old abandoned river valley just east of Williams.

The Salt Creek bottoms are on the average from three-fourths to a mile in width, generally low lying and wet, and considerable areas do not permit of successful cultivation. The parts of the area which are drained produce excellent crops. The soil is a sandy clay loam, with the clay predominating in the poorly drained areas, and such areas are termed "crawfishy."

Leatherwood and Guthrie Creek have bottoms with an average width of a half mile in their lower course. The soil is a sandy clay containing considerable gravel, consisting of geodes, limestone and sandstone fragments. The soil is productive. Corn and timothy are the principal crops.

Indian Creek has little bottom land except that occurring in the meander curves. The soil is quite sandy and is planted in patches of corn, potatoes, sugar cane, etc.

The valley of the east fork of White River is very narrow through Lawrence County, averaging less than a quarter of a mile in width. The soil is of a sandy clay with a loamy texture and is very productive. On the hills bordering the river valley are deposits of sand occurring up to a height of 75 or 100 feet, and always on the side away from the current of the stream. Second bottoms of small areas also occur along the streams. The sandy areas are favorable for the growing of melons, vegetables and some general crops. At Sandpit hundreds of carloads of this sand are shipped away for ballast, etc.

The improvements through the alluvial area are good, most of the roads are improved with crushed stone or stream gravel, and the lands usually demand a good price; the question of economic drainage and the fear of damage from overflows are the greatest drawbacks to this area.

GENERAL SUMMARY.

Lawrence County affords excellent opportunities in many lines of agriculture. The greatly diversified characters of the soil make them adapted to all sorts of crops.

Canning factories for the using of tomatoes, pumpkins and

corn would prove paying investments and would make of value much land now of little worth.

Large amounts of planer dust from the stone mills are being used as a lime application on the various soils with good results. The most noted of these experiments are in cases where from 1,000 to 2,000 pounds per acre of the dust was applied to fields of alfalfa and clover, and as a result much better stands were secured than in parts without the lime. This is a cheap source of lime for those who have access to the mills. It is not necessary that all of the lime be in the form of dust, but small fragments of the limestone included will also improve the physical condition of the soils.

The county ranks tenth in the State in the growing of water-melons and there are in the county 52,500 apple trees, 27,000 peach trees and 27,000 of all other fruit trees.

There are in the county 75 factories which represent great amounts of capital and employ thousands of men. The supplies for these people must be furnished by the products of agriculture, and with this in view much more attention can safely be paid to vegetable raising and the growing of small fruits. The demand is great, but is now largely furnished from outside the county.

The railroad facilities are good; school advantages rank among the best; roads are well improved; the natural resources, including the soils, are unlimited; rural routes and telephones reach all parts of the county; and everything seems to be in the best condition to promote the welfare of the rural communities.

MARTIN COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Martin County, named in honor of Major Martin, a hospitable and patriotic citizen of Newport, Kentucky, was organized in 1820. It is about twenty-six miles in length by thirteen in width, and contains 340 square miles. Its civil townships are: Baker, McCameron, Brown, Mitchelltree, Halbert, Perry, Rutherford and Lost River. The population in 1830 was 2,010, and in 1850 about 5,000, and at the present time 14,800. In 1850 there were in this county nine grist mills, nine saw mills, two lawyers, nine doctors, six preachers, and 126 mechanics. The surplus articles for exportation are corn, hay, flaxseed, pork and beef, and those, with staves, hoop-poles, etc., were shipped down the river to the value of about \$50,000 annually.

Martin County produces about 600,000 bushels of corn annually, but the average yield is not over 30 bushels. About 7,000 to 8,000 acres are sown to oats, but the average yield is again very low, being from 20 to 25 bushels per acre. The wheat acreage is usually 8,000 to 9,000, and the average crop is 12 to 13 bushels. Timothy hay is grown on about 13,000 acres and gives an average production of 1 to 1-14 tons per acre. Less than 2,000 acres of clover is grown and $1\frac{1}{4}$ to $1\frac{1}{2}$ tons is the ordinary yield. Of the minor crops the acreage and yields are as follows: Potatoes, 300 acres, average yield 40 bushels; tomatoes 30 acres, total yield 900 bushels; peas, 10 to 15 acres; watermelons, 20 to 40 acres; cantaloupes, about 5 acres; tobacco, 5 to 15 acres.

Considerable live stock is raised, but Martin is not an important county in this respect.

The principal towns are Shoals, Loogootee, Willow Valley, Indian Springs, Mt. Olive, Buris City, Blankenship, Windom, Lacy, Natchez.

Shoals, the county seat, has 1,013 inhabitants, and is situated about the center of the county on White River, and on the B & O. S. W. Railroad. It is the trading center for a large portion of the county. It has two sawmills, two grist mills, a novelty works and other small manufacturing establishments.

Loogootee, with 1,382 inhabitants, is in the west central part of the county, on the B. & O. S. W. R. R. It is principally a manufacturing town. It has a carriage factory, three glass factories, a canning factory, grist mills and several other small concerns. The volume of business has decreased since the failure of natural gas.

Indian Springs, Burns City, Blankenship and Mt. Olive are stations and trading points along the Southern Indiana R. R. The first two named have sawmills.

Windom, Lacy and Natchez are country stores and trading points in the south part of the county.

Trinity Springs has several boarding houses and several guests stay there each summer. It is in the central eastern part of the county, eight miles northeast from Shoals.

PHYSIOGRAPHY AND GEOLOGY.

The surface rocks of Martin County belong to three epochs, the Huron of the Lower Carboniferous or Mississippian period, and the Mansfield sandstone and coal measures of the Carboniferous or Pennsylvanian period. The Huron group of limestone, shale, sand-

stone and conglomerates, cover most of the eastern third of the county, the Mansfield sandstone the major part of the remainder, while the coal measures occur in the southwest part and on top of the ridges and hills of the Mansfield.

The streams, in cutting through the hard Mansfield and into the softer Huron, have produced extremely steep slopes, and in many places there are almost perpendicular bluffs reaching a height of 80 to 100 feet. Some of the highest and most famous of these are along White River near Shoals. Altogether the topography of the Mansfield area, where the streams have cut down into the



White River Valley looking north from Pinnacle, Shoals, Martin County.

Huron, is probably the roughest in the State, the tops of the ridges being 100 to 250 feet above the valleys.

Drainage.—With the exception of a small portion of the northwest part of the county, which is drained by Furse Creek into the west fork, the whole county is drained by the East Fork of White River and its tributaries. The East Fork enters the county north of the middle of the east line and takes a meandering course to the south and west, forms a part of the southern boundary and leaves the county at the southwest corner. Indian Creek, Boggs Creek, and Haw Creek are the principal tributaries from the north and west, and Beaver Creek and Lost River from the south and east.

Economic Geology.—Over most of the county the water supply is poor, but along Indian Creek and Sulphur Creek, at Indian Springs and Trinity Springs, are mineral springs whose waters are very similar to that of the famous springs at French Lick and West Baden. Other important mineral products are coal (which, however, seldom appears in workable deposits), and iron ore, which occurs as concretions and veins in the surface rock. The sandstone of the Huron group and some of the Mansfield, is used in the manufacture of grindstones and whetstones.

Natural Scenery.—Among the bluffs along White River which have already been mentioned, one of the highest is the “Pinnacle,” near Shoals, the county seat. Here a high ridge of Mansfield sandstone one hundred ninety-six feet above the level of the stream terminates abruptly within a few yards of White River. Large masses of rock that have broken off lie around the foot of the ridge in every position. From this point one obtains a good view of the character of the topography of this region. To the northwest of this ridge the formations have been cut through by disintegrating forces and there has been left standing at some distance from the head of the ravine a tall mass of sandstone, which has received the name of “Jug Rock,” from the fancied resemblance to an old-fashioned jug. On the upper side it is 45 feet high, and on the down hill side is 75 feet high; it is capped with a hard projected layer of harder sandstone. At the south of the deep-wooded ravine is “the Glen,” an under-cut sandstone cliff with an intermittent cascade. Across a valley to the north is “House Rock,” a large sandstone cave, the entrance to which is about 35 feet high, and the main room with an opening in the top is very much higher. It is formed principally by the tilting of large rock masses. The sandstone in front of the cave is weathered into an elaborate fretwork. Other points of interest as one goes down the river are the “Acoustic Rock,” “Buzzards’ Roost,” “Hanging Rock,” “Kitchen-middings,” “Shell Bank,” and the Hindustan Falls.

SOILS.

Four soil types occur in Martin County. Three of these owe their origin directly to the geological formations, and the alluvial type, which has an area of 25 square miles, consists of three or four types. The following table shows the extent of each general type:

Huron	40 square miles
Mansfield	200 square miles
Coal measures	75 square miles
Alluvial	25 square miles

1. HURON AREA.

The Huron formation covers an area of about forty square miles in this county, comprising three principal areas in the eastern side of the county—first, along the White River valley and extending northward along Indian and Sulphur Creeks; second, from Shoals in a northeastern direction in a narrow strip along Beaver Creek; third, occupying a strip along either side of Lost River for a distance of several miles, with small patchy areas coming in along the streams from the east. The greater part of the area consists of long, rather steep slopes toward the drainage level. These slopes for the most part can be cultivated rather successfully. The soil is a sandy clay, having a loamy texture. The improvements are better than over most of the area in the counties to the east.

Corn produces from 25 to 50 bushels, wheat 10 to 15 bushels, oats about 25 bushels. Taken together, the slopes and lowlands comprise good grazing lands, but only a limited number of live stock are raised. Some fruit is grown and the soil seems well adapted to it. These soils, while somewhat productive and easily tilled, must be handled with care to prevent washing and depletion by continual cropping.

2. MANSFIELD AREA.

About two-thirds of the area of Martin County is included in the Mansfield sandstone area. This sandstone is a rather coarse-grained, hard stone of considerable thickness. The topography is very broken, as the sandstone weathers into very steep slopes and in many places the streams have precipitous banks. The ridges between the streams are broad and flat-topped, and it is here that most of the tillable land lies. The slopes are too steep and the valleys of the small streams are too narrow to be of much importance.

The surface soil is usually a sandy yellow loam from one foot to two feet in depth. This is underlain by a subsoil, which is about the same color, but more clayey and tenacious. With increasing depth the soil grades into a stiff, white clay, mottled with yellow; at the base of the Mansfield the subsoil grades into a soft, mucky shale at 6 to 10 feet. Sometimes considerable quantities of iron ore concretions are found in the subsoil.

This Mansfield soil is not very productive. Corn is often injured by dry weather and even in good seasons seldom produces

more than 30 bushels per acre. Heavy dressings of commercial fertilizer are used to produce good crops and this soon exhausts the land, so that after a few years it is abandoned and grows up in briars, sumach, persimmons and sassafras. The chief cause for this wearing out of the soils is due to the removal of all crops from the field and thus entirely doing away with the supply of humus. Some of the farms on top of the flat ridges are kept up by clovering, but the use of commercial fertilizer is also extensive. The permanent improvement of these soils might be brought about by a careful cropping system.

The improvements as a rule are poor. Very few roads are improved, and owing to the topography and sandstone outcrops, they are very hilly and rough.

Most of the timber has been removed, and the greater portion of the slopes and much of the table land is covered with a second growth, consisting of different varieties of oaks. Very little ditching has been done, but the sandy soil and steep slopes make the natural drainage very good, and little of the land suffers from being too wet.

Much fruit, principally apples and cherries, is grown in the county, and there are splendid opportunities for development along this line. The principal hindrance is the distance which most of the produce must be hauled over the extremely rough roads. In the south part of the county much of the fruit finds a good market, at French Lick and West Baden. About 50,000 bushels of apples are produced in the county, of which the greater portion is grown on the Mansfield area.

Prices of improved land run from \$20 to \$35 per acre, while the unimproved and run-down farms are valued at from \$5 to \$25.

The following table will show the result of the mechanical analysis of the Mansfield residual soil:

MECHANICAL ANALYSIS OF MANSFIELD RESIDUAL SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	Three miles N. of Blankenship, Martin Co.	Sandy loam.....	.0	.0	.0	.6	13.5	85.5
1		Subsoil.....	.0	.3	1.2	1.4	25.6	70.5
*2	North part of Baker Tp., Martin Co.	Sandy loam.....	11.3	1.1	1.4	.5	18.7	64.5
*2		Subsoil.....	13.5	.4	1.0	1.4	18.0	63.8

*Sample No. 2 contained some small fragments of sandstone which is classed as gravel.

3. COAL MEASURES.

The residual soils of the coal measures occupy about 75 square miles in Martin County. A large part of the area consists of isolated patches and ridges of the higher elevations, while in the southwestern part the area of several square miles becomes of much more even topography and of much greater agricultural value. The ridges are flat-topped and produce much better farming tracts than the Mansfield area. A typical section of the soil taken from center section 17, Baker Township, is as follows: First foot, sandy loam, few fragments sandstone; second foot, stiff, sandy clay, with sandstone fragments and iron ore concretions; third foot, stiff, sandy clay, with increasing amounts of broken sandstone and iron ore concretions to eighth foot, where occurs a layer of shaly iron ore underlain by a thin bed of coal, underlain by alternations of shale and sandstone and coal. The surface soil in general is a sandy clay loam, and of a productive type.

The farmers are using considerable fertilizer on wheat and some are beginning to use it on corn. Wheat yields 12 to 25 bushels, corn 30 to 45 bushels per acre; oats, timothy and clover yield well. Rye makes a strong growth. It is planted for spring pasture and then plowed under as fertilizer.

The principal water supply for stock is from artificial ponds, and cisterns are used for water for domestic purposes. The native timber growth consists of walnut, beech, white oak, gum, ash, wild cherry, hickory, locust, mulberry, maple and persimmon. Fruit trees grow and produce good crops. A large number of peach trees have been planted during the past few years. The greatest drawback to the development of these soils is the difficulty with which markets can be reached. Land can be bought at prices from \$5 to \$50.

The following table shows the result of mechanical analysis of coal measure soils:

MECHANICAL ANALYSIS OF COAL MEASURE RESIDUAL SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	North central part Baker Tp., Martin Co.	Sandy red soil.....	6.5	1.2	2.0	5.0	16.2	68.0
2		Subsoil.....	*80.0	1.6	1.0	1.9	6.7	10.6
2	N. W. corner McCameron Tp., Martin Co.	Sandy red soil.....	.5	.4	6.2	28.5	18.9	46.4
2		Subsoil.....	*8.2	1.4	4.0	36.8	21.4	28.4

*Sandstone fragments.

4. ALLUVIAL SOILS.

The alluvial soils consist of sandy loams along the White River and Lost River valleys, with small areas along First, Indian, Sulphur, Boggs, Beaver Creek and other small streams. The White River valley through Martin County is very narrow, varying from a half mile to less than an eighth of a mile in width. The valley is subject to frequent overflow, and for this reason the entire valley is planted chiefly in corn. Some clover, timothy and alfalfa are grown, but it is usually difficult to obtain good crops because of the wet condition. Wheat is grown successfully on the long slopes coming down into the meander curves of the river. The improvements along the valley are good. The valley of Lost River is very narrow and the soils are only fairly productive. Along the creeks named the soil areas are small, but adapted to a greater variety of crops.

Some excellent farms are found in the alluvial area, and good prices are secured for the land. The most progressive farmers have part of their land in the bottoms and part on the uplands, with the house, barn, orchards and pastures on the uplands and all the bottoms devoted to grain crops. The soils do not require a great outlay for fertilizers, although some is used—both commercial and stable manure.

GENERAL SUMMARY.

Martin County is commonly classed among the poor counties of the State. As a county the agricultural development is in a backward condition, and the farming population is hampered for lack of proper facilities and improvements to meet its needs. More railroads, improved public roads, increased telephone service will add much to the prosperity of the county. In parts the county is in a prosperous condition and improved methods of farming are finding a place.

Much profit could be made from the cheap lands in devoting them to special crops, as tomatoes, pumpkins, sweet corn, etc., for canning factories; vegetable raising and growing of small fruits for the market at distant points, as St. Louis, Cincinnati, Louisville and Indianapolis. The building of a north and south line of railroad through the county would open up great advantages in this line. Each year Indiana pays other states over a million dollars for apples and large sums for other fruits. Such apples as

can be raised in Southern Indiana are worth from \$1 to \$3 per box and from 100 to 200 boxes can be grown to the acre.

There are in the county at the present time 53,500 apple trees, 25,050 peach trees and 66,696 of all other fruit trees. Many cherries are grown in the south and central part, and beside the local use, are marketed for good prices at French Lick and West Baden.

Some parties in Shoals buy the "sulphur balls" from the various coal mines of the county, and after removing the small pieces of coal, ship the material to certain fertilizer companies, to be used as an ingredient in fertilizers.

The White River valley presents the most picturesque scenery to be found within the State, which, in fact, is probably not excelled in the Ohio valley. The natural scenery, with advantages for drives, boating, etc., and the development of mineral waters, offer a most attractive location for summer resorts or sanitariums, which will not only add to the wealth of the county, but will materially aid the agricultural pursuits.

ORANGE COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

Orange County was organized in 1816, and was named after a county of North Carolina in which many of the early settlers had previously resided.

The county contains 400 square miles, being 20 miles square. It is divided into nine civil townships, viz.: North East, Stampers Creek, South East, Orleans, Greenfield, Paoli, French Lick, Jackson and North West.

The population in 1830 was 7,909, and in 1850 about 12,000, and at the present time about 18,000. In 1850 the surplus articles of export were 30,000 bushels of corn, 20,000 bushels of wheat, 20,000 bushels of oats, 6,000 hogs, 1,000 cattle, 1,200 horses, and 300 mules. There were in the county at that time thirteen grist and saw mills, propelled by water and three by steam; three carding machines, eight tanneries, eighteen general stores, five groceries, one printing office, two lawyers, thirteen physicians, twenty-five preachers, 125 mechanics, one county seminary and seventy district schools, in which 4,200 children were instructed about three months in the year. Paoli then had a population of 400, and French Lick and West Baden were not on the map.

The county now produces about 800,000 bushels of corn, with

an average yield of less than 35 bushels; oats, 250,000 bushels, average about 20 bushels; wheat, over 200,000 bushels, average 15 bushels. About 10,000 acres are in timothy meadow, which yield about $1\frac{1}{2}$ tons per acre; about 3,000 acres in clover meadow, yielding about $1\frac{1}{2}$ tons of hay per acre, and a total of 800 bushels of seed. Only about 70 acres are planted in potatoes, but they yield an average of over 60 bushels per acre. The average of tomatoes is usually about 60, and these yield about 13,000 bushels. From 20 to 40 acres of watermelons are raised; about five acres of cantaloupes and five to ten acres of tobacco. An ordinary yield of apples is about 40,000 bushels. Orange County ranks fourth in the State in number of peach trees, about 45,000 being planted.

The principal towns are Paoli, Orleans, West Baden, French Lick, Orangeville and Stampers Creek, Youngs Creek and Leipsic.

Paoli, the county seat, is situated on the Monon Railway near the center of the county. It has a population of 1,200 and is pleasantly located—fifteen factories, mills and shops are established here, including flouring mills, lumber yards and a spoke factory. It has connection with New Albany by stage line, which passes over the New Albany and Paoli turnpike, which was owned by a private corporation and operated as a toll road until 1899.

Orleans, eight miles north of Paoli, is on the main line of the Monon, C., I. & L. division, and is a thriving town of 1,250 inhabitants. It has a dozen factories and shops. The French Lick line of the Monon makes connection at this point with the main line of the Monon, and trains between the two places are run every hour of the day.

West Baden, with a population of 225, and French Lick, with a population of 275, are located in the French Lick valley, and both have been built up since the mineral waters of that region have been so well known. Their importance are as summer resorts and each has large, beautiful hotels for the accommodation of hundreds of guests and thousands of people visit these places each year. The livery business is a prosperous business at these resorts, and excellent drives are arranged in every direction, and the scenery is most picturesque. Other business enterprises are bottling works, flouring mills and lumber yards. The new line of the Southern Railroad now connects these places with Jasper and points south.

Orangeville, in the northwest part of the county at the rise of Lost River, has a population of about 100. Its chief industry is a flour and feed mill, and it is a good country trading center.

Stampers Creek and Young's Creek each have a population of

about 100. Each has a flouring mill and the former has an establishment for distilling liquors and fruits.

Leipsic is a little village in the northeast corner of the county, on the main line of the Monon.

There are in the county 700 miles of public roads, with 192 miles of improved roads of crushed stone and stream gravel. The first improved road in the county was the old New Albany and Paoli turnpike, completed as far as Paoli by the State in 1839 and later turned over to a private corporation, which operated it as a toll road until 1899, when Orange County purchased the eleven miles



French Lick Valley viewed from ridge southwest of French Lick.

within her bounds for \$11,000, and made it a free road. The first road improved under the present law was the Orleans and Paoli Pike, built in 1897. Rapid progress has been made in the road improvement of the county and with the abundant supply of stream gravel and the modern methods of construction, the county will soon have a large percentage of its roads in excellent condition.

There are within the county three lines of railway. The Chicago & Louisville line of the Monon passes through the northeast corner, and the French Lick & West Baden branch of the Monon passes through Paoli, the county seat, and has its termination at French Lick. During the early part of 1907 the Southern Railway

completed a line from Jasper, in Dubois County, to French Lick, and making connections with the Monon at the latter place. The nearest railroad for the southeastern part of the county is along the Southern at the towns of English and Marengo, in Crawford County.

PHYSIOGRAPHY AND GEOLOGY.

In Orange County three geological formations make up the surface rock. The Mitchell limestone covers the eastern two-thirds of the northern part. The Huron limestones and sandstones form the surface rock over the southern third, and a large area in the northwestern part. The Mitchell area is comparatively level, but somewhat varied by numerous sink holes and irregular depressions. The remainder of the county, especially in the south and western parts, is very rugged. High, steep ridges and narrow winding valleys are the prevailing surface features. Mt. Arie, near West Baden, and Burtin Hill, southwest of French Lick, are two of the highest points within this area. The drainage of the county is by two streams and their tributaries, Lost River, across the northern part, and the Patoka River, across the southern part. Both streams have very meandering courses and extremely narrow valleys. The general course of the drainage is from east to west. Lost River sinks southeast of Orleans and flows by an underground channel with a winding course for a distance of 12 or 15 miles, and again rises at Orangeville. The Patoka, after leaving Orange County, widens its valley very rapidly until just before joining the Wabash valley it is fully two miles in width.

The French Lick and West Baden and other mineral springs have an important place in the history and geology of Orange County. The water issues from joints and fractures in the lower carboniferous limestone at its junction with the Mansfield sandstone. These springs break out in a number of places along the streams and wells have also been drilled and strong flows of mineral water obtained.

SOILS.

There are in Orange four general types of soil, all having been derived from the three geological formations discussed above. The fourth type, the alluvial, comprises a small area and the materials of which it is composed are not far removed from the point of original formation. The general types have local variations which will be discussed.

The following table shows the proportion of each general type:

Mitchell	150 square miles
Huron	190 square miles
Mansfield	55 square miles
Alluvial	5 square miles

1. MITCHELL AREA.

The residual soils of the Mitchell limestone cover about one-third of the entire county. The area is for the most part level, except along the western and southern edges, where the surface becomes somewhat rougher, due principally to the increased number of sinkholes. The soils of the level areas are the most valuable soils found in the Mitchell formation. They are deep, easily tilled, and productive. The rougher parts are not so uniform in character and contain large amounts of chert and other impurities. In these places the soils wash badly and become grown up with sassafras, sumac and briars.

The typical soil is a clay loam of a yellow color with an average depth of 8 to 14 inches. Near the Huron contact the soil contains considerable percentages of sand from the sandstone of the formation; in the cherty areas the soil in some places becomes very gravelly.

Corn yields from 40 to 60 bushels, wheat 12-20 bushels; clover and timothy produce good hay, but in many places it is difficult to obtain good stands. Some experiments are now being made as to the needs of the soil and some helpful suggestions may be given out at a later time. The special need seems to be lime and potash; the amount of organic matter is also very low and good systems of green manuring would be very beneficial.

A great many live stock are raised and the chief source of water is from the clogged sinkholes. Poultry raising is carried on to some extent. The direct communication of the area with Louisville and West Baden and French Lick gives good outlets for a surplus of farm, garden and live stock products. Several farmers are engaged in dairying and this also adds to the value of their farms by feeding all crops raised on the land and thus returning to the soil a large part of the material used in the production of the crop.

The following table shows the result of mechanical analysis:

MECHANICAL ANALYSIS OF MITCHELL RESIDUAL SOILS.

Number.	Locality.	Description.						Silt and Clay.
			Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	
1	Two miles east of Orleans.....	Surface.....	.0	2.0	.5	.5	5.0	93
1	Two miles east of Orleans.....	Subsoil.....	.8	2.0	.5	.8	10.0	87
2	Near Orangeville.....	Surface.....	2.0	2.0	.8	.5	5.0	90.3
2	Near Orangeville.....	Subsoil.....	6.0	3.0	1.0	.7	12.0	79

2. HURON AREA.

The Huron formation covers almost one-half of the county. The ruggedness of this area stands out in contrast to the level Mitchell area to the east. The greater part of the area is very rough, but the flat tops of the ridges afford some good tillable land and the slopes are well adapted to grass and fruits. The soil is a sandy clay loam, grading from a fine light yellow to dark brown color. Corn, wheat and clover grow well on the tops of the ridges. Millet and alfalfa are also grown. The soil of this area has the general characteristics of this type of soil as discussed on preceding pages. The following table shows the result of mechanical analysis of Huron residual soil:

MECHANICAL ANALYSIS OF HURON RESIDUAL SOILS.

Number.	Locality.	Description.						Silt and Clay.
			Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	
1	N. W. of Orangeville.....	Surface.....	.3	.7	1.0	10	12	75+
1	N. W. of Orangeville.....	Subsoil.....	4.0	.5	2.5	8	10	74
2	East of West Baden.....	Surface.....	1.0	.5	2.0	12	12	73
2	East of West Baden.....	Subsoil.....	3.0	1.0	1.5	10	10	78.4

3. MANSFIELD AREA.

The Mansfield occupies an irregular patchy area of over 25 square miles, on the tops of the higher ridges in the western part of the county. There are no special developments or advantages to mention from this area in addition to the discussion already given for the type.

4. ALLUVIAL.

The alluvial soils in the county are of small extent and of little importance. The only bottom soils to be considered are along Lost River, small areas in the meander curves, extending from Orangeville west to the county line. The most of these patchy areas do not exceed an acre or so, and are planted to various crops, as garden spots, melon patches, pumpkins, corn, etc.

The Patoka River also has a very narrow valley through the county, but widens rapidly farther west.

GENERAL SUMMARY.

Orange County is large in area, but has few general soil types, yet with great variation in topography, productions, and natural vegetation.

Until within the past few years the railroad facilities were poor, and only few public road improvements were made until recently. The completion of the new line of the Southern Railroad from French Lick to Jasper in 1907, gives the county an outlet to the south and may have a decided influence on the southern part of the county.

The following table, showing the average climatic conditions for a period of fifteen years, as compiled at Marengo, Crawford County, will serve as a basis for Orange County:

Mean temperature	56° Far.
Highest temperature	106° Far.
Lowest temperature	-28° Far.
Mean precipitation	57.6 inches
Average depth of snow.....	20 inches
Average number of rainy days.....	97

The corn crop of the county in 1907 was greatly damaged by hail and wind.

The marked improvements which have taken place during the past ten years give an encouraging outlook for far greater developments in the next decade. Many farmers from northern counties have come into this county in the past few years and bought farms in the rougher parts of the county, and an interest is being aroused in these low-priced lands.

WASHINGTON COUNTY.**HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.**

Washington County was organized in 1813. This county is one of the largest in the State, being 25 miles in extreme width from north to south and 25 miles in greatest length from west to east, with a total area of 523 square miles. The civil townships are Monroe and Gibson in the north, Franklin in the east, Washington, Central, Jackson in the south and Posey, Vernon and Brown in the west.

The population in 1830 was 13,072, in 1850 about 18,000 and at the present time about 20,000. The surplus products of the county in the early days consisted of corn, wheat, flour, beef, pork, hay, oats, tobacco, timber, live hogs, cattle, horses, mules, etc., estimated to be worth \$300,000 annually. These products were conveyed to market either by flatboat or wagon, and the stock were driven to southern markets until the new railroad was completed from New Albany to Salem, about 1850, and a few years later was extended on northward. There were at that time in the county 25 saw mills, 20 grist mills, ten carding machines and two cotton factories, two printing offices, which issued weekly papers, 40 general stores, 22 groceries, six lawyers, 30 physicians, 18 ministers and about 300 mechanics. Carriage and wagon making and the construction of carding machines were carried on extensively. There were 120 schools and 44 churches in the county. Salem at that time had a population of about 1,200.

The county now produces about 1,000,000 bushels of corn, but the average yield is less than 40 bushels. Oats, 500,000 bushels, average per acre about 25 bushels; wheat, 400,000 bushels, with an average of 18 bushels per acre, and in 1905 the county ranked fifth in the State for average yield of wheat, with 21.60 bushels per acre. The average of timothy meadow is 15,000, yielding on the average $1\frac{1}{4}$ tons. Clover meadow, 3,500 acres, yielding from one to one and a half tons, and producing annually about 500 bushels of seed. About 350 acres are planted in potatoes each year, and the average yield is about 50 bushels. The county ranks fifth in the growing of tomatoes, with an average of about 800 to 1,000 acres annually during the past three or four years. Four canning factories in the county take care of the crop. A few acres each year are planted in watermelons and tobacco.

Washington County ranks among the first in the growing of

apples, pears, peaches and plums. In has about 90,000 apple trees and in 1907 the yield was good, considering the year, and in 1906 the yield was 90,500 bushels. Pear trees, 16,000; peach, 40,000, and a considerable acreage of plums and a large number of young cherries.

In the southern part of the county, berry culture is beginning to gain some prominence.

Dairying is carried on to some extent and a large number of cattle are sold each year. Many horses are marketed and the county stands among the first in the raising of mules. Several sheep and a large number of hogs are raised, and the raising of poultry is on the increase. There are in the county more than 50 factories and mills of various sorts.

The principal towns are Salem, Campbellsburg, Saltillo, Canton, Little York, Pekin and Fredericksburg. A number of small villages are Hardinsburg, Fayetteville, Martinsburg, New Philadelphia, South Boston, Livonia, and Lesterville.

Salem, the county seat, is situated near the center of the county and is on the C., I. & L. division of the Monon Railroad. The town has a population of 2,000. It has a beautiful court house built of oolitic stone, and the school facilities are good. There are 20 or more factories, shops and mills in the town. The growth in the past few years has been slow but substantial. The location and surroundings are such that with increased agricultural wealth of the county the town should grow to considerable size.

Campbellsburg, situated on the C., I. & L. ten miles northwest of Salem, has a population of 700. It is a thriving agricultural town and has a half dozen or more shops and factories, including a canning factory for tomatoes.

Saltillo is a railway station one and a half miles northwest of Campbellsburg, and has a population of 200. It is chiefly a trading center for the surrounding country.

Canton, with a population of 275, is situated northeast of Salem. A canning factory is also located at this place.

Little York, in the northeastern part of the county, has a population of 225. The principal business is a lumber yard and a canning factory.

Pekin, in the southeastern part of the county, is on the Monon Railroad, and has a population of 175. It has a lumber yard, flouring and feed mill and a canning factory for canning tomatoes. It is a successful little trading center and shipping point for small fruits, berries, etc., which grow well in that section.

Fredericksburg, in the southwest corner of the county, has a population of 275. It has a flour and grist mill, harness shop, and has an establishment which publishes newspapers and does job printing.

Hardinsburg, in the southwest corner of the county, has a population of 210. It is a country trading center, but has no mills except a sawmill.

Martinsburg has a population of about 90, and has an exchange for flour, meal and feed. It also has a lumber and shingle mill. It is located in the southeast corner of the county.

Livonia, in the western part of the county, has a population of 200. It has a good country trade and also does some lumber business.

The transportation facilities of the county are very poor, the C., I. & L. (Monon) being the only railway within its bounds. This crosses the county in a northwest-southeast direction, passing through Salem, the county seat.

The county has about 1,500 miles of public roads, but until the last few years but little has been done in the way of road improvement, there now being but 120 miles of improved roadway, not including eight miles of the old New Albany and Vincennes turnpike, owned by private corporation and operated as toll road. Most of the roads have been improved with crushed stone and after up-to-date methods. Stream gravel has been used on about 11 or 12 miles of the road, but is not as satisfactory as the stone. There is an abundant supply of good road material, both gravel and stone.

The county offers great advantages in agricultural pursuits, especially in the growing of fruits and tomatoes and in dairying and stock raising. Good land can now be bought at very reasonable prices and will yield good returns. With the increase in taxation from improved lands will come more improved roads and added railroad facilities.

CLIMATE.

The following table, compiled from Weather Bureau records, shows the normal monthly and annual temperature and precipitation taken at Salem and at Scottsburg, just east of the area of this survey:

NORMAL MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION.

MONTH.	Salem.		Scottsburg.	
	Tempera- ture of	Precipi- tation. Inches.	Tempera- ture of	Precipi- tation. Inches.
January.....	29.2	3.35	32.9	3.28
February.....	30.6	3.57	31.0	2.60
March.....	41.9	3.83	43.2	4.44
April.....	52.4	3.05	52.3	2.31
May.....	63.5	3.22	65.0	3.70
June.....	71.2	4.52	74.4	4.30
July.....	77.2	2.89	78.0	3.02
August.....	74.6	3.50	76.4	2.90
September.....	68.1	2.58	69.1	2.38
October.....	56.4	2.66	57.5	2.13
November.....	44.5	3.94	44.5	3.43
December.....	32.4	3.32	36.3	3.25
Year.....	53.5	40.43	55.1	37.74

PHYSIOGRAPHY AND GEOLOGY.

The rocks of five geological epochs form the surface of Washington County. First, the Knobstone, covering a large area in the northern part and about one-third of the eastern part; the Harrodsburg limestone covers considerable areas in the southeastern and central parts, and extends to the northeast, principally on the higher hills and ridges. The Indiana oolitic occupies a narrow winding strip in the central part, forming a belt between the Harrodsburg and Mitchell; the Mitchell limestone covers the northwestern part of the county and the western third, except about 8 or 10 square miles in the southeastern part, which is capped with remnants of the Huron.

That part of the county lying within the Mitchell area is generally level and comprises an important agricultural area. The remainder of the county, with the exception of the regions of the Muscatatuck, is very rough and broken. In the knobstone region is a series of deep, narrow valleys, from 150 to 300 feet deep, from one to five miles long and separated by flat-topped, narrow divides. Cuts in the crests and abrupt ridges give rise to the knob topography.

The drainage is through the East Fork of White River and the Muscatatuck. The main tributaries leading into these streams are Clifty, Twin, Rush, Buffalo, Delaney and Elk Creek. The eastern and south parts of the county are drained by the three branches of Blue River. These branches unite near Fredericksburg, in the southern part of the county. Blue River, in all its forks, is a meandering stream, with sharp curves, and has practically no valley.

A part of the central western part of the county is drained by the head water of Lost River.

SOILS.

Six principal soil types are found in Washington County. Of these, five are derived from the weathering of the underlying geological formations. The sixth or alluvial type, which consists of two or three varieties, occurs in the low, flat bottom lands and is derived from material deposited by the streams and the wash from the surrounding uplands. The following table shows the extent of each of the types:

Knobstone	150 square miles
Harrodsburg	75 square miles
Oolitic	20 square miles
Mitchell	230 square miles
Huron	10 square miles
Alluvial, clay muck, white clay, clay loam and silt loam.....	40 square miles

THE KNOBSTONE SOILS.

These soils consist of two main types, a silty clay loam and a sandy loam. The silty loam is of a light gray color and the more sandy areas grade from a light yellow to brown color. In their topographic features and productions and general characteristics the soils are the same and will be treated under one description.

The soil is from 8-12 inches in depth and numerous iron concretions are scattered over the surface; below 12 inches the soil grades into a light yellow or mottled silt loam, and at greater depth into a compact sandy clay, containing larger concretions and fragments of sandstone.

The topography of the area is very rough and broken, especially in the southeastern part, where the hills attain a height of 200-300 feet above the streams. The numerous small streams that traverse the area are adequate to carry off the surface water in times of heavy rain, and very little tile draining has been done; however, tile drains improve the conditions for most crops. If cultivated in a wet condition, the soil dries out rapidly and bakes into clods which are difficult to pulverize.

Careful management and cultivation are necessary to keep these soils in a productive state and some system of crop rotation is very important, as the continual cultivation of one crop causes depletion of the soil. Green manuring is the best means of fertilization, but commercial fertilizer should be freely applied.

These soils are adapted to corn, wheat, oats, clover, timothy and tomatoes, and abundant yields are often produced. Corn yields on

the average about 30 bushels, wheat 12 to 15 bushels, oats 20 to 30 bushels. Clover and timothy produce from one to two tons per acre, and clover seed yields from one to three bushels.

The soil is especially adapted to tomatoes, small fruits, vegetables and all early maturing crops. The rough, hilly portions are well suited to larger fruits. Large yields of apples and peaches have been secured from the orchards now bearing. Grapes grow well and could be profitably grown for the markets.

MECHANICAL ANALYSIS OF KNOBSTONE, SILTY CLAY-LOAM AND SANDY LOAM.

No.	LOCALITY.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Silt.	Clay.
600	Washington County.....	Knob. silt loam..	0.9	3.3	4.1	16.3	63.8	12.
600	Washington County.....	Subsoil.....	0.8	0.9	1.0	10.6	65.0	25.
615	Washington County.....	Knob. sandy l'm.	1.0	3.0	5.0	13.0	60.5	20.
615	Washington County.....	Subsoil.....	1.5	3.8	4.8	20.	43.	28.5

THE HARRODSBURG AREA.

The Harrodsburg residual clay covers about 75 square miles and are covered in the northern part to the tops of the hills and winding ridges. Larger areas are found in the central and southeastern parts and occupy more level and lower tracts, and are of more agricultural value. In general the improvements are good. The general characteristics and productions of these soils are the same as described under the Harrodsburg soil of preceding counties.

MECHANICAL ANALYSIS OF HARRODSBURG RESIDUAL SOILS.

Number.	Locality.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Very Fine Sand.	Silt and Clay.
1	Six miles N. of Salem.....	Red clay loam.....	.1	.2	.7	1.2	10.9	85.4
1	Six miles N. of Salem.....	Subsoil.....	.0	.4	4.5	12.3	22.4	59.2

THE INDIANA—OOLITIC.

The Oolitic belt in Washington County occupies about 20 square miles and extends in a narrow, winding strip through the central part of the county. Although small in extent the Oolitic belt presents the best improved area within the county. Along the north fork of Blue River the long gentle slopes to the streams yield excellent crops and the farms are well improved, good farm houses,

large barns, dairy herds, good horses, mules and numbers of hogs add to the interest as compared with the poor regions to the east. The roads are being rapidly improved and the latest machinery and farm tools are being used. Good apple orchards are planted and a large number of Winesap and White Pippin apples are planted, and in 1907, when the apple crop was so near a failure through this section, these varieties gave good yields. The best part of this region lies near the county seat and has every advantage to become well developed and gradually increase the agricultural value of the county. Corn yields on the average 50 bushels; wheat from 18-25 bushels; oats about 35-40 bushels, and timothy hay produces from one and one-half to three tons. The blue grass pastures are typical of the formation.

THE MITCHELL SOILS.

The residual Mitchell soils comprise the largest area within the county. The surface is generally level or slightly rolling. The area is the original table-land of the Mitchell formation. The soil is a clay loam of a yellow color and has an average depth of 10-14 inches. The subsoil is a compact clay of a darker color and usually contains cherty fragments in some places of sufficient quantity to be termed gravelly. The area is of great agricultural importance in this county. Drainage is an essential thing to secure good crops, although both the surface and underground drainage are well developed. Corn yields as high as 60 bushels in favorable seasons; wheat 10 to 20 bushels, oats are only fair. Within the past few years a large acreage of tomatoes has been successfully grown. Some fruit is grown on this type and there are no reasons why this should not be a great fruit producing region. Stock raising is on the increase, and some farmers are beginning to make a specialty of pure breeds. The improvements are good and the farms are good, and usually of larger size than in other types. Land sells at from \$50 to \$100, and can be made to pay well on the investment.

THE HURON SOIL.

The remains of the Huron formation within the county includes about ten square miles in the southwest part of the county, on the points of highest elevation. These soils are derived principally from the sandstone members of the Huron and are of a yellowish red medium sand, containing sufficient clay and silt to be somewhat loamy. The region is rough, but mostly admits of cultivation.

ALLUVIAL SOILS.

Clay Muck.—Along the narrow portion of the Muscatatuck valley, where the knobstone hills come down near the stream, the soil which has been derived from the wash from these hills is a stiff gray clay muck. It is very wet and of little value from an agricultural standpoint.

White Clay.—The white clay area forms a narrow, winding strip along the foot hills of knobstone along the Muscatatuck valley. This clay is cold and wet and in the subsoil contains numerous small iron concretions and gravelly fragments. It is poor in humus and is continually receiving a coat of lifeless soil from the hill slopes above. Topographically, this soil may be considered a low bench terrace.

Clay Loam.—The clay loam type occurs along the forks of Blue River. The streams have a very meandering course, and long slopes and steep bluffs come down to the streams and the valley is very narrow and occupies only a part of the meander curves. The soil is a rich clay loam and is used principally for the growing of potatoes and other garden vegetables and tobacco. Along Blue River are some of the most beautiful landscapes in the county. The bordering slopes and uplands are well improved and the whole represents progressive farming on a hilly and rolling surface.

Silt Loam.—The silt loam occupies an area of about 40 square miles bordering the Muscatatuck River, and is locally known as "the flats." The same type extends up the valleys of the principal tributaries and gradually grades into the white clay strip as the hill line is approached. The silt loam area is low lying and has a very gently rolling or level topography. In some places a narrow ridge of slight elevation extends along the immediate bank of the stream, and occasionally small, sandy areas are found along the streams; numerous ponds, bayous and old stream beds and swampy depressions are scattered over the area. The soil of these wet places is somewhat heavier than the typical silt loam. The silt loam has been formed from material deposited by streams at times of overflow, mingled with the wash material from the upland. The sand of the part of the area near the upland has been brought down from the adjoining hills. The soil has an average depth of 8-10 inches and consists of a gray to light brown silty loam, which becomes heavier with depth. It contains varying amounts of medium to fine sand and a large quantity of small iron concretions mixed with the soil and strewn over the surface. These are due

to the poor drainage condition, and the action of stagnant water has reduced the ferric hydrate to ferrous salts, and the lime, phosphoric acid, etc., which the soil has given up are formed into concretions. These concretions increase in size and number with depth, and the subsoil becomes a heavy mottled silty or clay loam somewhat gravelly from the large number of concretions. Local variations occur over the area, but are not of sufficient extent and importance to be discussed separately.

The natural drainage conditions of this type are very poor. The small streams have but slight fall, and during heavy rains they spread out over the adjoining bottoms, yet there is sufficient grade to admit of successful tile draining, and the land would soon be drained sufficiently after the floods had passed to admit of cultivation. The agricultural value of these lands depends largely on the successful drainage. The soil when drained is sufficiently fertile to yield excellent crops, while the poorly drained areas can be devoted to but little use except the growing of grass.

In the well-drained area corn will yield 45 bushels per acre, and in a favorable season will yield as much as 60 bushels. Wheat yields 18-20 bushels per acre, but little is sown on account of loss by heavy rain. Oats will yield 25 bushels, but the soil is not adapted to oats. Tomatoes yield 5-6 tons per acre, and timothy produces 2-3 tons per acre, and clover does fairly well. Thus we see the soil is best adapted to corn and timothy.

The native timber growth principally is oak, hickory, beech, sycamore, elm and ash.

The following table gives results of mechanical analysis of the soil and subsoil of the silt loam of the Muscatatuck area:

MECHANICAL ANALYSIS OF SILT-LOAMS.

No.	LOCALITY.	Description.	Gravel.	Coarse Sand.	Medium Sand.	Fine Sand.	Silt.	Clay.
610	Wash. Co. (Muscatatuck V.)	Silt loam.....	1.2	3.0	1.5	8.4	65.5	20.5
610	Wash. Co. (Muscatatuck V.)	Subsoil.....	1.5	2.5	1.5	7.5	63.4	24.2
612	Wash. Co. (Muscatatuck V.)	Silt loam.....	.4	1.5	1.0	8.2	55.3	34.5
612	Wash. Co. (Muscatatuck V.)	Subsoil.....	.6	1.4	1.0	8.4	57.3	31.2

GENERAL SUMMARY.

Washington County on the whole may be said to be a good agricultural county. With its diversified soil types it admits of all branches of agriculture.

The Harrodsburg, Oolitic and Mitchell area are well improved

and are inviting to the most enterprising farmers and fruit growers. The soils of these types are very permanent soils, and when proper care is used do not lessen in value by continual cultivation.

In the Knobstone area many of the hillsides, where the topography is most broken, are too steep to be successfully cultivated, and, as a whole, less of this type of soil has been developed agriculturally than any other soil in the area; but the greater part of these soils cultivated give fair yields of corn, oats, wheat, rye, timothy, clover and tomatoes, and the value of fruit growing cannot be overestimated. The constant cultivation of the land in the growing of tomatoes seems to benefit these lands.

Alfalfa has been successfully grown on small areas, and it has been shown that a very good grade of tobacco can be grown on the soil. Sorghum has also been raised with profit.

Timothy is extensively grown on the poorly-drained areas of the silt loam, and produces a greater tonnage than on the uplands.

The corn crop on the silt loam is planted late, after danger of heavy rains, and usually matures before killing frost comes.

The county is favorably located for reaching good city markets, but the great drawback in this region is the lack of railroad facilities. It is probable that within a short time other railway or interurban lines will traverse the county and add much to the value and progress of the county.

JACKSON COUNTY.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

This county was first settled in 1809, by parties from the falls of the Ohio and from Kentucky. When they first came to the county they met with a few French traders, who complained that the trade with the Indians had been ruined by the war. These Frenchmen left the county and probably went to Vincennes. Among the first Americans who settled in the county and whose names are still prominent were H. and A. Rogers, Abram Miller, J. B. Durham, James Hutchinson, Thomas Ewing, John Ketcham, William Graham, Abram Huff, Thomas Carr, and Alexander Craig.

"In 1812, the Indians became troublesome, and some of the settlers removed to escape their wrath; others sent their families, but remained themselves. They built a little fort for their defense, which alone saved them from the 'Pigeon Roost' massacre, where

in 1812 twenty families perished beneath the tomahawk. This little fort was frequently besieged, but always held out. The Indians, however, drove off all the horses and cattle and otherwise impoverished the settlers.

“During the War of 1812-14 several persons were shot and killed or wounded in this county. The Indians were very hostile, and kept a close watch for an opportunity to pick off the settlers. However, the only battle fought in the county during the war was at Tipton Island in 1814. There were about 50 Indians opposed to thirty whites, but they were quickly dispersed, leaving one or two killed upon the field. This encounter was conducted by General Tipton, the Commander.”*

The county was organized in 1815 and named in honor of General Andrew Jackson. In the following spring the county seat was located at Brownstown, which received its name in honor of General Jacob Brown, who distinguished himself in the War of 1812. Brownstown was laid out in the woods, and in consequence the county seat was temporarily located at Vallonia.

Very soon after the organization of the county the population increased greatly, and general improvement was pushed forward. In 1830 a number of Germans settled in the eastern part of the county. They were a very enterprising class of people and have done much to promote the general welfare of the county, and today many of the wealthy and well-to-do people of the county are descendants of these early German settlers.

The surplus produce of the early settlers was shipped down the East Fork of Driftwood River in flatboats or taken to different points on the Ohio in wagons and then on flatboats to the southern and eastern markets, but after the completion of the Ohio and Mississippi Railroad, now the B. & O. S. W., the trade of the county was carried to Cincinnati.

The agricultural advantages of the county rank it among the best in the State. The soil is of various types, well adapted to the production of grains of all kinds, fruits and melons. The constant increase in population and the continued increase of the surplus products of the county show that its agriculture is in an improving condition.

There are in the county 650 miles of public roads, with 500 miles well improved with crushed stone and gravel. The red creek gravel and the gravel deposits of White River are the gen-

*Goodrich and Tuttle's History of Indiana, 1876.

eral sources of road material. Only about ten miles of the improved roads have been built of limestone.

Jackson County contains about 520 square miles, and has a population of 27,000. It is divided into eleven civil townships, viz.: Driftwood, Grassy Fork, Brownstown, Washington, Jackson, Reddington, Vernon, Hamilton, Carr, Owen and Salt Creek.

The principal towns are Brownstown, Seymour, Vallonia, Medora and Crothersville.

Brownstown, the county seat, is located on the B. & O. S. W. Railroad and has a population of 2,200. It has a fair court house and good school facilities.

Seymour is the largest town in the county and has a population of 6,500. It is a good railroad center, and has every appearance of thrift, and is pressing forward in all valuable industries and improvements.

Vallonia has a population of 400, and is located on the B. & O. S. W. Railroad. It is the shipping point for the agricultural produce of the surrounding country. Hundreds of carloads are loaded here every year.

Medora is also situated on the B. & O. S. W., five miles west of Vallonia; has a population of 625, and is also chiefly an agricultural village of some importance.

Sparksville, with a population of 150, is also located on the B. & O. S. W.

Situated along the line of the Southern Indiana Railroad are the little villages of Norman, Kurtz, Freetown, Surprise, Cortland and Reddington. Of these Freetown is the largest, having a population of about 250. Surprise is a little station with about 30 inhabitants. The others range from 100 to 200 in population. These places afford trading points for northern Jackson County, and give the nearest railroad facilities for southern Brown.

Houston is a little village in the northwest part of the county with a population of 120. It receives a considerable amount of country produce, which is hauled to the railroad stations.

Crothersville, in the southeast part of the county, is situated on the Pennsylvania Railroad. The town has a population of 750. It is a good country trading center. Two canning factories afford a ready market for all tomatoes grown in this section. About 500 acres of tomatoes are annually grown in the county.

Rockford, with a population of 150, three miles north of Seymour, and Chestnut and Retreat, to the south, with a population

of a few families each, are other stations along the Pennsylvania line.

Tampico, with a population of 150, is located in the central southern part of the county, and receives the general trade from that section and the valley of the Muscatatuck.

The county is traversed by three railroads. The B. & O. S. W. Railroad crosses from the southwest corner to near the northeast corner; the Southern Indiana crosses through the northern half to Seymour, and has a branch line north and east, making connections with various other lines; the Pennsylvania line runs north and south through the eastern edge of the county. All these roads center in Seymour. All have good passenger service and heavy freight traffic. An interurban line, just completed, gives good connection between Louisville, Seymour, Columbus and Indianapolis.

The greater part of the county was formerly covered with valuable timber, very little of which now remains. The productive and easily cultivated soils of the valley areas rendered this part of the county better adapted to general farming purposes than the more broken areas of the northwestern part. The agricultural wealth of the county has probably increased 50 per cent during the past 12 or 15 years. Corn, oats, wheat, clover, timothy and vegetables are grown on almost every type of soil, and the rougher parts are well adapted to fruit growing, and the sand areas are especially suited to the growing of melons.

In 1907 the county produced 1,620,164 bushels of corn, 554,540 bushels of wheat, 453,848 bushels of oats, 6,396 tons of clover, 13,744 tons of timothy, 29,140 bushels of tomatoes, 27,100 bushels of potatoes and 471 acres of watermelons and 226 acres of muskmelons.

Considerable interest is manifested in county and state agricultural and historical organizations. Telephones and rural routes cover the county. Improvement is shown on every hand, and rapid progress is sure to continue.

PHYSIOGRAPHY AND GEOLOGY.

The western two-thirds of Jackson County is the southern extension of the knobstone plateau which includes all of Brown County, and the physiographic features of this section are much the same as in the former county. The small streams have carved

deep "V" shaped valleys into easily-eroded shales and sandstones. The general trend of these valleys and the ridges is from northeast to southwest.

In the northern part of the county the valley of the East Fork of White River forms the eastern boundary of the hill region. White River enters the county at the northeast corner and flows southeast until joined by the Muscatatuck at a point six miles east of the Lawrence County line. After its junction with the Muscatatuck the river flows almost directly west, forming six miles of the southern boundary.

The valley varies in width from eight to ten miles at Seymour to about four miles at Vallonia. The principal tributaries are the Muscatatuck, which forms most of the southern boundary; White Creek from the west, and Rough's Creek from the southeast. The Muscatatuck has a very narrow valley on the Jackson County side. Its principal tributaries are Vernon Fork and Grassy Fork, which enter from the northeast.

In the south half of the county the knobs extend east of the valley. The foothills to the south and east of these knobs spread out into a broad table-land covered with white clay, which reaches almost to the eastern border. A belt about six miles wide along the eastern border is thinly covered with glacial material, which is in too small quantities to affect the topography except in the case of Chestnut Ridge, a long ridge of drift which starts in Jackson Township and extends southwest through Washington Township into Grassy Fork Township. Its width is from one-fourth mile to one and a half miles.

As has been said, most of the surface rocks of the county are those of the knobstone group. Along the western side some of the hills and ridges are capped with remnants of the Harrodsburg limestone, and the deep red color of the soil and the presence of crinoid stems show that the same limestone once covered a much larger area than it does now. Along the eastern border a belt of from one to three miles in width is underlain by the New Albany black shales of the Devonian Period, but there are few outcrops and there is no marked change in the soil or topography.

SOILS.

There are five general soil types now within the county. Each of these have local variations which will be described under the various types. Three of the general types are derived from the

weathering of the geological formations; a fourth is due to the glacial invasion and presents same marked characteristics within this area; the fifth, the alluvial types, are due to three agencies: stream action, glacial invasion, together with the mingling of the residual material. The following table gives the area of each type:

Devonian	25 square miles
Knobstone	290 square miles
Harrodsburg	15 square miles
Glacial	10 square miles
Alluvial	160 square miles

DEVONIAN SOIL.

The Devonian soil lies in a narrow belt along the east edge of the county. The surface is level and usually shows traces of glacial material, but not in sufficient quantity to affect the character of the soil to any great extent. The soil resembles the knobstone soil but is of less sandy texture and of a lighter yellow color than the knobstone of the ridges.

KNOBSTONE SOIL.

In general characteristics the knobstone soils of Jackson County resemble the same soils in the counties previously discussed (see especially Brown and Monroe counties). There is a larger proportion of the white clay of the low hills and terraces. This white soil is predominant in the southeastern part of the county and is used extensively in tomato growing. The soils are generally more productive than the knobstone of the other counties, and consequently the farms are as a rule better improved. Much better use is made of the creek gravel, which is common in all the streams of the area, than in the other counties, and the roads are above the average for so hilly a region.

HARRODSBURG SOIL.

Only a small part of the county is covered by the Harrodsburg soil although on the western border much of the soil is slightly affected by the presence of soil from the Harrodsburg which has been altogether eroded from the hilltops. As in the other counties, the soil is a stiff, red, somewhat sandy clay, which usually produces good crops of hay and wheat. A full description of this type of soil may be found in the general discussion of Indiana Soil Types.

GLACIAL SOIL.

A large area in this county has been affected more or less by the invasion of the ice sheet, but the soils have been but little influenced by the glacial material except in an area of about ten square miles, where there has been a ridging or piling up of the drift. This is a long, irregular ridge from 5-20 feet in height extending in a north and south direction throughout the eastern part of the county south of the river and extending into the northern edge of Washington County. It is called Chestnut Ridge, and is composed of clay, sand and gravel. Some drift material is found sparsely scattered over the eastern third of the county. The upper course of the East Fork of White River has been changed by glacial action.

ALLUVIAL SOILS.

White Clay.—Just east of the hill line is a belt of white clay land from one-half mile to one and one-half miles in width. The north part of this belt is drained by White Creek and is known locally as "the White Creek Slashes." White Creek is a meandering stream almost in the valley floor, and has little fall, so that much of this soil is subject to overflow during the spring.

The soil is a white clay, very stiff when wet, and extremely hard when dry. The subsoil is still more compact and is mottled with yellow and brown. Owing to its extreme hardness when dry, the land must be worked while wet. The most valuable crops are clover and grass. Corn does well in moderately wet seasons, but in dry the soil becomes so hard that it can not be well cultivated. However, the summer of 1907 was too wet and the corn was badly damaged. Ditching would greatly improve the soil, especially the clay soil along the hills, which is very wet since it receives the water from the hills to the west. Ditching is hardly practicable on account of the high level of White Creek. Through part of Hamilton Township a dike of five to six feet in height has been constructed along the east bank as protection against freshets.

Brown Sandy Loam.—Between the white clay and the true bottom soil is a strip of brown, sandy loam from one to two miles in width. This is a very loose sandy soil of a few feet in depth, grading along the west side into a more compact dark subsoil, but into glacial drift along the east side. It is very productive; corn, the principal crop, usually yields fifty to eighty bushels per acre. Clover is grown extensively and does well. In the south part of the county several acres are devoted to the growing of muskmelons

and nutmegs. They are reported as giving a return of about one hundred and fifty dollars per acre of an ordinary season. The farms in the loam belt are much better improved than those on the knobstone and clay lands. The sandy soil also produces better in moderately wet seasons, as it is so loose that it dries out rapidly.

Valley Soil.—The sandy soil grades into the true valley soil, which is a black, sandy loam, although the percentage of sand is less than in brown soil. Glacial gravel underlies much of this soil, especially along stream courses. The crops are much the same as on the brown soil; corn does better in dry seasons but is more injured by wet. Clover is used for hay and for enriching the land. Wheat produces twelve to eighteen bushels per acre, and corn some better than on the sandy soil. Little commercial fertilizer is used on any of these soils.

Most of the timber has been removed, but some woods remain, which are composed principally of white, black, red and burr oak, swamp and gray ash, paper birch, yellow and tulip poplar, water elm, scarlet maple, cottonwood, sycamore, black and sweet gum, hickory and black and white walnut.

The price of the clay lands runs from \$20 to \$50 per acre according to location and improvements; the brown sandy loam from \$50 to \$100 per acre, and the valley soil somewhat higher.

FINE SAND AREAS.

On the east side of the river is a belt of the true valley soil somewhat narrower than on the west side. Back of this is a belt of a peculiar sand land. This belt is one to three miles wide in Reddington Township, widens to about four miles in Jackson, narrows to about a mile in Brownstown and again widens to three or four miles in Driftwood.

This soil is of a lighter color and more sandy texture than the brown loam on the west side. Its surface is somewhat irregular, being thrown into rounded knolls. The regular crops are raised with fair success, although the soil is not so productive as the true valley soil or the brown loam.

This area is especially famous on account of its production of melons. Over five hundred acres of watermelons and one hundred acres of canteloupes were planted last year. They yield well, and while the expense and labor of raising them are heavy, they are usually a very paying crop. Vallonia is the center of the melon industry and is the principal shipping point, although heavy ship-

ments are made from Medora, Brownstown, Seymour and Rockford. Several hundred carloads are shipped from these points, principally to the Cincinnati and Chicago markets. An accompanying photograph shows the method of handling and loading melons at Vallonia.

GENERAL SUMMARY.

Jackson County ranks as one of the best agricultural counties in the State. The knobstone soils which cover most of the county



Delivering watermelons for shipment at Vallonia, Jackson County.

do better and are better improved than is usual with this type of soil. The alluvial soils, especially the sandy soils and the loam, are unexcelled for corn, wheat and clover. The improvements on these soils will compare favorably with those of any portion of the State.

The prices of land are from \$5 to \$30 for the knobstone ridge soil, \$20 to \$30 for the white alluvial clay and terrace clay and \$80 to \$120 for the valley soils.

The roads are, as a rule, well improved; some of the ridge roads have been laid out by professional engineers and go over or around the ridges with the least possible grade.



By Wm. Tuell, Brownstown.

Watermelons ready for shipment, Vallonia. Jackson County. Twenty-five loaded cars were on switch in addition to 40,000 melons on ground.

Stock raising is an important industry, about 600 horses and the same number of mules being sold annually. The number of horses in the county is about 5,000 and of mules about 2,500. About 3,000 cattle and 20,000 hogs are sold annually.

There are over 100 factories, shops and mills in the county, including two canning factories, numerous grist and flouring mills, one meal and hominy factory and one commercial fertilizer factory.