

REPORT UPON THE GEOLOGY OF LAGRANGE COUNTY.

BY CHARLES R. DRYER.

The county of Lagrange was organized in 1832, and named from the country seat of Gen. LaFayette in France. It then included Noble County, which was separately organized in 1836, leaving in Lagrange 384 square miles. It is bounded on the north by St. Joseph County, Michigan; on the east by Steuben County, Indiana; on the south by Noble County, and on the west by Elkhart County. It comprises eight whole congressional townships and four fractional, being twenty-four miles long east and west, and nearly sixteen and one-fourth miles wide north and south. The civil and congressional townships are arranged as follows:

<i>Civil Tp.</i>	<i>Congressional Tp.</i>	<i>Range.</i>	<i>Sections.</i>
Van Buren	{ 38	8	{ 7-36
			{ 7-9
Lima	{ 38	9	{ 16-21
			{ 28-33
Greenfield	{ 38	9	{ 10-15
			{ 22-27
Newbury	{ 38	10	{ 34-36
			{ 7-9
Clay	{ 38	10	{ 16-21
			{ 28-33
Bloomfield	{ 38	10	{ 10-15
			{ 22-27
Springfield	{ 38	11	{ 34-36
			{ 7-36
Eden	{ 37	8	{ 1-36
			{ 1-36
Clearspring	{ 37	9	{ 1-36
			{ 1-36
Johnson	{ 37	10	{ 1-36
			{ 1-36
Milford	{ 37	11	{ 1-36
			{ 1-36

Lagrange County is crossed north and south, near the center line, by the Grand Rapids & Indiana Railroad, passing through Wolcottville, Lagrange and Lima; by the Detroit and Chicago division of the Wabash, east and west, near the southern line, passing through south Milford, Wolcottville and Hawpatch, or Topeka, and by the Battle Creek

and Goshen branch of the Lake Shore & Michigan Southern across the northwest corner, passing through Shipshewana. The population of the county in 1890 was 15,708, and of the town of Lagrange, the county seat, 1,790. Elevations are as follows:

Wolcottville	959 feet A. T.
Valentine	973 " "
Lagrange	927 " "
Lima	897 " "
State Line	889 " "
U. S. Lake Survey Station, Sec. 4, Springfield Tp.	1,027 " "
U. S. Lake Survey Station, Sec. 33, Tp. 38, R. 8	951 " "

The general surface slopes gently to the north, except the lake region of Johnson Township, which is drained southward into the Elkbart River, the crest of the divide being near Valentine. The whole area is covered with drift from 100 to 200 feet or more in depth, which has rarely been penetrated to the bottom. It lies entirely upon the Saginaw side of the Saginaw-Erie interlobate moraine of Chamberlain, and contains no Erie drift, except, possibly, at the southeast corner. It is crossed by two terminal moraines of the Saginaw glacier, so that about one-half of the county presents a topography of a distinctly morainic character, but its outlines and distribution are so irregular as almost to defy description in words.

Milford Township lies upon the outer slope of the *fourth Erie moraine*, described in the report upon the geology of Noble County, in this volume, and exhibits strongly the characteristics of that moraine. It presents a succession of irregular hills and depressions, largely composed of sand and gravel, but with some areas of clay upon the uplands. Sections 6, 7, 17, 18 and 20 form a part of a level depression which here cuts into the moraine from the north. The valley of Turkey Creek, with Big Turkey*, Little Turkey and several small tributary lakes, crosses the northeastern portion. This valley is from one-half to one mile in width and about 100 feet below the hilltops. Parallel with the valley of Turkey Creek and tributary to it, in central Milford, lies a row of lakes, not a chain, because they have separate outlets, each completely surrounded by hills. The northernmost, known as Clear or Pretty Lake, sections 15 and 16, approaches a circle in outline and covers 300 acres. Its basin forms a perfect washbowl eighty-three feet deep at the center, gradually shallowing to about seventy feet toward the shores in all directions, then rising rapidly to a wide shallow rim all around. The bottom is sand and gravel, and the water clear and free from vegetation except a few rushes. It is one of the clearest and most beautiful symmetrical lakes in Indiana. Long Lake in sections 22, 26 and 27, presents very different but equally attractive features. It is two miles long and nearly half a mile wide

* Big Turkey Lake is described in the 17th Report of the State Geologist, p. 127.

with some variations. Its depth is quite uniform varying from forty-five to sixty feet with a maximum of seventy-eight feet near the south end. The area of marsh is small and serves to give a pleasing undulation to its outline which is bounded for the most part by steep wooded slopes. In section 25, Milford, and 30, Salem, Steuben County, the Lake of the Woods is said to offer attractions fully equal to those just described, and the whole group, including several small ponds, exhibits a variety of beauty seldom found within so small an area.

Johnson Township is occupied in its eastern half by the main ridge of the Pigeon River terminal moraine, which parts from the interlobate in southeastern Johnson and southwestern Milford, and trends northward. It is a ridge of crumpled country, two to three miles in width, and rising to rounded summits in section 34. The western half of Johnson is occupied by a level depression which contains an interesting group of lakes. They are characterized by low, flat shores and extraordinary depth. Oliver and Olin Lakes, in sections 17, 18, 19 and 20, cover about 600 acres. The eastern half of Oliver gave soundings from 60 to 72 feet. On account of a very high wind it was impossible to examine the western half. Olin Lake, though much smaller, shows an equal general depth, with a maximum of 80 feet near the south end. Witmer Lake, in sections 32 and 33, about 300 acres, varies in depth from 40 to 56 feet. It is the head of a chain, of which the second is Westler, sections 29 and 30. It is one mile long and about one-eighth of a mile wide, an expansion and deepening of the channel of the Elkhart River. Its depth is 25 to 35 feet. Third Lake, section 30, is an irregular hole in the midst of an extensive marsh. No water was found less than 75 feet deep, and 96 feet was found within twenty rods of the inlet. The water is almost black, and its depth, in contrast with the absence of elevation around it, was somewhat startling. Dallas, a connected lake in section 25, Clearspring, was not visited. Atwood Lake, in section 31, Johnson, 250 acres, surrounded by moderately high hills, proved to be very shallow, from 20 to 30 feet. Contrasted with this, Adams Lake, sections 23, 24, 25 and 26, in the midst of the morainic ridge, covers 320 acres, and has an irregular bottom, the water varying in depth from 40 to 75 feet, with a maximum of 93 feet off the point of a box which projects from the north shore. Upper Adams Lake, in section 24, 25 acres in area, is said to be 65 feet deep. The Johnson Township lakes upset the supposed rule that lakes with high shores are relatively deep. No estimate of depth can be made from inspection of the surroundings, and a hole in a marsh may be deeper than a basin among the hills. These lakes form the head of the northernmost branch of the Elkhart River, the upper course of which is characterized by passage through very extensive marshes, and lakes of considerable depth in the midst of them.

Clearspring Township is considerably varied in topography. The southeastern corner is occupied by the valley and marshes of the Elkhart River in sections 24, 25, 26, 35 and 36. An irregular outlying tract of moderately hilly moraine crosses the township from section 1 to section 32 and may be continued to connection with a similar tract in sections 8 and 9, Elkhart Township, Noble County. This tract is quite hilly on the east and gradually fades out westward in sections 19 and 30. On the Noble County line, in section 33, the so-called "Hogsback" is a curved ridge, thirty to forty feet high and half a mile long, composed of gravel with numerous large boulders. Sections 2-9 and 16-19, Clearspring, form a part of the very level plain which occupies the whole of Eden Township.

Eden Township is the most uniform and monotonous portion of LAGRANGE COUNTY. To the eye it is apparently a dead level, broken only by the horseshoe-shaped "Big Marsh," which can now hardly be called a marsh, since it has been effectually drained and many farms are being carved out of its area. The most interesting thing in the region is the "Hawpatch," a tract in sections 25, 26, 34, 35 and 36. It was originally covered with very heavy timber—walnut, sugar and elm. The trees were very high and the ground covered with flowers and blackhaw. The soil is a black loam, in strong contrast with the cold clay on the west of it, underlaid at a depth of thirty feet by a sheet of gravel. Surface drainage appears to be entirely wanting and unnecessary. For agriculture it is one of the most productive and valuable tracts in Indiana. To the geologist its origin is an interesting problem. How such a well-defined area of peculiar character in strong contrast with its surroundings came to exist, and what were the conditions of its formation, are questions which, in the present state of our knowledge, probably can not be answered. It resembles the prairies of northern LAGRANGE in everything except the presence of forest. Eden Township possesses but one lake, Eden Lake in section 1. It is nearly a mile long, narrow, said to be very deep, and is evidently a portion of an ancient drainage channel, now followed by the Little Elkhart River.

Newbury and Clay townships resemble each other in possessing a surface varied by the presence of the irregular terminal moraine before mentioned, which passes westward through central Clay and northern Newbury. The southern tier of sections in Clay and the southern two tiers in Newbury belong to the level plains of Eden and Clearspring. Sections 7-8 and 15-30, Clay, and 1-18, Newbury, are occupied by the moraine, which itself presents characters varying and inconstant from mile to mile, with frequent intervals of nearly level surface like that around Shipshewana, and groups of quite massive hills like those in sections 22, 27 and 28, Newbury. The southern border of the moraine in these townships is indefinite and elusive. When apparently reached small tracts of a faintly

moranic character crop out unexpectedly beyond, so that attempts at its delimitation are unsatisfactory. The usual sag and swell topography degenerates into a sag and level, so that differentiation between ground moraine and terminal moraine, between material deposited by sub-glacial melting and material deposited at the edge of the ice, ceases to be practicable. The northern border of the moraine is bolder and more definite, extending from section 6, Clay, in a slightly curved line to the northern boundary of the town of Lagrange. Northeastern Clay is level and contains Hobb's marsh and a portion of Big marsh. Northern Newbury contains several lakes, of which Shiphewana, in section 4, is the largest. It covers about 200 acres and is very shallow, not more than ten feet of water being found.

Van Buren Township contains, in its western part, a tract of country which exhibits, in a striking manner, the capriciousness of the Saginaw glacier. Here, from some inconceivable cause, the glacier piled up a heap of sand and gravel knobs of the most tumultuous and impressive character, almost equaling the most rugged portions of the fourth Erie moraine in Steuben County. These knobs occupy sections 15-22 and 27-34, township 38, range 8, the highest and most massive ridge being just over the line in York Township, Elkhart County. The United States Lake Survey station in section 33 has an elevation of 951 feet. The county line divides the knobs into two nearly equal portions. Stone Lake, section 18, lies at the northern border of the knobs, being surrounded by them, except at the northeast side. It is clear, though shallow, with a sandy bottom. The deepest water found was 27 feet. The northern border of the knobs approaches the Michigan line in section 9, but trends away to the southeast in sections 15, 22, 26 and 35, township 38, range 8, and 1, Newbury. At the foot of the hills Big Marsh extends along this line for four or five miles. Its width is from a quarter to a half mile, and it is now a wet meadow, with several islands of dry land. The remainder of Van Buren belongs to the northern plain, which will be described elsewhere.

Bloomfield Township contains, in its southwestern part, a strong portion of the terminal moraine, which covers sections 20-22 and 27-35 with hills popularly known as "the knobs," although they do not deserve the name in the same sense as the knobs of Van Buren. This portion of the moraine consists of a nearly continuous ridge trending north and south, with a fringe of foot hills on the west. Its culminating point is in section 22, where a massive ridge rises about 150 feet above the valley on the east and north, and marks an angle where the moraine turns sharply to the west. The remainder of the township belongs to the northern plain.

In southern *Springfield Township*, sections 25, 26 and 31-36 present the

same characters as Milford, in a milder form, and belong to the interlobate moraine. A level depression a mile and a half wide extends from sections 31, Springfield, and 36, Bloomfield, to sections 19 and 20, Milford, dividing to that extent the terminal from the interlobate moraine.

The remainder of LAGRANGE County constitutes a base-level plain toward which nearly all the streams south of it flow. It covers the townships of Greenfield and Lima, the greater part of Springfield, the northern half of Bloomfield, the northeastern quarter of Clay and the eastern half of Van Buren. The plain itself slopes to the northwest, and is traversed by two streams roughly parallel to each other. Pigeon River and Fawn River, or Crooked Creek, rise in the large lakes of Steuben County and flow northwestward about forty miles to the St. Joseph. The course of Pigeon River is the more direct, that of the Fawn quite crooked. Five miles apart at the east line of the county, they approach within one mile near their exit into Michigan in Van Buren Township. The Pigeon has no tributaries on the north, and the Fawn none at all of any considerable length. The course of the Pigeon is roughly parallel with the northern face of the Saginaw terminal moraine, yet all its long tributaries rise on the other side of the moraine and cut directly across it. The surface of the Pigeon-Fawn plain is generally very smooth, but diversified by some remarkable features. A series of prairies lie between the two rivers, beginning with Jackson Prairie, in Jackson Township, Steuben County. English and Pretty prairies, in Greenfield, and Mongoquinong, in Lima, of four or five sections each, continue the series to the center line of LAGRANGE County. The spaces between them, even where narrow, display a recognizable morainic tendency. South of Pigeon River, in sections 20-22 and 27-29, Springfield, Brushy Prairie lies against the border of the moraine. Between the prairies and Fawn River a narrow belt of generally weak moraine forms part of a second Saginaw terminal. It crosses sections 16-18 and 20-26, township 38, range 11. It is less than two miles wide and attains its strongest development at the east end in sections 24 and 25. An isolated morainic outlier occurs near Mongo, in section 4, Springfield, where about one square mile is covered by a prominent hill upon which the U. S. Lake Survey established an observing station. The elevation here is 1027 feet A. T., the highest point in the county. A few lakes help to emphasize the tendency manifested even in the prairies to a sag and level topography.

Twin lakes, sections 23, 26 and 27, township 38, range 9, are about two miles west of Lima. The country between is level prairie with a soil of black loam, and resembles the Hawpatch.

North Twin Lake, section 23, about 200 acres, has an average depth of thirty to forty feet with a maximum of forty-three. South Twin, a little smaller, averages forty-five feet with a maximum of fifty. The surface of both is about thirty feet below the general level of the country.

The water is clear and of a delicate but decided apple green color, peculiar to these lakes, the cause of which is an interesting but unsolved problem. Cedar Lake, sections 21 and 22, township 38, range 10, resembles the twins in shape, size and shores, but is shallow, averaging not over eighteen feet with a maximum of twenty-four. Wall Lake, sections 24 and 25, township 38, range 11, lies in the edge of the Fawn River terminal moraine. On the west side the lake washes the foot of high morainic hills, the other shores being low. Its area is about 300 acres and its depth twenty-five feet with a maximum of thirty-two. It derives its name from a raised beach which bounds it on the hilly side. This beach is about eighty rods long, two or three feet higher than the ground immediately outside of it and six or eight feet above the present water level. The lake has been artificially lowered nearly that amount. The beach is at present covered with sand and not especially remarkable except for a length of about 100 feet where it cuts across a corner leaving a small marsh behind it. Here it is composed almost entirely of boulders, some of a size too large to be handled. One upon the crest measures 2x2x3 feet. It has the appearance of an artificial wall, and is so regarded by the people of the vicinity. The fact that it forms a part and continuation of a natural and not very unusual beach structure, and the impossibility of conjecturing any reason why men should ever have expended considerable labor in building a hundred feet of beach line to cut off a corner of a lake a few rods in area, render the hypothesis of its human origin highly improbable. At one end of the wall, and continuing it at the same level, there is a terrace cut into a spur of the hills, where the ground is seen to be full of boulders. It is necessary only to suppose that the waves and ice of the lake transported boulders a distance of one or two hundred feet to account for the wall by the action of natural agencies. The raised beach occurs only upon the west side, because there the materials were present and the conditions as to high country behind were favorable. Similar raised beaches on a smaller scale were observed at Pretty Lake and at Blackman's Lake, section 29, Milford.

The prominent features of Lagrange County may be summarized as follows:

The Saginaw-Erie interlobate moraine crosses the southeast corner of the county, occupying the greater portion of Milford Township, and presenting the usual pronounced and striking characters of that moraine as described in the reports upon the geology of Whitley, Noble, Dekalb and Steuben counties.

The Pigeon River Saginaw terminal moraine branches from the interlobate in southeastern Johnson and trends northward to central Bloomfield. This portion of it consists of an irregular ridge from two to three miles wide, and attaining its highest elevation at the northern end. From southwestern Bloomfield it turns sharply to the west and northwest

through central Clay and northern Newbury, its width remaining about the same. In this portion its characters are subdued and inconstant, varying from sag and swell to sag and level topography. It offers no obstruction to the course of streams, Fly Creek, in Bloomfield, Buck Creek, in Clay, and Shipshewana Creek, in Newbury, cutting directly through it in their northward course to Pigeon River. In western Van Buren and in York Township, Elkhart County, this moraine changes its character and displays a tract of hills and knobs, about twenty square miles in area, which, for tumultuous ruggedness and irregularity, are scarcely surpassed in Indiana. The northern and eastern borders of the Pigeon River moraine are bold and well defined, while its southern and western borders display an extremely irregular apron or fringe, where differentiation and delimitation of ground moraine from terminal moraine prove elusive and baffling. A clearly recognizable tract of terminal moraine, however, extends from the southwest corner of Bloomfield through central Clearspring to the south line of the county.

The lake region of Johnson Township is a level interval, which lies between the above described tract and the main ridge of the moraine on the east, and opens southward into the valley of the north fork of the Elkhart River in Noble County.

The southwestern plain includes Eden and adjoining portions of Clearspring, Clay and Newbury, and is drained by the Little Elkhart River.

The northern plain includes the remaining third of the county. It is traversed lengthwise through its centre by Pigeon River, which drains about three-fourths of the county. This region is characterized by a belt of beautiful prairies.

The Fawn River Saginaw Terminal Moraine crosses the northeast corner of the county. It is about two miles wide, distinct but feeble, except around Wall Lake.

The lakes are not so numerous as in adjoining counties, but are unusually varied and interesting in character. Those of Milford are among the finest typical specimens of morainic lakes. Those of Johnson include three or four which belong to a distinct species. Although their basins occur in a level morainic interval, their phenomenal depth defies prediction and upsets all general principles. Stone Lake and Wall Lake are very similar in situation and character, and although twenty-four miles apart, are as much alike as the Twin lakes. The latter again are unlike all others, and present a combination of peculiarities which deserves farther study.

The prevailing soil of Lagrange County is a sandy loam, varied by gravel and gravelly clay. The clay areas occur chiefly in Milford, Bloomfield, Clay, Newbury, Johnson and Eden. About one-half the county was originally oak openings which occupied the plains and mild morainic

areas. The relation of heavy timber to soil presents an interesting problem which would require a long and patient investigation into the original condition, surface deposits and underlying strata over a wide area. This would include also the question of the origin of prairies. The causes and conditions which determined the persistence of small, isolated, treeless tracts, which are not marshy, and differ very little in appearance from the timbered country around them, are far from obvious.

The following sections of wells bored within the limits of the town of Lagrange for a public water supply, show the usual irregular alternation of sand, gravel and clay. The occurrence of yellow clay and gravel at various depths testifies to the extent to which the material has been disturbed and redistributed since its glacial deposition, exposed and oxidized strata having been subsequently overlaid by eighty to one hundred feet of unoxidized strata. The four wells are all within the area of an ordinary town lot, yet the majority of strata can not be correlated in any two of them.

I.

Soil	7 feet.	Gravel	1 feet.
Gravel	12 "	Blue clay	0.5 "
Gravelly hardpan	11 "	Gravel	5 "
Blue clay	16 "	Blue clay	3 "
Gravel	2 "	Yellow clay	0.5 "
Blue clay	5 "	Yellow gravel	10 "
Gravel	2 "		
Blue clay	5 "		92 feet.
Hardpan	12 "		

II.

Soil	4 feet.	Blue clay	15 feet.
Fine sand	6 "	Yellow sand	4 "
Gravel	10 "	Gravelly clay	15 "
Blue clay	20 "	Gray gravel	5 "
Gravel	5 "	Yellow gravel	12 "
Blue clay	1 "		
Fine sand and muck	5 "		102 feet.

III.

Soil	4 feet.	Yellow sand	2 feet.
Fine sand	5 "	Blue clay	7 "
Gravel	9 "	Hardpan	5 "
Blue clay	3 "	Gravelly clay	3 "
Yellow clay	9 "	Blue clay	10 "
Yellow gravel	2 "	Hardpan	10 "
Yellow clay	1 "	Yellow gravel	13 "
Gravel	3 "		
Blue clay	12 "		98 feet.

IV.

Soil	2 feet.	Hardpan	7 feet.
Fine sand	2 "	Gray sand	3 "
Yellow clay	12 "	Gravelly clay.	26 "
Blue clay.	2 "	Hardpan.	13 "
Greenish sand	8 "	Yellow gravel	13 "
Yellow clay	10 "	—	—
Gravel.	10 "		111 feet.
Blue clay.	3 "		

The occurrence of bituminous coal in the drift of Indiana is not very unusual in the form of water worn fragments; nor is it specially remarkable since a large mass of the drift was carried across the Michigan coal fields, and the glacier could hardly avoid picking up bowlders of coal, some of which might escape destruction. The occurrence of genuine anthracite coal is quite a different phenomenon, and, as far as the writer is informed, is now for the first time reported. In 1890 Mr. Warren Carpenter sunk a well upon his farm in section 33, township 36, range 8, near Hawpatch, and, at a depth of 76 feet, bored through a mass of coal three and one-half or four feet thick. It was overlaid by clay and underlaid by gravel. A boring upon a neighboring farm struck black slate at 150 feet. In 1893 he made another boring about fifty feet from the first, and at the same depth found a few small fragments of coal. The second well was sunk to a depth of 105 feet without any result of importance. Mr. William Haller, in section 28, a quarter of a mile north of Carpenter's, found fragments of coal in his well at a depth of 80 feet. Specimens of the coal furnished by Carpenter, upon analysis, show the following composition:

Volatile matter	10.43
Fixed carbon	80.97
Ash	8.60

100.00

They have the hardness, lustre and fracture of genuine anthracite. The difficulty of accounting for its presence in such a position suggested the suspicion of fraud; but a careful examination of all the circumstances, the testimony of several intelligent and disinterested witnesses, and more than all, the conversation of Mr. Carpenter himself, convinced the writer that the theory of fraud must be abandoned. He has no other to offer in its place, but trusts that future discovery may throw light upon this apparently inexplicable phenomenon.

The wealth of LAGRANGE County depends almost entirely upon its varied and, in many localities, unusually fertile soil. One other industry, however, is worthy of note as depending upon its economic geology. About three miles north of Wolcottville, in section 21, Johnson, Mr. F. E.

Dickinson is working a stratum of clay of somewhat peculiar qualities. It crops out beneath a few feet of sandy loam, and is from two to sixteen feet thick. The upper portion burns to the ordinary red color and is easily fused. The lower portion at successively higher temperatures passes through pink and delicate cream to a yellowish green color, and is not readily fused. The capacity of his factory is \$3,500 worth of drain tile per season, and 20,000 common brick and 10,000 pressed brick per day. The common brick are very durable for outside work. The pressed brick are fine in finish, and their delicate tints render them very desirable for veneering, fire-places, and ornamental work of all kinds.