Location and Description of Area.

Laporte County is bounded on the north by the State of Michigan, on the east by St. Joseph County, on the west by Porter County, and on the south by Starke County. It derives its name from Door (Laporte) prairie, so called by early French settlers, because a narrow opening or passageway in the timber served as a means of approach to this prairie from the east. The county is one of the largest in the State, comprising an area of 562 square miles, or 359,680 acres. There are twenty-one civil townships: Michigan, Springfield, Galena, Hudson, Coolspring, Centre, Kankakee, Wills, Lincoln, Pleasant, Scipio, New Durham, Clinton, Noble, Washington, Union, Johnson, Cass, Hanna, Dewey and Prairie. The population of the county in 1870 was 27,062; in 1900, 38,386; in 1910, 45,797.

Laporte, the county seat, is situated in the north-central part of the county. Its population in 1910 was 10,525, an increase of 3,412 in the last ten years. The principal industries of the city are: carriage and wagon works, thrasher and traction engine factory, bicycle factory, two furniture factories, piano factory, woolen mill, milling and feed establishments, and various other smaller enterprises.

Michigan City, with a population of 19,027, is situated thirteen miles northwest of Laporte, on Lake Michigan. This city is an important lake port, and this, together with excellent railroad facilities, makes it one of the leading commercial cities in the State. The Indiana State Prison is situated here. The city supports numerous manufacturing industries and gives employment to many men. An estimated number of employes in the manufacturing plants of the city, according to statistical reports, is 5,000, with an estimated weekly payroll of $60,000.

Other towns and villages throughout the county are: Lacrosse, Hanna, Union Mills, Kingsbury, Stillwell, Westville, Haskell, Wanatah, Otis, Rolling Prairie, Wellsboro, Waterford, and Hudson.
The county has about 89 miles of improved roads, all of which have been improved with crushed stone. Fine macadam roads have been built for some distance out of the cities of Laporte and Michigan City, and one of these fine stone thoroughfares now connects these two cities. There is little, if any, gravel suitable for road purposes to be found in the county.

The county has the best of railroad facilities. There is not a township in the county that is not crossed by either a railroad or interurban line. The Lake Shore and Michigan Southern crosses the north central part of the county in an east and west direction; the Grand Trunk Western, the south central part in a northeast and southwest direction; and the Baltimore and Ohio, through the southern part. Besides these three principal east and west lines, there is the Pittsburg, Ft. Wayne and Chicago, the New York, Chicago and St. Louis, the Pittsburg, Cincinnati, Chicago and St. Louis, the Chicago, Cincinnati and Louisville, the Per Marquette, the Lake Erie and Western, and the Chicago, Indianapolis and Louisville. The Michigan Central cuts the northwestern part of the county at Michigan City. There are two interurban lines—the Chicago, Lake Shore and South Bend, which crosses the northern part of the county, and the Chicago, South Bend and Northern Indiana, which enters in the northeastern part, near Hudson Lake, and makes a loop through the central part of the county, taking in Rolling Prairie, Laporte, Waterford and Michigan City.

HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.

When the early missionaries and traders and trappers came to this county, they found the country in possession of the Pottawatomie Indians, the same tribe that held sway in St. Joseph County. The members of this tribe were not hostile to the new comers and readily accepted the religious teachings and customs which were given them. It was probably this friendly attitude of the Pottawatomies toward the white man that caused this northern part of the State to become so quickly settled.

The first settlements are believed to have been made about the years 1828-1829 in what are now New Durham and Hudson townships. The first immigrants came from New York, Pennsylvania and other eastern States. Among the names associated with early settlement we find those of Henry Clyburn, Asa M. Warren, Joseph Bay and Joseph W. Lykins.
The hardships and privations that usually accompany the settlement of a new country were their common lot. It is said, however, that this country did not pass through the usual interim between savagery and civilization, where men have to defend themselves and families with a rifle and to resort to strategic measures to maintain their rights. They who came to these parts were generally well educated, and being of a law abiding and thrifty class soon provided themselves with everything conducive to their interests and the interests of the community at large.

The forests were gradually cleared and the vast stretches of prairie land put under cultivation. The rudely constructed log hut gave place to the small frame cottage, and more modern agricultural implements supplanted the wooden plow and other inefficient tools. School and other public buildings were constructed, and good roads took the place of Indian trails.

The sale of the Michigan Road lands occurred in the fall of 1831, and at the end of the Black Hawk War settlements were more readily made. History tells us that in some of the townships nearly all the Government lands were taken up by 1835.

In the year 1832, on January 9th, Laporte County was formed and organized. The county as it was first formed did not contain the southwestern projection, which now includes Cass, Hanna, Dewey and Prairie townships, but was more regular in outline, being nearly square in shape. The addition of these four townships and the irregular projection of Wells and Lincoln townships was made about ten years after the county's organization. By this addition the size of the county was increased about one hundred square miles.

Corn, wheat and oats were the important crops of the early days, as they are now. Potatoes, beans and garden produce were raised to a large extent, especially on the sandy soils. Before the advent of the railroads, in the late thirties, it was difficult to dispose of the surplus wheat and produce, and we learn from a recent history of the county that in 1838, 200,000 surplus bushels of wheat were produced in that season.

Where the supply exceeded the demand, as it did at this time, extensive preparation was not necessary and rude implements were sufficient for ordinary purposes. Such was doubtless the belief of the average farmer, and it is perfectly natural that little or no progress should be made with such conditions existing.

With the coming of the railroads, things were changed. Not only was a means given for transportation of produce to markets in
the east, but population increased and with it a demand for grain and other things to support life. It was evident that intensive methods should be practiced, that increased facilities and more improved machinery should be had in order to work to the best advantage. All these things slowly but surely came.

Within the last fifty years great progress has been made in the agricultural line, until now Laporte County ranks among the first in production and land value. Probably no other county in the State contains so much good land as is found in the prairies of the central and southern parts of this county.

Great interest in agricultural pursuits is manifested in the county. An agricultural society was formed as long ago as 1841 for the purpose of holding annual fairs and thus promoting general interest in the science of farming. These fairs have been held almost every year since the organization of the society. The Grange is an educational and social society which was organized in 1874. Farmers institutes are held during the winter season, and well known and accomplished agriculturists are usually procured to address the meetings.

Geology and Physiography.

Laporte County, like St. Joseph County, lies in the glaciated territory. The thickness of the glacial debris varies considerably in different parts of the county, as the following data will show: A boring made at Michigan City, some years ago, showed the drift at this place to be 250 feet deep, one at Laporte gave the depth as 295 feet, while a boring at Lacrosse found the depth to be only 38 feet. The average depth, it will be seen, is about what would be expected in this region, but at Lacrosse and other places along the Kankakee River it falls somewhat below the average.

The surface features are much more varied in this county than they are in the county to the east. Here the surface is diversified with sand dunes, sand ridges, morainic hills, level to rolling prairie land, and reclaimed marsh land. The areas occupied by each of these physiographic features are quite uniformly distributed through the territory and their boundaries may be easily traced.

The most prominent elevations in the county are found in the morainic belt which enters the county a little north of the town of Westville and extends in a northeasterly direction to the borders of St. Joseph County. The hills continue at about the same elevation in a northeasterly direction to near Rolling Prairie; they then
turn southeastward, taking in almost all of the northern part of Willis Township. Near Laporte, the greatest elevation is attained, being 800 feet above tide. The breadth of the belt is about six miles at the widest place.

The high crest of this ridge is the watershed of the county. North of the crest the drainage is toward Lake Michigan; south of it, the streams flow into the Kankakee River and thence into the Mississippi.

Extending northward from the morainic belt, which is known as the Valparaiso moraine, are found a number of sand ridges descending gradually to the north. These ridges extend through the northwestern part of the county, nearly parallel with the lake shore, and are believed to be the former shore lines of Lake Michigan. The ridges, of which there are five in number, are about one-half mile apart and vary in height from 30 to 225 feet above the lake.

Along the immediate shore of Lake Michigan are several mounds or hills of fine light colored sand which have been formed from the wind-swept sand of the lake. These mounds, which are known as sand dunes, are scattered along the shore in great irregularity. Some are low and rounded, while others have been heaped up so that their sides lie at an angle of nearly sixty degrees. The height varies from 30 to 175 feet. One of these hills, known as "Hoosier Slide," is situated on the lake shore at Michigan City. Its height was formerly about 175 feet, but much of the sand has of late years been shipped away and it is now only about 75 or 100 feet above the surface of the lake. The ridges and hills next to the water are nearly destitute of vegetation, but back some distance from the lake they are often covered with small pines and scrub vegetation peculiar to a light soil of this kind.

South of the morainic ridge and extending with a gradual descent as far south as the Kankakee River is a broad, gravel outwash plain. This plain is about 810 feet above tide at Laporte, 770 feet at New Carlisle in St. Joseph County, 760 feet at Wellsboro, and 730 feet at Wanatah. The plain includes the vast prairie lands of the central and south central parts of the county and the reclaimed lands bordering the river.

"The head water portion of the Kankakee River leads through a gravel plain which descends toward the river from the moraines on either side. On the north side, the gravel plain connects with the Valparaiso morainic system, while on the southeast it connects
with the Maxinkuckee moraine of the Saginaw lobe. In the vicinity of Laporte, Indiana, the gravel plain which is connected with the Valparaiso morainic system attains an elevation of 800 feet above tide on the immediate borders of the moraine. This great altitude, however, is apparently maintained for only a short distance, for the railroad surveys show that there is a descent in it along the border of the moraine, both toward the northeast and the southwest, as well as a descent in passing southeastward from the moraine to the Kankakee River.*

The altitudes of various points taken from a list of elevations compiled by the Chicago, Indianapolis and Louisville R. R. are given in the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>Feet Above Tide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Michigan City</td>
<td>617.8</td>
</tr>
<tr>
<td>Otis</td>
<td>747.3</td>
</tr>
<tr>
<td>Westville</td>
<td>788.0</td>
</tr>
<tr>
<td>Alida</td>
<td>781.4</td>
</tr>
<tr>
<td>Haskels</td>
<td>767.0</td>
</tr>
<tr>
<td>Lacrosse</td>
<td>680.0</td>
</tr>
<tr>
<td>Wanatah</td>
<td>732.2</td>
</tr>
</tbody>
</table>

Elevations compiled by the Grand Trunk Western R. R.:

<table>
<thead>
<tr>
<th>Location</th>
<th>Feet Above Tide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mill Creek</td>
<td>698.2</td>
</tr>
<tr>
<td>Stillwell</td>
<td>741.0</td>
</tr>
<tr>
<td>Kingsbury</td>
<td>740.0</td>
</tr>
<tr>
<td>Union Mills</td>
<td>747.0</td>
</tr>
</tbody>
</table>

The natural drainage system of Laporte, especially in the southern part, is not very well developed. No large streams are found within the territory, although the Kankakee River forms the southern boundary. Trail Creek and its tributaries, which flow north into Lake Michigan, is the principal drainage system north of the divide. The Brown and Warwick ditches have been constructed to drain the depressions and ponds in Springfield and Galena Townships.

The streams south of the divide are Little Kankakee River, Trans Creek, Hog Creek, Kingsbury Creek and Mill Creek. Numerous dredge ditches have also been constructed in the southern townships and along the old marsh land.

The Kankakee, which was formerly a sluggish stream flowing southwestward from the St. Joseph County line and forming the southern boundary of this county for some distance, has been dredged and its channel straightened. A few years ago this stream

would overflow its low banks and spread far out over the level prairie lands which bordered its channel, making them appear as one great morass. All this wet and swampy land has been drained and the waters of the river flow freely through a well-defined channel.

Kankakee River after dredging and straightening. Laporte County.

CLIMATE.

The climatic conditions of this county are slightly affected by the influence of Lake Michigan; but as will be seen the temperature and precipitation do not differ materially from that of St. Joseph and other northern counties.

Mean Normal Monthly Temperature and Precipitation for a Period of Eleven Years.

<table>
<thead>
<tr>
<th>Month</th>
<th>°F</th>
<th>Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>25.3</td>
<td>2.50</td>
</tr>
<tr>
<td>February</td>
<td>21.9</td>
<td>2.53</td>
</tr>
<tr>
<td>March</td>
<td>37.2</td>
<td>3.49</td>
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<tr>
<td>April</td>
<td>46.3</td>
<td>2.30</td>
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<tr>
<td>May</td>
<td>59.1</td>
<td>4.02</td>
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<tr>
<td>June</td>
<td>68.5</td>
<td>3.11</td>
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<tr>
<td>July</td>
<td>73.8</td>
<td>3.66</td>
</tr>
<tr>
<td>August</td>
<td>71.1</td>
<td>3.19</td>
</tr>
<tr>
<td>September</td>
<td>64.6</td>
<td>3.21</td>
</tr>
<tr>
<td>October</td>
<td>53.5</td>
<td>2.43</td>
</tr>
<tr>
<td>November</td>
<td>39.5</td>
<td>2.50</td>
</tr>
<tr>
<td>December</td>
<td>26.8</td>
<td>2.52</td>
</tr>
</tbody>
</table>
A record of twelve years shows the average date of first killing frost in autumn to be October 5th, and last in spring May 1st. The earliest date of killing frost in autumn is September 14th; latest date of killing frost in spring, May 21st.

**Agriculture.**

Laporte ranks as one of the leading agriculture counties in the State. It has within its boundaries a comparatively small area of sandy soil, which may not come up to the standard for general crops, but its vast expanse of rich prairie soil and reclaimed marsh land by far makes up for the shortcomings of the lighter type.

The kind of farming carried on is mostly of a general character, although truck farming on the sand land is becoming of considerable importance and promises to increase extensively. In the neighborhood of Michigan City the sandy soil is well adapted to the growth of small fruits, of which huckleberries and raspberries are the most important. Watermelons and cucumbers are also well adapted to this kind of soil and are grown extensively. Transportation facilities are very good and a ready market is always to be had in Chicago and other nearby cities.

The following statistics for 1909 show the acreage and the average yield of the principal crops of this county: Corn, 42,732 acres, average 29 bushels per acre; wheat, 30,393 acres, average 20 bushels per acre; oats, 26,204 acres, average 31 bushels per acre; timothy hay, 19,644 acres, average 17-10 tons per acre; alfalfa, 18 acres, average 1 1-5 tons per acre; clover, 3,061 acres, an average of about one ton per acre; and 9,664 acres of marsh or prairie hay, an average of about one ton per acre.

Of the special crops, potatoes and onions are probably the principal ones. Statistics show that there were 2,868 acres cultivated to potatoes in 1909, with an average yield of 92 bushels per acre. On the lighter soil in the northern part of the county, especially in Springfield, Cool Spring, and Center townships, the yield is much greater than the above average, in some years 200 to 250 bushels being considered a fair estimate. Onions are grown extensively, especially on the muck areas in the southern part of the county. Extensive onion cultivation is carried on in Hanna Township, the largest patch devoted to this crop being just outside the town of Hanna on the farm managed by W. H. Tuesburg. In 1909 there were 21 acres in this county cultivated to this crop with an average yield of about 322 bushels to the acre.
There are two thousand, five hundred and thirty-six farms in this county, varying in extent from less than three acres to over 1,000 acres. According to the thirteenth census of the United States, there are four farms of less than three acres and three farms of more than one thousand acres. There are seven hundred and fourteen farms varying from 100 to 174 acres, which seems to be about the average size of most of the farms throughout the county.

About 30 per cent. of the farms of the county are occupied and tilled by renters. The land is rented on the share basis, the owner receiving one-half the grain, delivered at the nearest market. Hired help is usually secured at $20 to $30 per month.

The total valuation of farm lands for the year 1910 was $8,617-290 with a valuation on the buildings of $1,459,160. The above figures, however, represent only 50 per cent. of the actual value.

The farmers are progressive and prosperous. What mortgages are held against the farms are being rapidly paid off, which is a good indication of the financial standing of the community.
Soil Survey of St. Joseph County.

By E. J. Quinn.

LOCATION AND DESCRIPTION OF THE AREA.

St. Joseph County is situated in the extreme north central part of the State, and is one of the northernmost tier of counties bordering on the Michigan State line. It is bounded on the west by La-Porte County, on the east by Elkhart County, on the south by Marshall and Starke counties, and on the north by the State of Michigan. The county comprises an area of five hundred and sixty square miles, being twenty-four miles in length from east to west, and having an average width of about twenty-one miles.

The territory is divided into thirteen civil townships—Warren, Olive, German, Clay, Harris, Portage, Penn, Greene, Center, Liberty, Lincoln, Union and Madison.

South Bend, the county seat, was laid out by Alexis Coquillard and Lanthrop M. Taylor on the 28th of March, 1821. It is located on the south bend of the St. Joseph River and from this derives its name. The population of this city was in 1910, 53,684, an increase of 17,685 over 1900. The Studebaker Wagon Works, the Oliver Chilled Plow Works, Birdsell Manufacturing Company, South Bend Watch Factory, and numerous other world-famed enterprises make this one of the most important commercial cities in the State. The best of facilities are offered for education in this city. A good high school and a number of private schools are located here. The University of Notre Dame and St. Mary’s Academy, two of the most noted educational institutions in the country are situated about two miles from the city.

Mishawaka, with a population of 11,886, is another important city of this county, situated about four miles east of South Bend. Other principal towns are Walkerton, North Liberty, River Park, New Carlisle, Lakeville, Osceola, and Wyatt.

The transportation facilities for this county and the surrounding country are excellent. The country is traversed by the Lake Shore and Michigan Southern; Grand Trunk Western; Michigan
Central; Vandalia; New Jersey, Indiana and Illinois; Chicago, Indiana and Southern; Cleveland, Cincinnati, Chicago and St. Louis; Montpelier and Chicago steam roads, and the Chicago, Lake Shore and South Bend and Chicago, South Bend and Northern Indiana traction lines.

Good deposits of gravel are found throughout the county, especially in the northern part. All of the principal roads of the county have been graveled, and many of the side roads. With the abundance of such fine road-building material, more of this work should be done.

Pit of Glacial Gravel, 2½ miles northwest of South Bend.

**HISTORY OF SETTLEMENT AND AGRICULTURAL DEVELOPMENT.**

The territory that now comprises St. Joseph County was the first in the State to be traversed by the white man. Tradition and history tell us that Father Marquette, the French missionary, came here as early as 1675, while LaSalle in his tour of exploration passed up the St. Joseph River about four years later. The country was inhabited at this time by the Miami and Pottawatomie Indians, and these two tribes remained in the locality until the year 1832, when a treaty was made and the last of their possessions were ceded to the Government.

Two years prior to the treaty of 1832, a great tide of immigration set in from the eastern States and it was deemed necessary by
the State authorities to organize the territory as a county. Accordingly, on January 29, 1830, by an act of the General Assembly, St. Joseph County was duly formed and organized.

The development of the county progressed rapidly. The facilities for travel afforded by the St. Joseph River and the great Michigan Road, which was completed in 1832, attracted many immigrants to this part of the State. Along the great State Road, settlements were readily made, but often the productive soil of the prairie induced many to leave the much traveled thoroughfare and to settle there, where the soil was more easily cultivated and where luxuriant grass afforded excellent grazing to their horses and cattle.

One of the large drainage ditches which are frequently seen both in Laporte and St. Joseph County.

The crops which were first grown were those which would meet the immediate demands of the family. Corn, wheat and potatoes were the leading crops. Corn was grown usually two years in succession, then followed by wheat. Often corn was the principal crop and was grown continuously for years without any system of rotation.

Gradually the forests were cleared and the low-lying lands or marshes drained. These reclaimed lands proved to be most productive and induced further work along this line. For years this question of drainage was of utmost importance in the minds of the farmers. What was formerly utterly useless land, useless and unproductive because of continual wetness, has by a well regulated system of ditching and tiling been redeemed and is now
considered the most productive soil in the county. Not only has the drainage of this land brought money to the hands of the farmer, but it has done far greater good by ridding the country of much stagnant water. These low lying lands with their confined marsh water were ideal breeding places for the mosquito and malaria germs, but drainage did away with such a state of affairs and health conditions thereby improved.

The rude methods of carrying on agriculture that were employed in the early days are no longer to be seen here. Scientific farming has forged to the front, and it is uncommon to find a farmer who is not willing to take advantage of opportunities offered for advancement in this line. Many of the farmers or their sons attend the special sessions held at Purdue, Illinois and other agricultural schools. Several agricultural societies have been formed and yearly farmers' institutes are held during the fall or winter season. The county fair was a great attraction for many years, but these were discontinued in 1872. The Scientific Agricultural League is a farmers' association that has been but recently formed in this county. This society has for its object "the study of scientific farming and the promotion of things pertaining thereto." Scientific road building, farmers' short courses and institutes, and improvement of the rural school system are other things to be taken up for consideration by the members of this league.

CLIMATE.

Climatic conditions are favorable for growing all the leading crops of the State. A record of the average temperature and rainfall of this region for the past fifteen years is given in the following table:

<table>
<thead>
<tr>
<th>Month</th>
<th>Temperature °F</th>
<th>Precipitation Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>25.2</td>
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<td>21.8</td>
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<td>October</td>
<td>53.3</td>
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<tr>
<td>November</td>
<td>39.5</td>
<td>2.80</td>
</tr>
<tr>
<td>December</td>
<td>27.9</td>
<td>2.98</td>
</tr>
</tbody>
</table>
Reports for the past fifteen years show the earliest date of killing frost in autumn to be September 20th, and the latest date of killing frost in spring to be May 28th. The average date of the first killing frost in autumn is October 12th, and the last in spring is May 5th. On the prairie land and low lying muck beds of the county, frosts often occur much later in the spring and earlier in fall than is shown by the dates above.

Physiography and Geology.

The surface features of this county are those characteristic of all the northern counties of the State. The entire county is covered with drift material brought by the great ice-sheet as it passed southward. No where in the county were any outcrops of stratified rock found, and borings show that many feet of glacial material overlie the rock floor. The drift varies in depth from 50 to 200 or more feet and is composed of a mixture of clay, sand and gravel. Large granite boulders were a noticeable feature in the morainic areas. Some years ago a boring made near South Bend showed the drift here to be 160 feet deep, but this boring was made in the valley of the St. Joseph River which lies considerably lower than the morainic uplands surrounding it. The surface features vary from low, level prairies and marsh land to morainic hills and rolling upland. The hills south of the cities of South Bend and Mishawaka and the elevations extending from about one mile northeast of South Bend in a general northeasterly direction into the State of Michigan plainly show the result of the ice action in this vicinity. The northwestern part of the county is also crossed by morainic hills and uplands which mark the southeastern margin of the Michigan ice lobe.

These morainic hills with their confused mass of land, clay and gravel were deposited with great irregularity and between the knolls which were thrown up water readily accumulated to form small lakelets. St. Joseph County is noted for its numerous small and beautiful lakes, but many of these are becoming extinct. Marsh land and muck areas now mark the location of many of these former small bodies of water. Many or all of the prairies of this county were once the site of shallow lakes, but by drainage their waters were removed.

On either side of the Kankakee River the land is somewhat lower than it is farther back, and extensive marshes once extended from just southwest of the city of South Bend to the Laporte County
line. Most of these marshes are now a thing of the past, for a large acreage of this land has been reclaimed. Steam dredges have been used to dig wide, open ditches wherever the depressions of the area needed to be drained of their excess water. Laterals have also been constructed and from these secondary ditches, both open and underdrain, branch out in every direction.

The drainage of the county is principally through the St. Joseph and Kankakee rivers. St. Joseph River rises in the State of Michigan and enters the county in Section 9, Penn Township. This river flows through the old Kankakee valley in a southwesterly direction until it reaches a point near South Bend; here it turns abruptly north and flows through the old channel of the Dowagiac River to Niles, Michigan, and thence to Lake Michigan by a later eroded channel.

There are only a few small tributaries within the county which empty into the St. Joseph River. A State ditch extending through Clay and Harris townships is the main outlet for the surface waters of the northeastern part of the county. The western and southern parts of the county are drained into the Kankakee, the principal tributary being Grapevine Creek. A line drawn from the eastern part of the county about four miles south of the St. Joseph River and extending west to a point a little to the west of south of the city of South Bend, thence northwest through Warren Township, marks the watershed of this part of the county. North and north-
east of this line the waters flow to the northward into the St. Joseph River, and finally reach the Gulf of St. Lawrence and the Atlantic Ocean. South and southeast of this line the waters flow to the southeast through the Kankakee and by the Illinois into the Mississippi and thence into the Gulf of Mexico.

AGRICULTURAL CONDITIONS.

St. Joseph County is an agricultural county, with few superior in the State. The soils are well adapted to all the leading crops of this latitude and, with suitable climatic conditions, favorable yields can always be expected. Good markets for the produce are to be found in the cities of South Bend and Mishawaka. Chicago is about 86 miles from South Bend and also furnishes an excellent outlet for the produce of the county.

The farmers of the area are prosperous and have fine homes and buildings. The houses are well built, well painted, and usually modernly equipped. The total valuation of farm buildings, according to the report of the State Board of Tax Commissioners for 1911, is $1,380,120, and the true value of lands $6,505,420.

General farming is the usual type followed, although dairying and truck-farming are becoming of great importance. This county ranks among the first in the State in the number of milch cows and the production of milk. In 1909, the average number of cows milked was 8,212. The total value of dairy products for this same year was $559,462.

Truck-farming is being carried on more extensively every year. On the sandy soil, potatoes, melons and small fruits are the principal crops, while on the muck area onions, celery and cabbage receive the most attention. Both South Bend and Mishawaka are growing rapidly, and with the increase in population there is a resulting increase in demand for special crops, such as fruit and vegetables.

Corn and wheat are the principal crops of the county. Corn does well, especially on the black prairie soil and on the "clay" land in the southern part of the county. According to agricultural statistics, the average number of bushels to the acre in the year 1908 was 20; in 1909, 32. The average yield of wheat is about 18 bushels per acre, but the yield for the past year will fall far below this estimate. Considerable damage has been done of late years by the Hessian fly. The crop does not do well on the low-lying lands, as it is usually affected by the late frosts in the spring.
Among the minor crops, cucumbers and onions are the most important. Cucumbers are largely grown on the sandy soils and are sold at the salting stations, several of which are scattered through the county. The price usually paid is 75 cents a bushel for the small size and 35 cents a bushel for the larger ones. The different grades are sorted in the field by the pickers and then delivered at the station. Onions are grown chiefly on the muck areas. Two hundred and thirty-nine acres were devoted to this crop in 1909.

Clover was formerly grown with great success, but of late years it has been found hard to secure a good stand. In 1908 there were 20,072 tons of clover hay raised on 18,884 acres, and in 1909, 8,632 tons produced on 7,515 acres. Cowpeas have taken the place of clover to some extent in the sandy areas. This legume has been found of great value on these lands both as a forage and manurial crop.

Alfalfa is beginning to be an important crop in the county. It has been grown successfully on nearly every type of soil in the territory providing the ground was properly prepared beforehand. Most farmers lime their soil heavily and then inoculate with earth taken from a good alfalfa field. A few have had success with this crop without the preliminary work of liming and inoculation, but it was invariably found that the natural condition of the land in regard to drainage and fertility were exceptionally good.

The mint industry has become one of great moment in this county within the last few years. On the muck soil it may be grown for six or seven years in succession without any rotation, although it is very exhaustive to the upland soil. The land to be used for peppermint is plowed in the fall and harrowed in the spring. The small roots are placed in shallow furrows, then covered with the mucky soil and this in turn treading and packed firmly down. The rows are made about 30 inches apart, so as to allow room for cultivation. It is necessary to keep the field free from weeds as it is believed they injure the crop by contaminating the oil. In August or September, when in full bloom, the herb is mowed with the scythe and is then dried and hauled to the distillery. The price of peppermint oil varies nearly every year. In 1899, it brought 75 cents a pound; in 1902, the oil was rather scarce and brought as high as $4.75 a pound. Good prices have prevailed in the last few years and as a result a great increase in cultivation of this crop has been made. The yield varies from 12 to 50 pounds per acre.
Commercial fertilizers, as a general thing, are not used to such an extent as they are in the counties farther south. Barnyard manure is quite plentiful and ordinarily is the only kind of fertilizer used on the high ground. Potash salts are used on the muck areas with good results. On the sandy areas where the land is very porous, fertilizers are readily leached out and great care should be taken in selecting a fertilizer for this land so as to get one that will act quickly and readily yield its plant food.

Liming as a manure and as a means of improving the physical condition of the soil is generally understood. The soils in this county are as a general thing quite sour, especially the prairie lands, which are exceedingly rich in organic matter. Large quantities of crushed limestone are used, but a few prefer the caustic lime which acts quicker. The latter is not to be recommended, however, as it tends to exhaust the soil. The amount of crushed limestone usually applied is two tons to the acre. This is applied as evenly as possible, either by hand or by a spreader especially constructed for the purpose.
SOILS OF LAPORTE AND ST. JOSEPH COUNTIES.

SOILS.

The soils of both Laporte and St. Joseph counties are of glacial origin, having been formed from material as originally deposited or after being modified by wind and water.

St. Joseph County has nine distinct types, while Laporte has eleven. All the light soils have been classed in the Coloma or Miami series, but where organic matter has entered into the makeup of the soil to any great extent, so as to impart a dark brown or black color to the material, they have been classed in the Carrington and Waukesha series. Muck, dune sand and Kankakee marsh land soil are the additional types found in this territory and do not enter into the above two classes.

Variations occur among the general types, due to better tillage or perhaps to some other local causes, but these variations occur only in small areas and mention can only be made of them in the general discussion.

CARRINGTON LOAM.

The Carrington loam covers most of the territory in the southeastern part of St. Joseph County and is also found in Olive Township in St. Joseph County and in Galena and Hudson Townships in Laporte County.

The surface soil of this type to a depth of 12 inches is dark brown or dark gray in color and of a loamy texture. The subsoil from 12 to 36 inches is heavier in texture and lighter in color, becoming yellowish or brownish gray, often mottled or stained with iron oxide. Both surface and subsoil contain a high percentage of fine sand, while in places considerable gravel is encountered at a depth of two to three feet. The subsoil also contains a higher percentage of silt than the surface soil. Scattered over the surface of this soil are found many granitic boulders of various shapes and sizes.

There are small areas throughout the type which are quite sandy, especially on the higher elevations. One of these narrow sandy streaks in Madison Township, St. Joseph County, extends through Sections 13 and 14 northward through Sections 35 and 36. This was not a continuous ridge but is broken here and there and appears to lose itself in the “clay” land, only to appear again a little farther on. These sand patches are readily noticeable in the growing season, due to the scantiness of the vegetation upon them.
The soil of this type has been derived from glacial till, the deep subsoil consisting of sand, gravel, clay and boulders. The topography varies from gently rolling to almost hilly in places, while here and there scattered throughout the area are found numerous depressions—the sites of former ponds and lakes.

Part of the areas included under the head of Carrington loam was once heavily timbered, but very little of the original timber now remains. The black color of the soil is due to its rich humus content, derived from the leaf mold and decayed grasses which once covered its surface.

Although the subsoil contains a high percentage of fine sand, it nevertheless is compact and requires to be artificially drained before good results can be looked for. Artificial drainage with tile has been carried on extensively in both Madison and Union townships, St. Joseph County, and a number of open ditches have also been constructed to remove the surplus waters of the depressions and muck areas which abound in this locality. Because of this compactness of subsoil, this type probably suffers less from drought than any other soil in the territory. Outside of the Carrington sandy loam, this type is considered the best all around soil of the two counties.

If plowed when wet, the Carrington loam is hard to manage, as it turns up in clods which become compact and hard when dry. With proper care and sufficient tillage, however, it can be brought to an excellent state of productiveness. It is especially adapted for corn, oats and wheat. Timothy also does well on this type. Corn yields from 35 to 50 bushels; wheat, 18 to 25 bushels; oats, about 50 bushels, and timothy, from 1 to 2 tons.

The result of mechanical analysis of a typical sample of Carrington loam is given in the following table:

**Mechanical Analysis of Carrington Loam.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S. W. Corner Sec. 35 T. 36 N. R. 4 E.</td>
<td>Soil...</td>
<td>.3</td>
<td>.8</td>
<td>6.0</td>
<td>25.0</td>
<td>34.0</td>
<td>13.3</td>
<td>20.2</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>.0</td>
<td>.2</td>
<td>9.3</td>
<td>20.8</td>
<td>27.1</td>
<td>26.7</td>
<td>20.7</td>
</tr>
</tbody>
</table>
SOILS OF LAPORTE AND ST. JOSEPH COUNTIES.

Chemical Analysis of Carrington Loam.

Collector, Quinn.

Description ................................................... 28-3
Reaction to litmus ............................................ Neutral
Moisture in air dried soil ..................................... 1.24%
Total soil nitrogen ............................................ 0.112%

Analysis of fine soil dried at 105° C.—

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile and combustible</td>
<td>3.27%</td>
</tr>
<tr>
<td>Insoluble in 1.115 HCl</td>
<td>88.94%</td>
</tr>
<tr>
<td>Soluble silica (SiO₂)</td>
<td>0.13%</td>
</tr>
<tr>
<td>Ferric oxide (Fe₂O₃)</td>
<td>1.63%</td>
</tr>
<tr>
<td>Alumina (Al₂O₃)</td>
<td>4.01%</td>
</tr>
<tr>
<td>Phosphoric acid anhydride (P₂O₅)</td>
<td>0.40%</td>
</tr>
<tr>
<td>Sulphuric acid anhydride (SO₃)</td>
<td>0.06%</td>
</tr>
<tr>
<td>Calcium oxide (CaO)</td>
<td>0.28%</td>
</tr>
<tr>
<td>Magnesium oxide (MgO)</td>
<td>0.36%</td>
</tr>
<tr>
<td>Potassium oxide (K₂O)</td>
<td>0.15%</td>
</tr>
<tr>
<td>Sodium oxide (Na₂O)</td>
<td>0.27%</td>
</tr>
<tr>
<td>Total</td>
<td>99.50%</td>
</tr>
</tbody>
</table>

**Waukesha Sand.**

The soil of the Waukesha sand is a dark brown or reddish brown sand, containing a small percentage of clay and silt. The color becomes lighter at a depth of about 10 inches, the subsoil proper being a yellow sand with a lower content of silt and clay. Often gravel is found scattered through the soil and subsoil.

In the depressions and lowlands, the soil of this type becomes much deeper and its humus content higher. These patches are usually more productive than the upland, and are cultivated to the fullest extent by those who own them.

The material is derived from the reworking of glacial till by wind and glacial waters. The effect of wind action is plainly visible and to this agency is due, to no little extent, the topographic features of the type.

The type is found principally in the southwestern part of St. Joseph County, covering parts of Lincoln and Liberty townships. There are a few areas in Laporte, but they are small and scattered. The monotony of the sandy soil is frequently broken by muck and marsh land, this being especially true in the southwestern extremity of St. Joseph County.

The soil is light and easily tilled, but is apt to dry out quickly. Drainage is quite excessive, and crops often suffer from lack of moisture.
The greater part of the area is under cultivation. Corn, wheat, and rye are extensively grown, but with only fair yields. Corn will average 35 bushels; wheat, 15 bushels, and rye, about 15 bushels to the acre. Potatoes yield from 50 to 100 bushels per acre.

The growing of cowpeas and soy beans should be encouraged on this soil, so that the organic matter content will be increased and the soil thereby be better able to withstand the drought.

A mechanical analysis of a typical sample of the Waukesha sand follows:

**Mechanical Analysis of Waukesha Sand.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. W. Cor. Sec. 28, T. 35 N., R. 1 E.</td>
<td>Soil...</td>
<td>1.0</td>
<td>.4</td>
<td>8.6</td>
<td>34.7</td>
<td>37.0</td>
<td>13.7</td>
<td>4.4</td>
</tr>
<tr>
<td>Subsoil.</td>
<td></td>
<td>.2</td>
<td>7.5</td>
<td>9.4</td>
<td>34.4</td>
<td>38.1</td>
<td>6.9</td>
<td>3.4</td>
</tr>
</tbody>
</table>

**Kankakee Marsh Land Soil.**

This soil is peculiar in so much as it varies continuously in respect to its sand and organic content. Because of its varying character and since it has not been identified by the United States Bureau of Soils under a distinct type-name in the latest classification, it has been thought best to retain the old name of Kankakee marsh land and to speak of the soil that comes within the confines of the old undrained area as Kankakee marsh land soil.

Generally, this soil is a sandy, silty loam, with a very high percentage of organic matter, either wholly or partly decomposed. The sand particles themselves are white, but the large amount of decayed vegetable matter and dark silt make the whole appear black. Often the sand and silt are absent and only the vegetable matter is found. Where such is the case, and where it was found expedient, such places have been included under the type of Muck. These mucky spots were usually encountered at the beginning of the old marsh near South Bend and along the borders on either side of the marsh throughout the two counties. On the higher elevations, which were doubtless islands in this great marsh at one time, the soil is rather deficient in sand and organic matter, especially the former, but contains a high percentage of silt and clay. The soils of the whole type are very changeable, being nearly as variable as the main uplands in the remaining parts of the territory.
The surface soil, if it can be designated as such, is ordinarily 15 to 18 inches deep. Beneath this is a whitish sand containing little or no organic matter. Often when boring with the auger a blue clay was encountered at a depth of 24 to 36 inches, while in other places the clay would be found nearer the surface, with little sand intervening.

The valley through which the Kankakee River now flows was formed by a post glacial river, and for a time constituted a line of discharge for the St. Joseph River. By some movement of the glacial ice and its load of material, the course of the waters flowing through the St. Joseph was changed and the amount of discharge through the old post glacial valley greatly decreased. Coupled with this decrease in volume was the small gradient of the stream. At Momence, Illinois, a rock formation obstructed the discharge, causing the waters to be backed up over the level lands along the borders of the river, and making the stream aggrade its bed. This aggradation still further checked the flow of the Kankakee, filling its valley with heavy sedimentation. Where the water was not very deep, aquatic vegetation rapidly encroached from the sides. These plants began to decay and, together with the wash from the uplands, gradually filled the stream and started the formation of the marsh soil of the present time.

This type sets in a short distance southwest of South Bend and extends, with an average width of about two miles, through to the Laporte County line. Here it cuts the southeastern corner of Laporte and extends along the southern part in a southwesterly direction to Porter County. The city limits of South Bend now extend to this former marsh land, but the soil here is mostly a deep muck, to a depth of three feet or more, with little sand and clay in evidence.

Much of this land has been drained and is now being cultivated. The work of drainage has been undertaken by syndicates and private individuals. Where this system has been carried on extensively, so as to include both large and secondary ditches, the land has been brought to an excellent state of productiveness and the large yields of corn and wheat will compare with any in the State for both quality and quantity.

It is hard for one to conceive of the great benefits that have been derived from the reclamation of these lands. Hundreds and hundreds of acres which formerly were covered with water for the greater part of the year, are now dry and cultivated. Houses have
been erected and roads have been built on land that but a few years ago was accessible only to the hunter with his boat; and land that was practically of no value has been transformed into the most valuable in the county.

The topography is comparatively level. Back away from the river, on either side at a distance of from one-eighth to one mile, the higher land begins, gradually getting higher until the morainic hills are approached.

Hemp Farm, St. Joseph County, on reclaimed Marsh.

Truck crops, such as onions, cabbage and celery, do well on this soil, and are extensively grown. Transportation facilities are good along the river, and produce can easily be disposed of. This "Garden of Chicago," as it has been called, will doubtless continue to be a favorite soil for this class of farming, although good crops of corn, wheat and timothy are grown. Excellent crops of corn are produced, the yields often being 75 or 80 bushels per acre. Frosts in the spring sometimes do some injury, but corn planted as late as June 10th has matured. There are two large hemp farms
situated within this type, one of these having 450 acres devoted to the crop. Where drainage is not complete, great quantities of marsh hay are grown, and in 1909 over 10,000 tons of this wild hay were harvested in the two counties.

This land generally sells in the neighborhood of $75 or $100, but much of it is not for sale at $150. The price depends upon the extent the land has been drained and the improvements, such as buildings, fences, etc.

The following table gives the result of mechanical analyses of the Kankakee marsh land soil:

**Mechanical Analysis of Kankakee Marsh Land Soil.**

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S. E. Cor. Sec. 35, T. 33 N., R. 4 W.</td>
<td>Soils</td>
<td>.3</td>
<td>.0</td>
<td>1.3</td>
<td>20.2</td>
<td>49.6</td>
<td>19.6</td>
<td>7.0</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>.0</td>
<td>.4</td>
<td>1.8</td>
<td>45.7</td>
<td>30.0</td>
<td>10.0</td>
<td>9.0</td>
</tr>
<tr>
<td>N. E. Cor. Sec. 4, T. 33 N., R. 3 W.</td>
<td>Soils</td>
<td>1.7</td>
<td>1.1</td>
<td>7.4</td>
<td>35.6</td>
<td>29.2</td>
<td>17.5</td>
<td>7.4</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>1.5</td>
<td>.6</td>
<td>6.4</td>
<td>45.5</td>
<td>30.6</td>
<td>12.0</td>
<td>3.2</td>
</tr>
</tbody>
</table>

**Chemical Analysis of Kankakee Marsh Land Soil.**

Collector, Quinn.

Description ................................................... 178-a
Reaction to litmus ............................................ Neutral
Moisture in air dried soil ................................... 1.40%
Total soil nitrogen ........................................... 0.268%

Analysis of fine soil dried at 105° C.—

- Volatile and organic ......................................... 6.27%
- Insoluble in 1.115 HCl ..................................... 89.46%
- Soluble silica (SiO₂) ....................................... 0.05%
- Ferric oxide (Fe₂O₃) ....................................... 0.92%
- Alumina (Al₂O₃) ........................................... 1.85%
- Phosphoric acid anhydride (P₂O₅) ......................... 0.60%
- Sulphuric acid anhydride (SO₃) .................. 0.07%
- Calcium oxide (CaO) ...................................... 0.46%
- Magnesium oxide (MgO) ................................... 0.23%
- Potassium oxide (K₂O) .................................. 0.07%
- Sodium oxide (Na₂O) .................................. 0.23%

Total ....................................................... 100.21%
COLOMA SAND.

The sand is very similar to the Waukesha sand, heretofore described, but occupies a more rolling topography and is lighter in color.

The surface soil to a depth of 10 to 15 inches is a light brown, slightly loamy sand, containing a small percentage of fine gravel. The contact between the soil and subsoil is, as a rule, not very well marked, the texture and color remaining about the same to a depth of 36 inches.

The topography varies from undulating to hilly. Often on the hills and higher elevations the sand becomes very light and fine, and would be classified and mapped as a new distinct type if the areas were large enough to warrant such separation. A few small areas or pockets of gravel are also found throughout the type.

The Coloma sand is by no means considered a superior soil for general farming, but is well suited to small fruits and vegetables. Truck crops are particularly adapted to a light soil of this kind and most farmers in the area realize the fact. The soil warms up early in the spring, causing the crops to mature in time for a profitable market. Good markets are to be had in South Bend, Mishawaka, Laporte and Michigan City.

Little commercial fertilizer is used on this soil. Probably the thing most needed is a liberal supply of vegetable matter and good barnyard manure. This would not only enrich the soil but would make the light sand more retentive of moisture. This sand being so light, is shifted about by the winds considerably and until the humus content is increased, little benefit will be derived from fertilizers by him who uses them.

Vegetables and fruit receive the most attention on this soil, although corn and rye are grown to some extent. Cowpeas are an important crop, both as a forage and a manurial crop. Clover is grown, but of late years it has been hard to get a good stand, owing to it being burned out. Alfalfa has been grown quite successfully on the lower lying land, where the clay and humus content are high, but little attention has been paid to it on the higher ground.

The following table shows the result of mechanical analysis of the Coloma sand:

<table>
<thead>
<tr>
<th>Material</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand</td>
<td>80</td>
</tr>
<tr>
<td>Gravel</td>
<td>10</td>
</tr>
<tr>
<td>Clay</td>
<td>10</td>
</tr>
<tr>
<td>Humus</td>
<td>5</td>
</tr>
</tbody>
</table>
SOILS OF LAPORE AND ST. JOSEPH COUNTIES.

MECHANICAL ANALYSIS OF COLOMA SAND.

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. E. Cor. Soc. 14, T. 38 N., R. 3 E.</td>
<td>Soil..</td>
<td>.1</td>
<td>.4</td>
<td>4.5</td>
<td>36.9</td>
<td>38.9</td>
<td>13.6</td>
<td>6.3</td>
</tr>
<tr>
<td></td>
<td>Subsoil.</td>
<td>.7</td>
<td>1.0</td>
<td>5.5</td>
<td>44.2</td>
<td>37.2</td>
<td>6.6</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Chemical Analysis of Coloma Sand.

Collector, Quinn.

Description ................................................... SS9-a
Reaction to litmus ............................................ Neutral
Moisture in air dried soil .................................... 0.78%
Total soil nitrogen ........................................... 0.102%

Analysis of fine soil dried at 105° C.—

Volatile and organic .......................................... 2.72%
Insoluble in 1.115 HCl ....................................... 92.36%
Soluble silica (SiO₂) ....................................... 0.09%
Ferric oxide (Fe₂O₃) ........................................ 1.24%
Alumina (Al₂O₃) ............................................... 2.18%
Phosphoric acid anhydride (P₂O₅) .......................... 0.58%
Sulphuric acid anhydride (SO₃) ............................. 0.05%
Calcium oxide (CaO) .......................................... 0.31%
Magnesium oxide (MgO) ....................................... 0.20%
Potassium oxide (K₂O) ....................................... 0.10%
Sodium oxide (Na₂O) ......................................... 0.18%

Total ......................................................... 100.01%

COLOMA SANDY LOAM.

This type of soil is found in both counties, associated with the other sands and fine sands of the Coloma series. The line of demarcation between the sandy loam and the sand is often not well defined, and only an arbitrary separation was possible in mapping the different types of this series. The surface soil of the Coloma sandy loam, to a depth of 10 or 12 inches, is a grayish brown loamy sand underlain to a depth of 36 inches with a material coarser in texture and containing varying amounts of gravel. The line of separation between the soil and subsoil is usually well pronounced, as the color of the underlying material is much lighter and its texture considerably coarser.

The Coloma sandy loam has been formed from glacial material reworked by water and wind. As a general farming soil, it is con-
sidered to be very good and is well adapted to truck crops. The crops grown are those ordinarily grown on the Coloma sand, but the yields are much better than on the latter type. The surface configurations are also similar to those found in the Coloma sand area. Because of its irregular features and light and porous nature, it is naturally well drained.

The same treatment and care recommended for the other sandy soils of the area will also apply to the Coloma sandy loam. A liberal incorporation of green manurial crops is necessary. It has also been found that commercial fertilizer, relatively high in phosphoric acid, are very beneficial.

Chemical Analysis of Coloma Sandy Loam.

Collector, Quinn.

<table>
<thead>
<tr>
<th>Description</th>
<th>172-a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction to litmus</td>
<td>Neutral</td>
</tr>
<tr>
<td>Moisture in air dried soil</td>
<td>1.39%</td>
</tr>
<tr>
<td>Total soil nitrogen</td>
<td>0.132%</td>
</tr>
</tbody>
</table>

Analysis of fine soil dried at 105° C.—

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile and organic</td>
<td>4.27%</td>
</tr>
<tr>
<td>Insoluble in 1.115 HCl</td>
<td>87.70%</td>
</tr>
<tr>
<td>Soluble silica (SiO₂)</td>
<td>0.23%</td>
</tr>
<tr>
<td>Ferric oxide (Fe₂O₃)</td>
<td>1.64%</td>
</tr>
<tr>
<td>Alumina (Al₂O₃)</td>
<td>4.59%</td>
</tr>
<tr>
<td>Phosphoric acid anhydride (P₂O₅)</td>
<td>0.45%</td>
</tr>
<tr>
<td>Sulphuric acid anhydride (SO₃)</td>
<td>0.04%</td>
</tr>
<tr>
<td>Calcium oxide (CaO)</td>
<td>0.28%</td>
</tr>
<tr>
<td>Magnesium oxide (MgO)</td>
<td>0.38%</td>
</tr>
<tr>
<td>Potassium oxide (K₂O)</td>
<td>0.17%</td>
</tr>
<tr>
<td>Sodium oxide (Na₂O)</td>
<td>0.24%</td>
</tr>
<tr>
<td>Total</td>
<td>99.99%</td>
</tr>
</tbody>
</table>

Muck.

Muck consists of black or dark brown decomposed organic matter, varying in depth from six or eight inches to three feet or more. The subsoil varies and appears to depend considerably upon the material which makes up the surrounding upland. In a few places the underlying material is a whitish sand, but ordinarily a blue-white sandy clay is encountered.

The type is found in nearly every township in St. Joseph County and is also well developed in Hanna and Springfield townships, in Laporte County. Besides the muck of the upland soil, there is considerable of this type found in the Kankakee valley bordering
the river. Many of the small lakes of both counties are bordered by embryo muck beds, with their heavy growth of water-loving plants.

All of these muck areas are low lying, and it is the general belief that they mark the site of old lakes, which became filled by the wash of the uplands and the slow accumulation of organic remains. Natural drainage is very poor, and until these beds are artificially drained they are of little agricultural value. Considerable work along this line has already been done, but there are areas of this type that can never be profitably cultivated.

These lands were once of no value except for the little hay and pasturage they furnished, but now large yields of cabbage, onions, celery and peppermint are derived from them. The selling price of such lands is as high as $150 per acre, and as their value as truck soils becomes more recognized they will, without doubt, demand a still higher price.

Farmers that have a considerable area of this kind of soil, or even enough to affect the value of their farm, are particularly anxious to bring it to a state of cultivation and production. Commercial fertilizers are used quite extensively, especially for truck crops. Such fertilizers are usually selected that have a high potash content, as it is believed this element is most needed on these soils. Wood ashes are used to some extent. Liming with crushed limestone and caustic lime has been tried, but seems to have little effect.

A few farmers were found who hauled the muck of their lowlands onto the upland clay. It was believed by those who tried this experiment that good results were obtained and that the increase in yield of corn and wheat was well worth the labor of hauling. In certain cases, the reverse might be profitably done, but the labor would hardly justify such an action.

These muck lands it is believed improve with age and cultivation. When first drained, most of the material is still undecomposed, much of it being in the form of peat. Such a confused mass allows the moisture to rapidly pass through, to be drained off into the tile or open ditches, and it is then unable to bring the moisture again to the surface when needed. After being cultivated and cropped for one or two years, the peat and vegetable matter become more decayed and mixed with soil, thus giving to it more body and weight, and consequently greater power to conserve the required amount of moisture.

After a rain, this soil becomes soft and sticky, but it does not
require very long for the sun to shine on the dark surface, before it is dry. When drying, the material contracts considerably, and large cracks are often formed over the surface, but these are of little consequence and are readily filled in with cultivation.

A factory has been started at Lakeville, St. Joseph County, for the purpose of utilizing the muck from one of the large areas located near that town. The muck is used as a fertilizer filler and in making briquets. The analysis of this muck has shown a very high percentage of nitrogen and is thought to be a valuable material as a filler. Large standing orders were on hand last summer for both the briquets and the filler, and it was found necessary to furnish the plant with more modern machinery in order to supply the demand.

**MICAMI LOAM.**

The soil of the Miami loam is from eight to 12 inches deep, and varies in color from a light grayish brown to a brown. One would ordinarily call this a "clay" soil, but mechanical analysis shows it to fall short of this class. The subsoil from 12 to 20 inches is a yellowish brown loam of heavier texture than the surface soil, often approaching a clay loam. Sometimes at a depth of 20 to 24 inches, gravel and coarse sand are encountered, but the loam usually extends to the three-foot limit. The light color of the surface soil is due to the small percentage of organic matter.

This type is not confined to any one part of this territory, but is most extensively found in St. Joseph County bordering the Carrington loam, in Union and Liberty Townships. In Laporte County, the Miami loam is associated with the Miami clay loam, and, because of their similarity, it is often hard to find where the one begins and the other ends.

The surface features of the Miami loam vary from gently rolling to hilly. One of the pictures accompanying this report gives a good idea of the physiographic features of this type. Large bowlders are frequently found scattered over the surface, but are not so numerous as to impede cultivation to any extent.

The Miami loam is of glacial origin, having been formed by the weathering of glacial till. Much of this type represents morainic material as originally deposited.

This soil is not difficult to cultivate, but like the Carrington loam will clod badly if plowed when wet. The natural drainage is better than the Carrington loam, owing to the more porous nature of the subsoil and to the irregular features of the surface. Kettleholes are seen throughout the area. Most of these depressions
are dry the greater part of the year and are marked by a much
darker soil than that of the uplands.

General farming is practiced on this type almost exclusively. 
Corn, wheat and oats are the principal crops. Corn will average 
about 45 bushels, oats 40 bushels, and wheat 18 bushels per acre. 
Timothy does well and will yield about one or one and one-half 
tons per acre.

Commercial fertilizers are used to some extent, but it is the 
belief that a complete fertilizer, i.e., one having the “2-8-2 for-
mula,” or two per cent. nitrogen, eight per cent. phosphoric acid 
and two per cent. potash, does the work better than any other. 
Stable manure gives the best results, as it not only adds the ne-
cessary plant food but increases the organic matter, thus improving 
the physical condition of the soil.

The following table shows the results of mechanical analysis of 
the Miami loam:

**MECHANICAL ANALYSIS OF MIAMI LOAM.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S. E. Cor. Sec. 35, T. 36 N., R. 3 E.</td>
<td>Soil</td>
<td>.0</td>
<td>.0</td>
<td>.8</td>
<td>8.0</td>
<td>14.7</td>
<td>57.0</td>
<td>19.1</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>.1</td>
<td>.2</td>
<td>5.0</td>
<td>8.7</td>
<td>10.0</td>
<td>58.4</td>
<td>15.3</td>
</tr>
</tbody>
</table>

**Chemical Analysis of Miami Loam.**

Collector, Quinn.

Description ................................................... 55-a
Reaction to litmus ........................................... Neutral
Moisture in air dried soil ................................... 0.93%
Total soil nitrogen ........................................... 0.0099%

Analysis of fine soil dried at 105° C.—

Volatile and combustible ...................................... 3.31%
Insoluble in 1.115 HCl ....................................... 89.48%
Soluble silica (SiO₂) ........................................ 0.17%
Ferric oxide (Fe₃O₄) .......................................... 1.62%
Alumina (Al₂O₃) ............................................... 3.79%
Phosphoric acid anhydride (P₂O₅) ............................ 0.47%
Sulphuric acid anhydride (SO₃) ............................... 0.05%
Calcium oxide (CaO) .......................................... 0.44%
Magnesium oxide (MgO) ...................................... 0.42%
Potassium oxide (K₂O) ...................................... 0.14%
Sodium oxide (Na₂O) ......................................... 0.26%

Total ......................................................... 100.15%
Carrington Sandy Loam.

The Carrington sandy loam, generally to a depth of 12 or 14 inches, is a dark brown or black, silty, sandy loam, containing a high percentage of fine sand and organic matter. From 14 to 18 inches the material becomes lighter in color, being a yellowish brown sandy loam, gradually grading into a sandy, gravelly clay of a dark gray color, mottled with iron rust.

This type was originally covered with prairie grass, and to the decomposition of this vegetation is attributed the high organic content of the soil. Here and there scattered over the prairie land were groves of burr-oak, maple and elm. The former location of these groves may now be readily distinguished by the lighter color of the soil upon which they grew.

The surface of the Carrington sandy loam varies from level to slightly undulating or rolling. Natural drainage is fairly good wherever the subsoil is of sand and gravel, but where clay is the underlying material artificial drainage is necessary. There are a few sandy, gravelly knolls where the drainage is excessive, but the main phase of this type is fairly well able to retain its moisture.

Much of this type was formerly covered with water, due to the backing up of the waters of the streams that now flow through or near the comparatively low and flat areas which represent the type. The shallow lakes and ponds thus formed became filled with sediment and decayed vegetable matter, and remained as a great marsh until they were drained. This is particularly true of the prairies of St. Joseph County, for within only comparatively recent years Terre Coupee and Harris prairies were covered in whole or in part with water for much of the year. Perhaps the coarser and more sandy nature of the prairies of Laporte County is due to the longer time that they have been exposed to the elements, and because a much longer period has elapsed since conditions were favorable for increasing the organic content. Although primarily these areas were made up of soil of glacial origin, they have been modified greatly by water and plainly show the presence of their alluvial matter.

This type of soil includes the extensive prairies of both counties. Door Prairie and Rolling Prairie are the largest in Laporte County, and Terre Coupee and Harris prairies occupy the greater part of the type in St. Joseph County. Although the soil of all these prairies is practically the same, there are a few variations due to local conditions, such as drainage, nature of adjacent upland, and methods
of cultivation. Mechanical analysis has shown the soil of Harris Prairie to contain more fine sand than the others, due no doubt to the wind swept sand from the northern part of the county.

No soil is more prized in either of the two counties than the Carrington sandy silt loam of the prairies. Because of its loose and granular character, the soil is easily tilled and no hills occur to interfere with cultivation. No rocks, and very few large stones are to be seen in the area.

On account of its rich and mellow character, and its power to withstand droughts, it is well suited to most crops of this latitude. Corn, wheat, hay, oats, clover and vegetables are grown, but corn, oats, and hay are the leading crops. The native vegetation is prairie grass, much of which is still harvested in the poorly drained places.

Fertilizers are not used extensively on this soil, barnyard manure being generally applied. The black soil is and has been very productive, but there is a decrease in the crop yields of late years where rotation has not been practiced and where little or nothing has been returned to the soil. As a general thing, this soil is sour, and a heavy application of crushed limestone would be found very beneficial. Most of the farmers practice some kind of rotation, but a few are still found who continue to crop their land with corn and wheat with no rotation of timothy or clover. Although this land is the best in the territory surveyed, and no doubt as good as any in the country, still fertilization and rotation must be considered or it too will in time be depleted like many of the other soils of our State.

The following table gives the result of mechanical analysis of the Carrington sandy loam:

<table>
<thead>
<tr>
<th>Locality</th>
<th>Description</th>
<th>Fine Gravel</th>
<th>Poor Sand</th>
<th>Medium Sand</th>
<th>Fine Sand</th>
<th>Very Fine Sand</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Southern part Sec. 30, T. 36 N., R. 3 W.</td>
<td>Soil</td>
<td>.4</td>
<td>.3</td>
<td>1.9</td>
<td>8.6</td>
<td>17.9</td>
<td>50.3</td>
<td>20.0</td>
</tr>
<tr>
<td>Subsoil</td>
<td>.3</td>
<td>.1</td>
<td>5.6</td>
<td>17.2</td>
<td>28.0</td>
<td>34.2</td>
<td>9.2</td>
<td></td>
</tr>
</tbody>
</table>
Chemical Analysis of Carrington Sandy Loam.

Collector, Quinn.

Description ................................................... 78-a
Reaction to litmus ............................................ Neutral
Moisture in air dried soil .................................... 1.51%
Total soil nitrogen ............................................. 0.248%

Analysis of fine soil dried at 105° C.—

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile and combustible</td>
<td>7.02%</td>
</tr>
<tr>
<td>Insoluble in 1.115 HCl</td>
<td>85.04%</td>
</tr>
<tr>
<td>Soluble silica (SiO₂)</td>
<td>0.13%</td>
</tr>
<tr>
<td>Ferric oxide (Fe₂O₃)</td>
<td>1.89%</td>
</tr>
<tr>
<td>Alumina (Al₂O₃)</td>
<td>3.99%</td>
</tr>
<tr>
<td>Phosphoric acid anhydride (P₂O₅)</td>
<td>0.39%</td>
</tr>
<tr>
<td>Sulphuric acid anhydride (SO₃)</td>
<td>0.08%</td>
</tr>
<tr>
<td>Calcium oxide (Ca²⁺)</td>
<td>0.41%</td>
</tr>
<tr>
<td>Magnesium oxide (MgO)</td>
<td>0.35%</td>
</tr>
<tr>
<td>Potassium oxide (K₂O)</td>
<td>0.16%</td>
</tr>
<tr>
<td>Sodium oxide (Na₂O)</td>
<td>0.25%</td>
</tr>
<tr>
<td>Total</td>
<td>99.71%</td>
</tr>
</tbody>
</table>

Coloma Gravelly Sandy Loam.

There is probably no soil found throughout the territory more varied in texture and topographic features than this type. The surface soil is usually composed of a light brown, sandy, gravelly material to a depth of 10 inches, underlain to a depth of 36 inches by a gravelly sandy subsoil. Sometimes very little gravel is found in either soil or subsoil, and the material approaches a loam or almost a clay loam.

The type occupies a rolling to a hilly part of the country and is derived from glacial till. There are a number of large bowlders strewn over the surface of this soil, but they are not so numerous as to interfere with cultivation.

The type, except for the large quantities of small stones and gravel throughout the soil and subsoil, often appears very much like the Coloma loam, and in the south central part of St. Joseph County where the two occur, some difficulty was encountered in separating the areas. Besides being found quite extensively through the central part of St. Joseph County, the type is also well developed in the northwestern part, south of New Carlisle, and extending westward into Laporte County.

As an agricultural soil, this can only be spoken of as fair. The crops most commonly grown are corn, wheat and hay. Probably
this type, especially the rougher phase of it, would bring better returns if used for pasturage. The soil is well adapted to fruit, and most farmers have their own home orchards for supplying their needs in this line.

Because of the irregularity of the surface features and the gravelly subsoil, natural drainage is very good, but often excessive. Crops, especially on the hills, suffer during a hot spell, and frequent rains are needed to make crops yield anywhere near what they should. The soil between the knolls and hills is considerably darker in color and is deeper than that on the higher land. When boring in the uplands, it was impossible often to get below eight or 12 inches with the auger, but in the depressions usually no gravel was struck down to a depth of three feet.

The following table gives the result of mechanical analysis of the Coloma gravelly sandy loam:

**Mechanical Analysis of Coloma Gravelly Sandy Loam.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>S. E. Cor. Sec. 3, T. 37 N., R. 1 W.</td>
<td>Soil... 16.9</td>
<td>.8</td>
<td>9.9</td>
<td>47.6</td>
<td>8.1</td>
<td>6.5</td>
<td>10.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Subsoil 2.8</td>
<td>.6</td>
<td>11.6</td>
<td>62.8</td>
<td>9.6</td>
<td>3.1</td>
<td>9.3</td>
<td></td>
</tr>
</tbody>
</table>

**Miami Clay Loam.**

The Miami clay loam is a light colored, usually a yellowish gray, soil eight to 12 inches deep. The subsoil is a yellowish, more compact material, containing small stones and gravel. In the localities where this type is found it is usually spoken of by the farmers as "white clay."

The Miami clay loam is not found extensively in either county, but occurs in small areas in the western and north central part of Laporte, particularly well developed in Cool Spring and the northern part of New Durham townships. The type enters the county in two small strips and extends in a northeasterly direction to the north central part of the county, where it becomes mixed and confused with the Coloma gravelly sandy loam and the darker Carrington loam.

The general features vary from gently rolling to hilly. In the more level areas, the type is fairly uniform, but near the small creeks and streams, the surface is badly cut up, and the hills, with
their whitish yellow soil, present a striking contrast to the dark lands of the valleys and depressions. In the vicinity of Otis*, a small town in the northern part of New Durham Township, the surface becomes very rough and broken, and considerable washing and gullying has taken place on the hills. The confused mass of clay, silt, sand and gravel which makes up this type is of glacial origin, and represents the product of weathered glacial material. There are a number of igneous stones and boulders found on the surface, and in boring with the auger, stones were encountered in the subsoil. In the deep subsoil, is found the boulder clay, typical of the underlying material of this type.

In the rougher sections, drainage is very good, but tile drainage is required in the more flat and level parts.

The type was once heavily timbered, but few wooded areas now remain. It would have been much better had the rougher areas been left timbered, as little farming in the way of field cultivation can be carried on, on the slopes now. In the rough portions, dairying could be carried on profitably, as the soil is well suited to blue grass, and would furnish excellent pasturage. Fruit, especially apples, could be grown successfully on soil of this kind, but little interest has been taken in this line.

On the more level areas, wheat, oats and corn are the principal crops. The soil is well adapted to wheat, and a large acreage is devoted to the crop. Hay yields well, timothy averaging about one and one-half tons to the acre.

This, like the other soils of the Coloma and Miami series, is in great need of humus. The heavy application of barnyard manure and the turning under of green manurial crops will doubtless do more for the soil than anything else that can be done. Commercial fertilizers are all right in their place, but the physical conditions of all soils deserve first consideration; and then if plant food needs to be added it can be done later.

Mention was made above of the black soil of the valleys. Ordinarily this type would be classified as a distinct type, but as the areas are too small to map on a scale of one inch to the mile, it was thought best not to make a separate classification but to include it under the Miami clay loam.

This soil is about 14 inches deep, of a dark gray color, very compact and stiff and often hard to manage. The dark color is due to the high percentage of organic matter. To the large quantity of

* The Valparaiso Moraine passes through Otis.
humus and its high clay and silt content are attributed to the stiff and cohesive properties of the soil when wet. This black, stiff soil is sometimes called "gumbo" by the farmers.

If handled when dry the soil may be brought to an excellent state of tilth and good crops of corn, hay and oats may be produced.

The following table gives the result of mechanical analysis of the Miami clay loam:

**Mechanical Analysis of Miami Clay Loam.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. W. Cor. Sec. 16, T. 37 N., R. 4 W</td>
<td>Soil</td>
<td>.1</td>
<td>.2</td>
<td>6.7</td>
<td>.0</td>
<td>3.1</td>
<td>13.6</td>
<td>47.7</td>
</tr>
<tr>
<td>Subsoil</td>
<td>.0</td>
<td>.1</td>
<td>.8</td>
<td>6.5</td>
<td>32.0</td>
<td>40.3</td>
<td>19.8</td>
<td></td>
</tr>
</tbody>
</table>

**Dune Sand.**

The material that makes up this soil is a whitish, silicious sand, very fine grained and light in weight. Because of its porous nature and excessive drainage, it is of little agricultural value. The type occupies hillocks and ridges bordering Lake Michigan, especially in Michigan and northwestern part of Cool Spring townships in Laporte County. None of this type is found in St. Joseph County, but the finer particles of the Coloma sand, after having been blown and drifted about, often appear very much like the typical dune sand, both in form and appearance.

The light sand is continually changing its position and consequently allows little chance for vegetation to get a start. About the only growth found on the hills is small pine and scrub trees.

Back from the lake, a little farther, where the sand becomes more loamy, small fruits, especially huckleberries, do well. Melons are grown and are of a very superior quality.

The following table gives the result of mechanical analysis of the dune sand.

**Mechanical Analysis of Dune Sand.**

<table>
<thead>
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<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. E. Cor. Sec. 30, T. 38 N., R. 5 W</td>
<td>Soil and Subsoil</td>
<td>.0</td>
<td>.0</td>
<td>.4</td>
<td>10.1</td>
<td>89.2</td>
<td>.3</td>
<td>.0</td>
</tr>
</tbody>
</table>
The Coloma fine sand is very much similar in appearance to the
Coloma sand, but is finer in texture. It is nearly as fine grained as
the typical dune sand around Lake Michigan, but is more loamy in
texture. The type occupies a rolling and hilly country and is found
principally in LaPorte County, in a narrow strip extending parallel
with Lake Michigan.

The type has been derived from the reworking of glacial ma­
terial by wind and water. Most of this sand marks the former
short lines of Lake Michigan when the lake extended father inland.

Because of its open character and its rolling and irregular sur­
face features, drainage is excessive. Crops often suffer from
drought, especially on the higher land. The crops to be grown
should be carefully selected, as the soil is too light for general
farming. Potatoes, wheat, rye, and small fruits are the principal
things cultivated, but during a wet season, corn yields fairly well.
The lower lands and depressions contain more organic matter and
are much more productive than the higher land.

The following table gives the result of mechanical analysis of
the Coloma fine sand:

### Mechanical Analysis of Coloma Fine Sand

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. W. Part Sec. 2, T. 37 N., R. 4 W.</td>
<td>Soil...</td>
<td>2.5</td>
<td>.5</td>
<td>3.0</td>
<td>28.6</td>
<td>47.5</td>
<td>13.1</td>
<td>14.5</td>
</tr>
<tr>
<td></td>
<td>Subsoil...</td>
<td>2.9</td>
<td>1.2</td>
<td>3.5</td>
<td>25.6</td>
<td>53.1</td>
<td>10.4</td>
<td>3.7</td>
</tr>
</tbody>
</table>
Soil Survey of Bartholomew County.

By E. J. QUINN.

LOCATION AND AREA.

Bartholomew County is situated in the south central part of the State. It is bounded on the north by Johnson and Shelby counties, on the east by Decatur and Jennings, on the south by Jackson and Jennings counties, and on the west by Brown County. It comprises an area of approximately 256,000 acres, or 400 square miles. There are fourteen civil townships in the county—Ninevah, Union, Harrison, Jackson, Ohio, German, Flat Rock, Haw Creek, Columbus, Clay, Clifty, Sand Creek, Rock Creek and Wayne.

The only city in the county is Columbus. The principal towns are Hope, Hartsville, Elizabethtown, and Jonesville. Columbus, the county seat, had a population in 1910 of 8,813. It is situated on the P., C., C. & St. L. and C., C., C. & St. L. steam roads and Indianapolis, Columbus and Southern traction line. The city is well located and furnishes a market place and trading center for the farmers of the surrounding country. Numerous manufacturing establishments are situated here. There are two agricultural implement factories, three brick and tile mills, two carriage and wagon factories, canning factory, flour, woolen and planing mills, structural iron works, two tanneries and several smaller industries.

Hope, a town in the northeastern part of the county, has a population of 1,223. It is located fourteen miles northeast of Columbus, on the C., C., C. & St. L. Railroad. One brick and tile mill, carriage and wagon factory, canning factory, two flour and grist mills, and a planing and sawmill are the industries of the town.

Hartsville is another town in Haw Creek Township, and has a population of 358.

Jonesville, a small town situated on the P., C., C. & St. L. in Wayne Township, lies in the fertile bottoms of East White River, and affords a good trading center for this region.

Elizabethtown, in the southeastern part of the county, has a population of 250. Clifford, South Bethany, Ogleville, Taylorsville, and Waymansi ville are other small villages in the county.
HISTORY AND AGRICULTURAL DEVELOPMENT.

The territory which now comprises Bartholomew County, was up to the year 1818 in the possession of the Delaware Indians. By a treaty made in that year, the land was given over to the whites. About two years later, the tide of immigration began pouring in and settlers came from Virginia, New York, North Carolina and Kentucky. In the early history of the State this county formed a part of Delaware and Jackson counties and was organized as Bartholomew County under an act of Legislature approved January 8, 1821.

The first settlements were made north of the present site of Columbus, on what is now locally known as the Haw Patch. The sand area in the south central part was also readily taken up. Not until ten or twelve years later did the western part of the county attract any of the new comers. The soil with its rich humus accumulation for many years required little care. Vast areas of timberland were cleared and cultivated for corn, potatoes and other vegetables. Where such lands began to show signs of growing less productive, new areas were cleared and these in turn cultivated. The cut timber was the source of income for many years, and it was not until the forests began to be well cut off that the lumber industry gave place to more intensive farming.

CLIMATE.

The following table was compiled from the 1910 report of the Weather Bureau Station at Columbus:

<table>
<thead>
<tr>
<th>Normal Monthly Temperature and Precipitation.</th>
<th>Temperature °F</th>
<th>Precipitation Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Month</td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>29.1</td>
<td>3.18</td>
</tr>
<tr>
<td>February</td>
<td>29.9</td>
<td>3.02</td>
</tr>
<tr>
<td>March</td>
<td>41.2</td>
<td>3.73</td>
</tr>
<tr>
<td>April</td>
<td>52.3</td>
<td>2.92</td>
</tr>
<tr>
<td>May</td>
<td>62.7</td>
<td>3.25</td>
</tr>
<tr>
<td>June</td>
<td>71.9</td>
<td>3.64</td>
</tr>
<tr>
<td>July</td>
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<td>2.87</td>
</tr>
<tr>
<td>August</td>
<td>73.7</td>
<td>3.48</td>
</tr>
<tr>
<td>September</td>
<td>67.2</td>
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<td>54.4</td>
<td>2.33</td>
</tr>
<tr>
<td>November</td>
<td>42.3</td>
<td>3.33</td>
</tr>
<tr>
<td>December</td>
<td>33.1</td>
<td>2.84</td>
</tr>
</tbody>
</table>

The records show that the average date of the last killing frost in the spring and the first in the fall for a period of sixteen years is 21--29153.
is April 26 and October 6 respectively. Latest date of killing frost in spring for this same length of time is May 21; for the earliest date of killing frost in autumn, September 14.

**Topography and Geology.**

The topography of the county varies greatly. In the western part the Knobstone formation is the prevailing type. From the weathering of this formation many hills or knobs have been formed which give to the locality a rough and broken surface. Nearly all of Jackson, Ohio, Harrison, Union and part of Wayne townships are covered with soil resulting, to a great extent, from the disintegration and erosion of this formation. Taylor’s Hill, Mt. Healthy and Dial Hill are some of the highest of these knobs. In Brant and Fuller’s history of Bartholomew County, the altitude of Taylor’s Hill is given at 1,003 feet above tide level and 360 feet above the city of Columbus. From this high point a magnificent view may be had of the surrounding country. Considerable sandstone has been quarried from the hill in past years, but of late it has not been worked to any extent.

The central portion of the county is comparatively level, much of it being made up of the rich bottom land of the East White River. Extending from the city of Columbus to the Shelby County line is the well-known Haw Patch, a level tract of land unexcelled in this county in productiveness and value.

From the level central plain, extending eastward to Decatur County is the “limestone upland.” The topography here can hardly be called hilly, but is more of an undulating or rolling character. Near the town of Hartsville and in the northeast part of Clifty Township, especially along Clifty Creek and its tributaries, are fine exposures of the heavy limestone of the Corniferous group. Here the most picturesque topography of the county, and it is said of the State, has been developed. Borings and examinations of outcrops along the creeks show the Corniferous limestone and Devonian shale to underlie the drift which covers nearly all of Clifty, Rock Creek, Clay and Haw Creek townships.

Geological maps show the glacial boundary to extend through the southwestern part of this county, cutting off a small section which ordinarily would be considered outside of the glacial territory. Evidences of ice action were found here, however, and with the exception perhaps of the highest knobs and ridges in Harrison and Union townships, the entire county was glaciated. The follow-
ing is taken from Frank Leverett's Water Supply and Irrigation Papers of the United States Geological Survey:

"The entire county was apparently glaciated, although the glacial boundary lies but little west from the front of the prominent hills on the county line. The portion of the county east of the East White River valley was nearly all covered by the later ice sheet, and a narrow belt along the west side of the stream in the north part of the county was also covered by that invasion. There remains, therefore, only a narrow strip on the southern and western borders of the county where the older sheet of the drift alone is present. There are morainic features along the borders of the East White River valley from the north line of the county southward to the vicinity of Columbus. There are also two well-defined moraines eastward and northeastward from this valley across the county. The southernmost one, which lies near the line of Bartholomew and Jennings counties, marks the southern limit of the later Wisconsin sheet of drift. The other lies near the borders of Clifty Creek. Each of these moraines has a breadth of two or three miles, but stand only 30 or 40 feet above the bordering plain.

The surface of the older drift in this county is generally plane. The thickness of the drift ranges from a mere trace to a deposit fully 100 feet in depth. Along the East White River valley there is a gravelly belt from two to five miles or more in width, and the morainic knolls just referred to appear in the midst of this gravelly district. Flat Rock valley also contains a broad gravel plain. In the remainder of the county the drift is mainly till. Very few deep wells occur, there being generally an abundant water supply within 35 or 40 feet of the surface."

**DRAINAGE.**

East White River, the chief water course, enters the county near Edinburg and flows in a general course southeast through the central part of the county. Just west of the city of Columbus the river, which is locally known as Driftwood to this point, unites with Flat Rock Creek and forms the east branch of White River.

The general slope of the western half of the territory is southeast, the principal streams being Big Ninevah, Catherine, and White Creeks. The tributaries on the east side are Haw Creek, Middle Fork, Fall Fork, Flat Rock and Clifty Creek.

From the map it will be seen that the natural drainage is well developed, but artificial means have to be resorted to on the flat
uplands in the eastern half of the county. The practice of tile drainage has been introduced and is being carried on extensively on every type of soil included in the county. Most farmers realize that this is necessary in order to derive the greatest benefit from manures and fertilizers.

According to the table of altitudes of the P., C., C. & St. L. Railroad, Columbus is 628.4 feet above tide; Edinburg, six miles north in Johnson County, 674.2 feet; Rockford, 10 miles south in Jackson County, 577.9 feet. From these altitudes, it can be seen that there is considerable fall from Edinburg to Columbus—almost eight feet to the mile—while from Columbus to Rockford the fall amounts to a little over five feet to the mile. These differences in gradient are readily noticeable in the velocity of the river in its course through the county. From Edinburg, the river runs south with a comparatively swift current, often confining itself to permanent banks on either side. Below Columbus and south toward Seymour and Rockford, the current becomes slow; the banks are low and are frequently overflowed, and extensive bottoms two or three miles wide have been developed. The valleys formed by the tributaries on the east and west of East White River are usually narrow with only small flood plains. Many of the smaller streams which flow through the Knobstone formation on the west have cut deep V-shaped valleys with little or no bottoms at all.

Agricultural Conditions.

The farmers of this area are intelligent and energetic and their homes and farm buildings are the finest to be found in the State. Fine schools and roads are found throughout the entire county. There is a considerable number of large farms owned in this county, although with increased population the farms are becoming smaller. The population of the county in 1880 was 22,777; in 1910, 24,813.

The value of farm land ranges from $10 to $300 an acre. Very few farms are sold for cash in the western part of the county, the property being usually exchanged for town property. The valuation, however, is usually placed at $10 to $35. Very few farms exchange hands in the central part; the farmers usually if they do not live there themselves rent their farms and move to town to enjoy the rich harvest which their land yields. The valuation of all the farm land according to the census of 1910 was $7,590,285.
Oats, corn and wheat are extensively grown, especially the latter two. Special crops of rye, Irish and sweet potatoes are grown, but only to a limited extent. A comparison of the statistics of 1880 and those of 1910 show a vast difference in the yield of the principal crops. This county in the year 1880 produced 568,708 bushels of wheat from 36,458 acres, or about 17 bushels to the acre; in 1909, it produced 720,563 bushels, an average of 14 bushels per acre. Corn, in 1880 averaged 45 bushels, 1,489,208 bushels being produced from 32,779 acres; in 1909 the same crop grown on 54,530 acres gave 2,093,400 bushels, or an average of 38 bushels. Only a small acreage is given to rye, buckwheat and barley. The acreage of tomatoes is increasing rapidly. In the year 1908 there were 369 acres cultivated for the crop; in 1909, over 3,130 acres. A large acreage of timothy is raised, yielding on an average of one and one-half tons to the acre. Clover, when cut for hay, will average about one and one-fourth tons per acre. Alfalfa has been experimented with and found to grow successfully on every type of soil in the county.

Fruit growing is becoming a leading industry in the Knobstone section. Many people, who live outside the hills, ridicule this part of the county and claim the soil is worthless. This is not true and many are beginning to realize that this "Brown County Edge of Bartholomew" is valuable as fruit land. A number of good size orchards were found in this section and where they had had careful management showed that the owners had invested well.

Dairying is not an important industry, although most of the farmers keep a few cows to supply their own needs. The lack of interest in this line is very noticeable. On the average farm the amount of manure is very small compared with what is necessary for the land. Much dependence is placed in commercial fertilizers and a great deal of this applied with little of an idea of what is required. On the river bottoms and sandy areas, very little fertilizer is used, the natural productiveness being sufficient at present to meet the requirements. The majority of farmers realize the value of clover as a fertilizer, but with the price of clover seed as it is, it seems to be a great temptation to cut the first crop for hay and to harvest the second for seed.

The benefits derived from crop rotation are generally understood. The system usually practiced, especially on the clay land, is clover, corn and wheat; on the bottoms, corn has always been the favorite crop, but of late years it has been found necessary to alter-
nate wheat and clover. Fairly good stands of clover can be secured on all the types of soil found in the area. Alfalfa growing should be encouraged, especially on the sandy soil north of the city of Columbus. This soil, because of its porous nature, is especially adapted to alfalfa culture.

A great difficulty encountered in the rough country west of East White River valley is soil erosion. At present, the washing of the surface soil and the exposure of the unproductive subsoil is a very important problem to be considered in this locality. Judicious cultivation is necessary to remedy the trouble. Crops should be selected that, during the winter and spring months, will not leave the ground exposed. Soil binding plants that will furnish pasturage or meadow land and at the same time enrich the soil are recommended. Blue grass or clover, when a stand can be secured, should be grown, or in extreme cases reforestation with black locust may be necessary. Under drainage should be encouraged, particularly on this land, as by this means the water can find an outlet in drainage channels instead of rushing over the surface.

**SOILS.**

The soils, representative of this county, are mostly of glacial origin, except in the western part of the territory, where they have been derived to some extent from the underlying sandstones and shales of the Knoebstone formation.

Roughly speaking, the east fork of White River, which flows through the central portion of the county from north to south, separates the more heavily glaciated area from the thinner deposits. The western townships lie in the loessial belt and the material has been mostly derived from glacial material, deposited either by wind or water. Granite and other igneous stones and small boulders, too heavy to have been carried by the wind, were found on some of the hills, clearly indicating that there must have been some other agency besides wind alone at work in conveying material to this region. From these observations, it is evident that water and perhaps ice brought material to the highest parts of the western hills.

Each type extends quite uniformly through the sections where it occurs, and with but a few exceptions has little variation from the typical phase. Wherever these variations occur, mention can be made of them in considering the main type in which they are found.
The Knox silt loam, to a depth of eight or 10 inches, is a light brown to ashy gray, silty material, containing a small percentage of fine sand. The subsoil, to a depth of 36 inches, is a pale yellow, compact silt loam or silty clay. Both soil and subsoil resemble each other in texture, but mechanical analysis shows the clay content of the subsoil to be higher than that of the surface.

The greatest variation or departure from the typical phase is found in the white soil, locally known as "white slash" land, south of Ogleville, in Ohio Township. Here the surface is more level and the natural drainage more poorly developed. After rains this material, which makes up the surface soil of these spots, appears to run together, forming a close, compact crust which, on drying, not only excludes the air, and therefore oxygen, but also interferes with capillary attraction, or the drawing up of the moisture from below. At a depth of two or three feet water is usually found and this wet condition makes the land cold and backward. This is an ideal home for the crawfish, and its presence is readily seen by the numerous white mounds which stud the surface.

The improvement of the physical condition is absolutely necessary before this soil can produce well. The addition of humus, either by application of a liberal supply of manure and straw or the plowing under of green crops, like corn, oats, or better still a legume crop like clover, will do much in improving the soil, as the earth will then become more loose and porous, thus allowing a circulation of air and a freer movement of the underground waters in working to the surface.

Excepting the small areas referred to above, the remainder of the type which covers most of Wayne, Jackson, Ohio, Harrison and Union townships is quite uniform. The material has been derived principally from loess, or wind and water deposited glacial material. On the higher hills and slopes, where the original soil has been removed or is very thin, the underlying sandstone and shales have contributed considerable to both soil and subsoil.

Very few stones are found throughout the area, except on the hills or along the streams where the sandstones and shales have been exposed and fragments of the formations have been broken off. Iron concretions are frequently found in the soil and subsoil of the upland areas, and in the beds of the smaller streams. Concretions which appear as gravel in the creek beds furnish an excellent material for road metal. A few glacial stones and boulders were found
in Ohio and Harrison townships, but nowhere were they found in any great number.

The Knox silt loam covers rather hilly upland, more broken near the streams and more hilly as the Brown County line is approached. As a rule, a line drawn north and south through the east middle part of Jackson, Ohio, Harrison and Union townships divides the hilly region from the more level and undulating. East of this line the land is rolling to nearly level, gradually sloping to the southeast. West of the line the surface features are very irregular, hills and deep valleys occupying the greater part of the territory. Taylor’s Hill, Dial Hill and Mt. Healthy are, as mentioned in the general description, some of the largest of these knobs and hills.

The land was once heavily timbered with poplar, beech, hickory, etc. Lumber was cheap at that time and much of the forests was cut and burned in order to make room for agricultural purposes. It is said that this land would be worth $200 an acre now if the original timber had been left or had been judiciously handled. As it is, many of the steep slopes which were once heavily wooded have been deprived of their thick growth and are now badly washed and gullied, the unproductive subsoil being exposed.

Corn, wheat and hay are the principal crops. Considerable of the rougher portions are devoted to pasturage. The soil is well adapted to fruit growing and the drainage and aeration could not be better. The only difficulty encountered in this industry is the poor facilities for transporting the product, but this obstacle is being overcome by the building of fine roads and pikes through the entire western part of the county.

The improvements on this type are the poorest in the county. Land is sold at prices ranging from $10 to $60 per acre, and some has been sold for even $8.

Very few of these farms are sold for cash, but are usually traded for farms in other parts of the county, or for town property. The low price of land and the inducements for fruit growing are attracting many new comers to these parts.

The following table gives the result of mechanical analysis of the Knox silt loam:
SOIL SURVEY OF BAROLOMEW COUNTY.

MECHANICAL ANALYSIS OF KNOX SILT LOAM.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Central part Sec. 20, T. 8 N., R. 4 E.</td>
<td>Soil</td>
<td>.1</td>
<td>.3</td>
<td>3.5</td>
<td>5.7</td>
<td>10.0</td>
<td>64.5</td>
<td>14.9</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>.9</td>
<td>.0</td>
<td>5.6</td>
<td>11.8</td>
<td>18.5</td>
<td>32.7</td>
<td>30.4</td>
</tr>
</tbody>
</table>

Chemical Analysis of Knox Silt Loam.

Collector, Quinn.

Description .......................................................... 131-a
Reaction to litmus .................................................. Neutral
Moisture in air dried soil ........................................ 1.31%
Total soil nitrogen ................................................ 0.115%

Analysis of fine soil dried at 105° C.—

Volatile and organic .............................................. 3.25%
Insoluble in 1.115 HCl .......................................... 85.01%
Soluble silica (SiO₂) ............................................ 0.44%
Ferric oxide (Fe₂O₃) ............................................. 2.71%
Alumina (Al₂O₃) ................................................... 7.48%
Phosphoric acid anhydride (P₂O₅) .............................. 0.39%
Sulphuric acid anhydride (SO₃) ................................. 0.03%
Calcium oxide (CaO) ............................................. 0.25%
Magnesium oxide (MgO) ........................................... 0.64%
Potassium oxide (K₂O) ........................................... 0.23%
Sodium oxide (Na₂O) ............................................... 0.27%

Total ................................................................. 100.70%

SIOUX LOAM.

The Sioux loam, to a depth of 12 or 14 inches, is a dark brown sandy loam, containing a small per cent. of gravel. The subsoil, to a depth of three feet, is ordinarily a yellowish, gravelly sandy loam, containing a higher content of clay than the surface soil, and having a higher percentage of fine gravel and small rounded stones. The soil is very loose and mellow and is easily cultivated.

The type is found principally in German, Columbus and Flat Rock townships, and is usually included in what is known as the Haw Patch land. When this area was first cleared, it is said the patch became covered with a dense growth of hawthorn (Crataegus Oxyacantha), and the territory was named by the early settlers after this shrub. The soil is of glacial origin, having been derived
from reworked glacial material, and represents a filled in valley or outwash plain where glacial waters once flowed.

The topography varies from level to slightly undulating. The drainage, because of the gravelly subsoil, is very good but often excessive. Crops often suffer during a dry season, but when climatic conditions are favorable and with an average amount of rainfall, no soil in the county will produce as well.

Commercial fertilizers are used to some extent, but as a rule are not necessary. The crops grown are corn, wheat, oats and timothy. Corn will average in a good year 50 bushels, wheat 25, oats 35, timothy $1\frac{1}{2}$ tons per acre. Because of its good drainage and its loose character, the Sioux loam is an early soil and well suited to market and truck crops. Frequent cultivation is necessary, whether it is used for general crops or for special purposes, as by this means a greater amount of moisture is conserved which otherwise would not be available.

The improvements on this type are the best in the county. Fine houses and barns, good fences and good roads are found throughout the area. The interurban line connecting Indianapolis and Louisville runs through the western portion of this area, and the P., C., C. & St. L. Railroad through the eastern portion. Very few farms exchange hands in this locality, but the price usually asked is $125 to $200 per acre. The rent for this land is mostly on the share basis, one-half the grain being usually demanded.

The following table gives the result of mechanical analysis of the Sioux loam:

<table>
<thead>
<tr>
<th>Mechanical Analysis of Sioux Loam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>N. E. Cor. Sec. 13, T. 9 N., R. 5 E...</td>
</tr>
<tr>
<td>Subsoil.</td>
</tr>
</tbody>
</table>

**Coloma Sand.**

The Coloma sand is found principally in Sand Creek Township and in the southeastern part of Columbus Township. There is also a narrow strip of this light soil extending in a northeastward direction, through Clay Township, as far north as the town of Nortonburg.
The surface soil, to a depth of eight or 10 inches, is a slightly loamy, brownish sand of rather fine texture. The subsoil, from 10 to 36 inches, is reddish brown sand of coarser material than the soil and also has less organic matter. In the lower lands and depressions, the soil becomes more loamy, has a higher organic matter content, and is more productive than that on the hills.

The Coloma sand is of glacial origin, having been formed from the residuary glacial till and subsequently modified and arranged by wind and water. The material which makes up this soil, when examined through a microscope, appears to be made up mostly of small, angular, and rounded quartz particles, each covered with smaller grains of silt and clay.

The surface features vary from gently rolling to hilly. Because of these irregular surface features and its light, porous nature, the soil is very susceptible to drought, and crops often suffer during a continued dry period. Addition of organic matter and frequent cultivation are to be recommended for these areas.

The crops usually grown are corn, wheat, oats and potatoes. In a favorable season, good average yields are obtained. This is probably the earliest soil in the county, even earlier than the Waukesha sandy loam in the northern part of the county.

Fertilizers are not used to any great extent. Considerable dependence is being placed on green manurai crops, especially soy beans and cowpeas. The effects of these crops help in a great measure to keep up the fertility of the soil.

Improvements on this type of soil are very good. The farmers are, as a rule, very prosperous, and are interested in all modern agricultural methods. Good roads abound through the area, and the interurban line running south from Columbus cuts the western portion of the type. Land sells at from $60 to $125 an acre.

The following table gives the result of mechanical analysis of the Coloma sand:

<table>
<thead>
<tr>
<th>LOCALITY</th>
<th>Description</th>
<th>Fine</th>
<th>Coarse</th>
<th>Medium</th>
<th>Fine</th>
<th>Very Fine</th>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Cent.</td>
<td>Sand</td>
<td>Sand</td>
<td>Sand</td>
<td>Sand</td>
<td>Sand</td>
<td>Per</td>
<td>Per</td>
</tr>
<tr>
<td>S. central part Sec. 22, T. 8 N., R. 6 E.</td>
<td>Soil</td>
<td>.5</td>
<td>.0</td>
<td>.7</td>
<td>32.1</td>
<td>43.7</td>
<td>10.8</td>
<td>12.1</td>
</tr>
<tr>
<td></td>
<td>Subsoil</td>
<td>.0</td>
<td>.0</td>
<td>1.1</td>
<td>41.9</td>
<td>47.1</td>
<td>3.9</td>
<td>5.9</td>
</tr>
</tbody>
</table>
The alluvial soils of this county have all been classed in the Wabash series.

There is some variation in the soil of these bottom lands, but ordinarily a silty, sandy loam is found in the immediate vicinity of the streams, gradually becoming more sandy at a distance. Although the area was formerly subject to great overflow, especially along White River below Columbus, there has been less trouble along this line during recent years, and it is only after excessive spring rains that floods are common. Along the larger tributaries on both the east and west side of White River, considerable damage is often done to fields and crops by the spring freshets. To eliminate this destruction as much as possible, dikes and breakwaters have been constructed along the creeks, wherever the danger from this source is greatest.

The soil of the Wabash sandy loam is usually a dark, sandy, silty loam to a depth of 12 or 15 inches. The subsoil, from 15 to 36 inches, is a sticky, sand loam, at times containing a great deal of gravel. Gravel and water-worn pebbles are often found scattered over the surface soil. Where the silt content is high, as near the streams, little difference can be observed in the texture of the soil and subsoil, and the dark color is maintained throughout.

The topography of the type is generally quite level, although a few "swags," or depressions, are encountered near the river. Outside of these low-lying places, natural drainage is very good. On the second bottoms, where the silt is less in evidence and the sand and gravel content high, drainage is sometimes excessive and crops are apt to suffer from drought.

The soil is easily worked, and when spring floods do not interfere crops may be put in as early as on any other soil in the county. All crops grown in this part of the State do well on the bottoms. Corn, wheat, oats, clover and truck are grown extensively, but corn has always been the favorite crop. In the year 1910, Mr. Jesse Newsom, a farmer in Sand Creek Township owning considerable of this bottom land, raised 3,300 bushels of corn on 47 acres, making an average of over 70 bushels to the acre. Mr. Newsom says he has grown as high as 96 bushels to the acre on the well drained areas. An average of 75 bushels is a yield not out of the ordinary, on soil of this kind, providing weather conditions are favorable during the growing season.
Corn is grown continuously in some places, but where the floods no longer add their rich deposits of silt and organic matter it is plainly seen that this soil can become depleted as well as the clay uplands on either side. Wheat averages well, and is usually used in rotation with corn. Clover and alfalfa are grown on the bottoms and where drainage is good many fine stands are secured. Dr. J. H. Morrison of Hartsville has had excellent results with alfalfa on the bottom lands, along Clifty Creek. It should be remembered, however, that whenever the water level of the streams is high it is useless to undertake the growing of clover or alfalfa, as neither of these legumes can exist with a wet, cold subsoil.

Because of the danger from floods, very few buildings have been built on the bottom lands. Other improvements as fences, breakwaters, roads, etc., are very good. The alluvial soils are considered among the best in the county and a high price is usually asked for them.

**MIAMI CLAY LOAM.**

The Miami clay loam occurs principally in the eastern and northeastern townships. Excepting the Knox silt loam, which occupies most of the western part of the county, this is the most extensive type found in the territory.

This soil is generally a light brown or grayish brown silt loam extending to a depth of eight or 10 inches, underlain by a lighter colored silt loam, grading into a yellow, mottled, silty clay loam at a depth of 24 inches. The surface soil contains considerable fine sand in some places, its presence being particularly well marked after a hard rain.

The topography varies from gently rolling to hilly and broken near the streams. The surface features have been affected to a great extent by the underlying rocks, especially near Hartsville and Newbern, where the limestone formations are exposed. The soils in this vicinity and throughout the upland area are often spoken of as limestone soils, but the limestone rocks have contributed little to their formation.

The Miami clay loam represents the product of weathered glacial till, and throughout the area stones and rock fragments, both of local and foreign rocks are encountered. Numerous depressions, which very likely mark the site of lakes and ponds of the glacial epoch, are seen throughout the area, especially in the northern half of the territory.
Natural drainage is, as a rule, poorly developed, except where the surface features are uneven and the underlying rocks come close to the surface. In the flat and rolling tracts, the surface water has little chance to run off, and the impervious nature of the subsoil allows only little to pass through to the underground channels. Where such conditions exist, tile under-drainage is very necessary. In the depressions where the soil and subsoil are still more compact and heavy, due to the large amount of organic matter, tile drainage is of utmost importance, but often difficult to bring about, due to the nature of the surrounding uplands.

This soil, like the Knox silt loam, is adapted to the general crops, but the yields are much greater than on the Knox soil. Corn will average from 25 to 60 bushels per acre, wheat 12 to 25 bushels, and potatoes 50 to 150 bushels. The black soil of the depressions is unexcelled corn lands, and almost invariably is devoted to this crop. Oats and wheat have been grown, but some claim that such crops have a tendency to grow rank, having lots of straw but little if any grain. These dark soils should be liberally supplied with potash to make up for the deficiency which is usually indicated by such growth.

As a general thing, the Miami clay loam is considered a good all around soil. Crops often yield much better on this land than on the Haw Patch and river bottoms. It is not as susceptible to drought as the former, nor is it subject to overflow like the latter. Compared to the Knox silt loam it is far superior. Improvements in the way of roads, farm buildings, school houses, etc., are above the average.

The following table gives the result of mechanical analysis of the Miami clay loam:

**Mechanical Analysis of Miami Clay Loam.**

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>N. E. Cor. Sec. 18, T. 8 N., R. 7 E..</td>
<td>Soil</td>
<td>1.5</td>
<td>.6</td>
<td>4.5</td>
<td>11.9</td>
<td>24.5</td>
<td>22.4</td>
<td>35.1</td>
</tr>
<tr>
<td>Subsoil</td>
<td>1.2</td>
<td>3.6</td>
<td>18.1</td>
<td>14.2</td>
<td>16.7</td>
<td>29.6</td>
<td>29.5</td>
<td></td>
</tr>
</tbody>
</table>