THE PLEISTOCENE GEOLOGY OF
CLARK COUNTY, OHIO

A Thesis Presented for the
Degree of Master of Science

BY

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Approved by:

[Signature]


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INTRODUCTION

Geographical Background

The area described by this thesis is Clark County, Ohio, named for General George Rogers Clark, who was intimately connected with the history of the region. It was organized on March 1, 1818, from parts of Champaign, Greene, and Madison counties. The county covers approximately 407 square miles in the southwestern section of the state. The area covers parts of six quadrangles of the United States Geological Survey, the Troy, Saint Paris, Mechanicsburg, Dayton, Springfield, and South Charleston quadrangles.

It is the site of an ancient culture, probably the Adena, represented at Knob by the second largest mound in the state of Ohio. It is a burial type mound, which has been excavated. Within it, at a depth of thirty feet, was found a cave, shaped like a kiln, and high enough for a man to stand in. Inside the cave was an altar littered with bones, charcoal, and decayed wood. This is just one of several hundred known mounds and village sites within the county.1

Just five miles southwest of Springfield, on the north bank of the Mad River, is the site of the ancient Indian town of Piqua, the birthplace of Tecumseh, famous Indian statesman and warrior. Piqua, now George Rogers Clark State Park, is the site at which Clark battled the Shawnee Indians.

Fig. 1 - Index Map. The shaded area is the location of Clark County, Ohio which is discussed in this report.
burned two of their villages, and destroyed their corn, thus bringing peace to Kentucky and Ohio for several years by driving them into the forests to hunt for food.

The first real settlement was made at Gribb’s Station, at the forks of the Mad River, in the spring of 1796. The city of Springfield was laid out in 1803, the same year that Ohio became a state. This city has grown from a population of 20,730 in 1880 to one of 70,662 in 1940. Its industrial capacity has increased accordingly.

"The first productive concern in Springfield... was a "grist mill", built simultaneously with Springfield’s first schoolhouse and church in 1804; in 1805, the second productive concern... was a tannery built by Cooper Ludlow." 2

It is now the home of the International Harvester Co., truck division, The Crowell-Collier Publishing Co., the Robinson and Meyers Co., makers of electrical equipment, and many others.

Wittenberg College, founded in 1845, is located in the northwest portion of the town, just north of Snyder Park, the city’s recreational area.

Most of the Clark County landscape is in use for farming, either as land under cultivation or in pasture. There are no virgin forests within the limits of the county but there seem to be an increasing number of planted woodlots, started whenever the soil becomes too worn out through erosion or neglect. The most prevalent crop is corn, with wheat, oats, and other grains next in acreage. Large dairy herds and many beef cattle make up another large portion of the farm.

industry of the county.

The outwash areas find much use as airports. There are three good airports within the county, with every farmer's nearby flat field a potential landing strip.

Geomorphology

Clark County is in the Till Plains division of the Central Lowlands province, an area characterized by Fenneman as consisting of young till plains, rare morainic topography, and an absence of lakes.\(^3\) The area is immediately south of the high Bellefontaine outlier which split the late Wisconsin ice into two lobes: The Miami lobe to the west and the Scioto lobe to the east. The two lobes were constantly oscillating permitting the formation of several series of morainic belts across the county. Here these trend generally north-south, because they mark the lateral edges of the ice lobes.

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Drainage

The drainage pattern of Clark County today does not indicate the drainage of ages past. In Pre-Kansan time when the Teays River system was operating the drainage was to the west. A buried channel has been outlined from the London Prison Farm just east of the county line, running westward to the northeast edge of Springfield, then northward on the west side of the present Mad River valley and finally swinging westward again in the vicinity of St. Paris.4

Between Kansan and Illinoian time the drainage was already to the southwest, through the Deep Stage system, a tributary of which can be seen just west of Springfield. This old valley is rather shallow for Deep Stage and shows that some tributaries of the Teays must have had extremely high gradients. In less than two miles the tributary must have fallen over 350 feet, a very good mountain stream. During Deep Stage time a valley was cut some sixty feet into the dolomite, at the site of the old tributary to the Teays. This made an outlet to the west, to the main Deep Stage system. However, this system did not have the large drainage area of the present Mad River.

The outlet is shown on the map by a red arrow.

When the Illinoian ice advanced the gorge was filled by till and the water sought another outlet, probably to the south. With melting and retreat of the ice, the lowest point on the divide received the water and cutting of a new gorge began. This gorge evidently persisted or was only partially

filled during the Wisconsin advance since with the retreat of Wisconsin ice the gorge continued to be used.

The story of Honey Creek shows another drainage change. When Wisconsin ice was at the boulder belt, to be discussed later, the creek flowed to the south past New Carlisle and Medway into the Mad River. When the ice retreated further, the stream made a right angle turn into a lower passage to the west through recently uncovered glacial deposits. It now flows through this gorge directly west of New Carlisle and into the Miami River.

The drainage for the northern two-thirds of the county is nearly all to the southwest through the Mad River, and for the southern one-third through the Little Miami River. Many of the tributaries are barbed and many of them flow on higher levels of outwash, showing that drainage changes occurred all during glaciation as well as after it. The stream pattern is dendritic throughout with the location of the stream determined by an original ice front or by a moraine after the ice had melted. As examples might be cited the Little Miami River, and the upper reaches of Beaver Creek.
Relief and Topography

The relief is always of a low order, rarely reaching a local variation of one hundred feet, and then only in the moraines in the northeast corner of the county. For the most part it is of the order of twenty or thirty feet.

The detailed character of the topography varies greatly and when used in conjunction with the relief, determines the presence of a moraine, a till plain, or an outwash plain. The mapping of these features depends in a great measure on the proper use of these two factors.

In the moraines the relief may be measured in the tens of feet, and the topography is rolling. There are swells and swales, shallow enclosed depressions, and good construct- tional topography, in which the hummocks are rolling, and have an arcuate profile.

The till plains show a relief less than ten feet, with some shallow enclosed depressions. However, the amplitude of the rolling is quite diminished in comparison to that of the moraines.

The local relief of the outwash plains is generally less than five feet, except where there are kettles or ice contact slopes, and in some local areas there are gently rolling undulations. The topography is flat and nearly always there is an abrupt change when passing from outwash to till plain.
Bedrock Exposures

The bedrock exposures are extremely few in number, being confined entirely to stream beds since the glacial debris covers and masks most of the surface. At many places, however, the bedrock, though covered, controls the slope of the surface. Such an area is southeast of Springfield, and just south of the Dayton road, where the drift rarely exceeds thirty feet. Here the high area suggesting a moraine has been caused instead by the rough surface of the bedrock.

Northwest of Springfield and east of New Carlisle is another area where the bedrock is exceedingly close to the surface, and where the geomorphic age of the present day streams and the depth of the valleys is due almost entirely to the bedrock control.

There are bedrock exposures along the Mad River gorge west of Springfield, along Hill Creek south of the same town, along both forks of Honey Creek in the northwest corner of the county, a few small exposures in the till plain to the north of Yellow Springs, and in the hill section immediately north of Patterson Field.

The entire eastern section of the county is devoid of bedrock exposures of any kind. Till of the Cable Moraine and moraines to the south here averages 150 feet in thickness as determined by well borings.

Stratigraphy

In Clark County the stratigraphic sequence of surface exposures includes rocks of Ordovician and Silurian age,
ranging from the Elkhorn shale to the Cedarville dolomite, as follows:

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<th>Niagara</th>
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<td>Cedarville</td>
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<td>Springfield</td>
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<tr>
<td>Euphemia</td>
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<tr>
<td>Caygill</td>
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<tr>
<td>Dayton</td>
<td></td>
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<tr>
<td>Brassfield</td>
<td></td>
</tr>
<tr>
<td>Ordovician</td>
<td>Elkhorn</td>
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The Elkhorn shale is exposed just south of the county line in the Clifton Jorge, but is not seen within the limits of the county, except as the topographic break in slope at the base of the Brassfield limestone.

Immediately overlying the Elkhorn shale is the Brassfield, a pink, crystalline, limestone, which controls the topography of two hills in Sections 5, 11, and 23 of Mud River Township and another in Sections 31 and 32 of Bethel Township, at the southern edge of the county. The till is extremely thin over these hills and the contour of the till will undoubtedly be found to be the contour of the underlying bedrock surface. The exposures on the southern edge of the county are in cliffs eight to twelve feet in height, whereas on the southwestern edge of the county the exposures merely follow the slope where recent erosion due to poor conservation methods has exposed about fifteen feet of the Brassfield.

The succession above the Brassfield, consisting of the Euphemia, Springfield, and Cedarville dolomites is exposed at several places. In the valley of Mud Run in the south central portion is found a gorge formed of these three form-

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C. Carman, J.E., Personal communication.
ations. The cliffs along the Mad River west of Springfield extend for about seven miles, and are thirty to forty feet high. The succession is exposed as well in the valleys of all of the south flowing streams, Donnels Creek, and both forks of Honey Creek. At many points they form bedrock benches and cause the streams to assume a temporary graded profile, with swamps and wide flat flood plains upstream from the benches.

Within the county, at South Charleston, is the Friend Well, one of the six wells in the state which have reached or penetrated the Pre-Cambrian. The Friend well has a total depth of 4647 feet and penetrated the Pre-Cambrian to a depth of 1228 feet.9

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Methods of Study

In mapping this area, a diversity of mapping methods was used, such as relief, topography, continuity of morainic features, depth of leaching, stone counts, and soil studies. No one of these methods can of itself give the true picture of any area, but the compilation of data from all of the methods makes the final result more positive. For instance, in mapping outwash as different from till plain, soil types were used extensively, and a soils map of Clark County now in progress aided immeasurable in determining boundaries of these two landform types. Soils indicative of till are the Miami, Crosby, Salina, and Brookston, with the Fox type of soil indicating one derived from the gravel of an outwash plain, terrace, or channel.

The stone counts were made by collecting one hundred pebbles one inch to three inches in size, and classifying them into limestone, dolomite, sandstone, shale or foreign crystalline rocks from far off. The main classifications were further subdivided and note was taken of all distinctive types, such as a black dolomite found only at certain locations in what is believed to be Miami lobe deposits.

The presence of boulders usually indicates a moraine, and this criterion was used sparingly except in one region of notable concentration, the Boulder Belt Moraine discussed under glacial features. Notation was always made on the map of the presence or absence of boulders, and the approximate number found in any one spot, so that the presence of the boulders actually might indicate a moraine if there were no boulders in the till plain nearby.

5. Petro, James, Unpublished.
6. Conrey, G.W., A Key to the Soils of Ohio, Department of Agronomy, Ohio Agricultural Experiment Station, 1947.
Moraines were differentiated from till plain on the basis of relief as stated before, in that the moraines must have at least ten feet plus of local relief, and the till plain less than ten feet of local relief, disregarding the post-glacial dissection. In addition to the requirement of relief, the moraines must exhibit an undulating topography, or must have undrained depressions, or must contain boulders in greater numbers than the adjoining till plain, or must represent a continuous ridge at higher elevation than the adjoining till plain.

Acknowledgements

The work was carried out under the sponsorship of the Ohio Water Resources Board, for the purpose of investigating the water resources of the county, with the glacial history an important factor in determining the available supply.

The writer wishes to express his appreciation for the help of Dr. Richard F. Goldthwait of the Department of Geology of Ohio State University for the aid in mapping and for the many suggestions during the field work and writing of the thesis, to Mr. James H. Petro of the Department of Agriculture who is mapping the soils of the county, to Mr. Ralph J. Bernhagen, of the Ohio Water Resources Board, for the aid in the field work and in the interpretation of many of the features by the use of well logs of the board, and to Dr. J.E. Carman for aid in interpreting the stratigraphy of the county.
PLEISTOCENE GEOLOGY

South Charleston Till Plain

This till plain includes the entire southeastern corner of Clark County, an area of approximately sixteen square miles, bounded on the north by the Little Miami River and on the east by the South Charleston moraine. The relief over the entire area of the till plain is of the order of sixty feet, with the local relief of the order of five feet. The average elevation of the till plain is 1120 to 1165 feet. The streams form a radial pattern, flowing in all directions from the crest. The area is extremely poorly drained and tiles are used extensively. The wells in this area show a depth of drift up to two hundred feet, as shown by farmers contacted there.

There are some few boulders to be seen, usually less than three or four to a field, hardly enough to satisfy the requirements of end moraine.

There are several possibilities for the extreme flatness of the plain. It could represent an area in which the ice retreated too fast to build good frontal hummocks, or it could represent an area where the ice stood for a long time but still did not build an upstanding moraine for lack of load. The former is probably the correct interpretation here.

Yellow Springs Till Plain

This till plain is a rather extensive one, an area of approximately thirty square miles, stretching from the Mad River south to the county line and from Enon to Melrose. Over its entire extent in Clark County, the Yellow Springs
Till Plain is controlled by the closely underlying bedrock surface. At the northern edge of the plain is one of two locations within the county where striae on the bedrock may be seen, trending on the average 343° E plus or minus 5°. There are many bedrock exposures on this plain, perhaps more than all the rest of the area combined. The Mad River cliffs form the northern boundary, the Mill Creek cliffs form the eastern boundary, the Clifton Gorge is near the southern boundary in Greene County, while the western boundary is complicated by the morainic patches south and east of Enon. In the upper reaches of Mud Run a miniature Clifton Gorge can be seen, with cliffs of dolomite on both sides. The streams all are flowing on bedrock with stretches of marsh at intervals down their courses. The elevation of the plain varies from 1000 to 1060 feet. The highest points are to the south, due to the rising bedrock surface in that direction. The relief is less than five feet for the most part and is an ideal location, so far as flatness is concerned, for the Springfield Municipal Airport, located six miles south of the center of town.

At several points to the west of this plain in Greene County cross-striations have been found,7 indicating that this plain has been crossed and recrossed by ice from both the Miami and the Scioto lobes. However, the last ice to cover the region must have been the Miami lobe, since the striae from the northwest are more deeply engraved everywhere.

7. Goldthwait, R.F., Personal communication.
Wells drilled for water in the area of the plain show the thickness of the till generally to be about thirty feet. From well information just east of Hennessey on the southern boundary of the county the till overlies gravel, with the till being about twelve feet thick and the gravel less than twenty. This may represent a thick gravel lens or local condition.

North Hampton Till Plain

This till plain is the most extensive one in the county, an area of approximately ninety square miles, bounded on the east and south by the Mad River outwash, on the west by the Honey Creek outwash series and the boulder belt, and on the north it extends past the county line.

The southern edge of the plain is controlled by the bedrock close to the surface, whereas, the northern stretches are composed of thick till. At the southern extremity of the plain are bedrock cliffs at the top of which is exposed another set of striations, also trending S 43° E plus or minus 5°. The streams at the southern edge all have floors of rock and are exposed for several miles northward. The streams as a whole seem to have reached base level in their upper reaches, probably as a result of the artificial level maintained by the bedrock exposed near their mouths, where they tumble over falls of dolomite. These streams follow the original slope in their courses so that the dominant direction of drainage is southward.

The entire eastern edge of the plain is much more dissected than the other edges. This probably is due to the
higher percentage of gravel in lenses toward the east in contrast to the higher percentage of till to the west. This is a result of the constant oscillation of the ice over the area covered by the plain, and also to widespread readvance of the ice over the region near the Springfield Moraine discussed later.

That there were several readvances and retreats can be shown by several sections along Chapman's Creek, Donnel's Creek, and Jackson Creek. The most interesting by far is along Chapman's Creek, several photographs of which follow. (See Figures 2, 3, and 4)

The multiple till layers represent a series of advances of the ice, followed by an outwash of cobbles and gravel. Here the highest percentage is till, whereas to the east only small patches of till can be discerned.

To the north, the streams, as Chapman's Creek and Storms Creek, have cut very deeply into the plain. There are several reasons for this. The bedrock is very deep, deeper than on the plain further south, since the rocks are dipping to the north and the till must thicken. Also, the streams have a lower relative base-level to the north since the difference between till plain and local base-level is greater. The streams to the north are much closer to the ice front maintained at Boulder Belt time. A tremendous amount of erosion may have been accomplished by the meltwaters from this stationary ice.
Figure 2. Center of stream cut along Chapman's Creek.

Figure 3. East end of cut along Chapman's Creek.

Figure 4. West end of cut along Chapman's Creek.
front during glacial time which is reflected today by the much deeper valleys of the northern extension of the plain in Champaign County.

At the south edge the plain is at an average elevation of 1020 feet, rising northward until at the county line it is about 1150 feet. The local relief when on the top of the till plain itself is very low, being less than five feet in any one acre. However, it is dissected and wherever a stream appears the relief increases to the degree of cutting attained by the stream.

Boulders are extremely scarce throughout the plain for the average seen was less than one per farm lot. This is in decided contrast to the boulder belt to be discussed later in this section.

At Anio near the southern edge of the plain much of the water supply comes from springs dug into one of the gravel layers present. These springs are good sources of water in drought or flood time, and many have flowed constantly for the past fifty years. The wells drilled at the south are always good. They are shallow wells drilled into the limestone ordinarily.

The depth of leaching as found by eight holes in this plain was about thirty inches. This indicated late Wisconsin till, since if there were early Wisconsin present the depth of leaching would be about forty to sixty inches or more.10

Brighton Moraine

The Brighton Moraine is a part of the Bloomingburg Moraine

10. Leverett, Frank
of Leverett. It represents the frontal moraine of a minor halt in the series of Jocoto lobe oscillations. The Brighton Moraine at some points can hardly be called a clearcut moraine yet it satisfies many of the criteria. It is a definite ridge, though a small one. The rise in regional relief where the moraine enters the county is about ten feet increasing greatly northward until at Route 40 the rise is of the order of forty feet (see Fig. 5), and the topography is gently rolling. Associated with the west edge of the ridge are many boulders, the presence of which can be traced northward for several miles until the moraine becomes a part of the complex of united moraines of the north end of the county, and even then a section of the complex in a northern extension of this line contains many more large boulders than the rest of the complex. To the south the number of boulders would be three or four of moderate size per fence corner, whereas, the northern extension would contain over half a dozen boulders larger than eighteen inches.

A stone count of one hundred pebbles taken on U. S. Route 40 east of Brighton showed that this moraine coincides in type of material to the Plattsburg and the South Charleston moraines to be considered later. Here the dolomites numbered 89%, limestone, 9%, shale, 1%, sandstone 1%, and there was a complete lack of foreign crystalline types from afar. This lack of foreign types is characteristic of the above mentioned moraines only, and in this respect these three moraines are entirely different from all other moraines in the county.

11. Leverett, Frank, Monograph XLI, p. 335.
Figure 5. Brighton Moraine viewed from the east on Route 40 east of the county line.
The Brighton moraine enters the county directly east of South Charleston, trending north-northwest, directly north past Wilson Chapel, and the village of Brighton. Then a mile north of Brighton it loses itself in the morainic complex of the Cable Moraine except for the zone of boulders which appear to mark its northern extension.

This moraine forms a drainage divide between the west and the east, between the Mad River drainage and the Paint Creek drainage. It is interesting to note in this connection how the position of the Brighton Moraine influences the position of Paint Creek in its southern extension. Beaver Creek also, in its upper reaches, has developed to the north by the upstanding Brighton Moraine. In an area of this kind, then, the drainage, though basically dendritic, is controlled largely by the position of the end moraines.

Plattsburg Moraine

The Plattsburg Moraine is discontinuous within the county. It starts with excellent morainic topography just east of South Charleston where it is crossed by U. S. Route 42. From that point north to Beaver Creek the moraine can be followed as a definite ridge with a total relief at places of over sixty feet. Plattsburg is on the western apron of the moraine and South Vienna is on the northern crest of the moraine. However, the morainic topography dies out to the south and disappears into the South Charleston Till Plain which has already been discussed.

The content of this moraine conforms with the others on the eastern edge of the county as evidenced by this stone
count in which 61.5% is dolomite, 14.5% limestone, 1% shale, 2% sandstone, and 1% foreign. The extreme lack of foreign material in all the stone counts of the eastern edge of the county is a unique feature of this section.

At its north end the Plattsburg Moraine also disappears into the Cable Moraine complex north of South Vienna. As far as Sinking Creek, however, it is continued as a distinct high hammocky area and can be followed easily in the field.

*South Charleston Moraine*

The South Charleston Moraine is a mappable unit in the county for several reasons. It is continuous from the Beaver Creek drainage channel to the south county line. It marks the boundary of a distinct change in the soils and also in the stone counts. Therefore, even though the general relief is only ten feet and hammocky topography is rare, the ridge can be followed with no break the entire distance. It extends from the south county line past Briggs School, through South Charleston and Lisbon and ends at Beaver Creek just one and one-half miles west of Plattsburg. At Lisbon the moraine is best shown with a relief of forty feet above the surrounding plain and good local morainic topography. In both directions it flattens and represents a total rise of about ten feet.

As shown by several stone counts, this is the westernmost moraine in the county in which the count of foreign lithologies is so small: 83.5% dolomite, 9.5% limestone, 2% shale, 2% foreign. There are several possible explanations, no one of which has yet been shown to be the correct one.
This abrupt lithologic change may show that in the last oscillations of Wisconsin time here, the Scioto lobe ice did not reach any further west than the South Charleston moraine, and with no further evidence than that shown in Clark County alone, this would undoubtedly be the accepted interpretation. However, this change is not confined to Clark County. It is continued both south into Greene County and north into Champaign and Logan Counties. Stone counts in Greene County and curvature of the Xenia Moraine continuing southward past Xenia suggest that Scioto ice moved further west to the Xenia Moraine line. If it occurred later this westward bulge would have terminated the South Charleston Moraine to the south, which does not appear to be the case.12

A second theory, which fits these objections, is based on the fact that the South Charleston Moraine represents the boundary between soils with different depths of leaching. To the west, the depths approach twenty-six inches as an average, and from the South Charleston Moraine eastward the depth is approximately eighteen inches.13 The difference probably lies in the type of soil parent material rather than in the time involved. If this section can be shown to have a higher percentage of sand-derived material, the shallower depth of leaching can be explained. This boundary continues southward and northward from the county just as in the case of the stone counts, but in this case can be traced north to the Bellefontaine outlier, and then west into the soils of

Indiana. Since it does enter Indiana and follows an east-west line to the outlier, then the second theory of formation is the more likely, that the change is due to a shifting of the source of the late Wisconsin ice. This shift would cause a change in the composition of the till which is actually shown by the stone counts. This will not be proven until much more work has been done on the problem in adjacent counties.

This moraine is probably the northern continuation of the Reesville moraine, which follows the eastern edge of Greene County, Clinton County, and then into the northern end of Highland County.15

Xenia Moraine

This moraine enters the southern edge of Clark County just east of the village of Clinton and extends to the west of the village of Selma. The name is taken from Greene County where it passes through the city of Xenia. Within the county it has good morainic topography, high rolling hills, enclosed depressions, and boulders. The relief is from twenty to sixty feet and the moraine is continuous from the county line to just west of the village of Selma. The position of this moraine would indicate that the ice of the Scioto lobe was spreading out, and moving northwest and west into the interlobate area. The boundary on the north is the outwash channel of the Little Miami River. A stone count in this moraine shows no great difference between it and the moraines

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of the Miami lobe; the number of limestones is slightly larger but that is all. Dolomites are 70%, limestones are 17%, sandstone is 1%, shale is 1% chert is 3%, and foreign types constitute 3%. To the northeast the moraine disappears probably as a result of an oscillating ice front in that direction which successfully eradicated evidence of the northern extension. Still more likely is the idea that the ice may have readvanced over this eastern end when it took up a more north-south line and stood at the moraine. A rather isolated end moraine to the northeast but west of the South Charleston Moraine may be the continuation of this moraine though there is little reason except continuity for saying so. For a distance of four miles from the south county line northward to the Miami River outwash level the moraine shows a total relief of over eighty feet decresing rapidly southward and gradually northward. The local rough topography shows this section to be a good moraine, with numerous enclosed depressions, many large swales and swells, and good till exposures throughout. Boulders are fairly frequent, numbering seven or eight to a field. The stone count is entirely different from that of the South Charleston moraine: dolomite 79%, limestone 9%, chert 1%, and foreign 11%. This moraine represents one formed before the South Charleston and almost at the time of the Xenia to the south, though it was probably cut off at the south by a late readvance of the ice to the furthest position of the Xenia Moraine while the north end remained stationary.
Thorpe Moraine

The Thorpe Moraine is the westernmost moraine clearly attributable to the Scioto lobe in Clark County. It is probably another northern extension of the Xenia Moraine, at an earlier time when the ice was farther advanced than the moraine segment just described. The moraine itself is a very unspectacular one, with a relief of twenty or thirty feet and local high points of sixty feet or more. These high points invariably contain a high percentage of gravel, the moraine as a whole containing more gravel than any so far discussed. It extends from the valley of the Little Miami River on the south to the village of Harmony on Route 40 on the north. It is seldom more than a half mile wide, dropping off abruptly to the west and grading imperceptibly into a flat till plain on the west. Stone counts taken in this moraine do not vary from the average of the Scioto lobe: dolomite 73%, limestone 6%, shale 2%, sandstone 2%, and foreign 9%. North of harmony the moraine is not traceable on topography, but since the high percentage of gravel is unique, an extension northward might be postulated on the gravelly western edge of the moraine complex to the north.

Pitchin Moraine

This moraine is the easternmost one in the Miami lobe series, and it follows closely the alignment of the Thorp Moraine of Scioto lobe. The total rise of this end moraine above the ground moraine varies markedly, from about ten feet at its southern extremity to over sixty feet in the north, increasing gradually all the way. It extends from the Little
Miami River valley on the south to the Beaver Creek valley on the north, being breached midway by a high level outwash series. The local topography aids greatly in making this a good moraine, since the swales and swells are very closely spaced, and enclosed depressions are very numerous. The western slope of the moraine to the south is very much dissected. (See Fig. 6) Boulders are very numerous, especially to the south, where the relief and topography show fewer frontal moraine characteristics than elsewhere. The western slope is very abrupt and is very much dissected. The moraine is lost completely to the north, and it is mere speculation as to whether the ice-edge at this time lay in the same moraine complex postulated for the Incrop Moraine, or whether the ice edge joined the Springfield Moraine to the northwest, the next one to be discussed. From the form and proximity one may guess that it joined the Springfield and has since been breached by the Buck Creek outwash.

Springfield Moraine

The so-called Springfield Moraine consists of an extremely large section of moraine north of the city of Springfield and of discontinuous patches in the southern part of the city. Frontal moraine topography in this section continues unbroken from the north city limits of Springfield northward to the county line and it is two to four miles in width. There are very many enclosed depressions in sharply rolling topography, with widespread local relief above twenty feet. The crest of the moraine rises gradually to the north from about 1050 feet at the south to over 1120 feet at the north.
Figure 6. Dissected western edge of the Pitchin Moraine.
with the topography more rugged to the north.

This moraine is everywhere underlain by gravel as shown by the several exposures (See Fig. 7 and 8) and by information from wells. The average till thickness over the central part of the moraine is over thirty feet with the underlying gravel attaining thicknesses of thirty to fifty feet. In some places, sand is interbedded with the gravel, both being widely used for road and building purposes. The till over gravel continues through Springfield and to the south as far as a high-level outwash series which makes a definite boundary for the southern extension of the moraine.

Southwest of Springfield and south of Enon are several patches of moraine, containing much gravel, which probably represent the western continuation of the Springfield Moraine. If they do, they show a long stand of ice to the north of Springfield and an oscillating front south and west of the city so that no extensive continuous moraine was formed. Such a discontinuous front is suggested by the large number of kames south of Enon and south of Springfield. These form, with a series in Greene County, a discontinuous ice front which ultimately joins the kame moraine at Southern Hills and the Camden Moraine of Leverett.16

Boulder Belt Moraine

The Boulder Belt Moraine is found in the northwest corner of the county. The east boundary of the belt might be mapped roughly as the East Fork of Honey Creek for east of it very few boulders are found, but west of the creek there are many in every field. In the north the boundary is

Figure 7. Gravel pit in the Springfield Moraine showing till over sand over gravel.

Figure 8. Gravel pit in the Springfield Moraine showing till over sand.
very definite whereas to the south the boundary becomes obscure.

The belt at the south end is lower topographically than the till plain to the east. The belt rises more rapidly than the plain, however, and at the county line, the elevations of frontal and ground moraine are comparable. The local undulation in Clark County is of the order of fifteen to twenty feet. It includes enclosed depressions, and hundreds of boulders. The number of boulders varies markedly, since at some places a person could easily go from one edge of a field to the other, never touching the soil, by walking on boulders. In other areas, the fields are completely free of boulders with perhaps a dozen hauled to the fence line or to the woodlot. (See Fig. 9 and 10) A boulder count of one hundred pieces over six inches in diameter showed a remarkable abundance of foreign types from many miles away: sandstone 1%, acid igneous 62%, quartzite 19%, basic igneous 14%, and schist 4%. The complete absence of local rock types, as dolomite and limestone, is very remarkable since for many miles to the north the ice must have passed over practically nothing else.

A stone count here shows the finer fractions of the boulder belt soils to be typical of the Miami lobe already counted: dolomite 79%, limestone 10%, shale 2%, sandstone 2%, and foreign crystalline rocks 6%.

As shown by well information the till of the belt is

17. Goldthwait, R.F., Personal communication.
Figure 9. Boulder spotted field of the Boulder Belt Moraine.

Figure 10. Boulder-lined fence line in the Boulder Belt Moraine.
rather thick, exceeding sixty feet in most places, though in both the East Fork and the West Fork of Honey Creek dolomite is exposed.

At the southern edge of the belt in Clark County, the topography changes to that left by a stagnant ice sheet, with kames and kettles replacing the hummocks and hollows of the moraine to the north. In this area the transition from till to gravel to silt occurs very rapidly. Farmers digging fence posts just west of New Carlisle complain that they never know what material the next fence post-hole will be dug into. The first may be in gravel, the second in till, and the third in silt.

The boulder belt continues to the north into Champaign County where it seems to spread out widely. To the west it enters Miami County along a discontinuous line and then has been traced southward into Montgomery County. The topography, the continuity, and the boulders mark it as a definite ice-frontal feature although at places the morainic topography is lost and the other two criteria must be used in mapping.

The depth of leaching in the belt is approximately thirty inches suggesting that it is of middle-late Wisconsin age, and relates to the other moraines of the Miami lobe. The depth of leaching figure was obtained from an average of nine auger holes within the boundary of the belt. It is the youngest of the Miami lobe series in Clark County, representing the point of furthest retreat in the county.

16. Ibid.
17. Ohio water resources board, the alluvial and glacial deposits of Montgomery County, Ohio, (a map) Nov., 1947.
Cable Moraine

This moraine covers the entire northeastern corner of Clark, County. It is the highest single element in the county, rising to 1300 feet just west of the village of Knoxville. The local relief is the greatest relief of any moraine in the county. Relief which shows good frontal moraine topography further south would be called ground moraine in the Cable Moraine because of the very rough local relief. The type of material varies from east to west, containing large amounts of gravel on the west edge, and changing to all till toward the east.

The Cable Moraine is actually a moraine complex, formed by the junction of the following moraines of the Scioto lobes: the Brighton Moraine, the Plattsburg Moraine, the South Charleston Moraine, and the Thorp Moraine. It is a north-south trending moraine from which all the others branch. Several of these moraines can be traced northward as high north-south ridges in the Cable Moraine, as shown on Plate II by the black dashed lines of the axes. A glance at the regional map, (See Fig. 28) prepared by Dr. Richard P. Goldthwait, serves to give the regional interpretation as so far understood.

Two mammoths have been found so far in the Cable Moraine, one of which is mounted in the Geological Museum at Ohio State University, Columbus, Ohio, and the other is mounted at Wittenberg College in Springfield. There is a possibility of another skeleton, one and one-half miles north of Brighton at the junction of the Old Columbus Road and the Tradersville Pike, where a farmer has uncovered several bones.
Enon Kames

Approximately three miles south of Enon can be seen a series of kames, included already with the Springfield Moraine, but distinctive enough to be given special attention.

The outstanding one is less than a half mile north of the county line, and attains an elevation of 1060 - 1070 feet. A gravel pit has been opened on the north slope, exposing and at the base, about twenty feet thick, overlain by gravel and cobbles about twenty feet thick. On the west bank of the cut is an ice contact slope showing the till rising abruptly over the gravel and thinning out upward. This helps to prove the kame or ice-contact origin of the hills in the region. (see Fig. 11 and 12)

At the base of the till is a conglomerate layer from one inch to three inches thick cemented post-glacially by lime derived from the leaching of the overlying till.

Since kames are a distinctive feature of a thinning wasting ice front, this means that the ice which formed this section of the Springfield moraine was a thin dirt-covered sheet due to down-wasting.

New Carlisle Kames

Immediately south of the village of New Carlisle is found a kame about four tenths of a mile long and a tenth of a mile wide. It stands above the outwash plain to the north and is closely allied with a high level pitted outwash plain to the south. A gravel pit has been opened in about the center of the kame which shows cross-bedding by water flowing from
Figure 11. West cut of the Enon Kame, showing the till exposure over conglomerate over gravel.

Figure 12. North cut of the Enon Kame, showing the till exposure at the surface.
the northwest and flowing outward from the center. (See Figs. 13 and 14) On the north and south slopes there is till overlying the gravel, showing that they are probably ice-contact slopes.

**Little Miami Outwash**

The Little Miami Outwash series occupies an area immediately east of the Thorp Moraine, with an arm extending eastward around the Selma Moraine and just west of the South Charleston Moraine. (See Figs. 15 and 16) This outwash is colored in purple on Plate II at the end of the report. It is a flat gravel plain varying in elevation from about 1040 feet at the south to about 1080 feet at the north. For the most part, there is strong topographic break between the outwash plain and the adjacent till plain or moraine. Since this is at the highest level of any outwash in the southern part of the county, it must have been the first formed. Lower outlet passages cause lower outwash levels and presumably it was gradual disappearance of the ice which opened lower outlets. On this logical basis, Miami lobe ice must have stood at the position of the Pitchin Moraine, and effectively blocked the Mad River gorge west of Springfield. Scioto lobe ice must have been somewhere east of the position of the Selma Moraine during the time of formation of this level, since there is a till over the gravel of the plain to suggest that ice advanced into that area later. Ice may have readvanced to the position of the Reesville Moraine later, cutting off the southern extension of the outwash plain and also of the Selma Moraine, as already postulated in a description of.
Figure 13. South cut of New Carlisle Kame showing cross-bedding from west to east.

Figure 14. East cut of New Carlisle Kame showing cross-bedding from south to north or from center outward.

Figure 15. Little Miami Cutwash plain looking westward toward Selma Moraine.
that moraine but evidence for this would be in Greene County and is unknown as yet. The meltwater probably flowed down what is the present Little Miami River valley, and off through Clifton Gorge as it does today, though if the gorge were closed by Miami lobe ice it may have flowed across the flat plain in front of the Reesville Moraine. Since the plain slopes southward and westward this plain was probably formed by the Scioto lobe ice. (See Plate I)

Clifton Outwash

This outwash plain enters Clark County just north of the village of New Moorefield and trends southward west of Harmony, (See Fig. 17) west of Thorp, and leaves the county just east of the village of Clifton. At Clifton the plain is at an elevation of 1000 feet rising northward to 1050 feet west of Harmony, up to 1090 feet east of New Moorefield (See Fig. 19) and up to 1110 feet at the north county line. This plain is extremely flat for the most part though there are small undulations, minor in nature, over parts of the area. There are several segments of the plain not directly connected with the main system. Some of these can be found within the city limits of Springfield, sloping southeastward, and several others just southwest of the city limits, east of Springgrove Park and at the location of Emery Chapel. These all are tributaries to the main system and slope southeastward. One other segment attributable to this system is found just south of the Anon Kame sloping into Yellow Springs Gorge which is tributary to Clifton Gorge. Their relation to the main system can be seen from the slope profile, Plate I, accompanying the
Figure 17. Clifton Outwash as seen west of Harmony

Figure 19. Clifton Outwash as seen east of New Moorefield.
thesis, plotted in red.

In view of this distribution it is possible to say that the Miami lobe ice had retreated from the position of the Pitchin Moraine to that of the postulated Springfield Moraine, thus leaving Clifton Gorge free of ice, and allowing free flow of meltwater through a gap in the older Pitchin Moraine. The Springfield Moraine north of that city is composed of till over gravel which indicates a probable readvance of the Miami lobe ice over an old outwash plain. South of the city, however, a front of thin wasting ice is indicated by the presence of kames. The presence of these outwash segments at the position of the Springfield Moraine adds credence to the existence of a significant ice edge there, even though the end moraine features are patchy. The Scioto lobe ice must have remained at the same position all through this outwash period because its retreat from the South Charleston or Reesville position coordinates with the Mississinawa Moraine of the Miami lobe on a soils basis. (See p. 25)

Eton Outwash

This outwash level occupies three separate areas in Clark County. One is the area on which Eton is located, an area which extends south and west from the village and is at an elevation ranging from 860 feet at the south county line up to 900 feet at Eton. A second area consists of several patches, one on which New Carlisle is located, one just northeast of this town, one on which Medway is located, and a fourth southeast of Forge. This second area ranges in elevation from 850 feet at the south to 920 feet north of
New Carlisle. The third area is in the Buck Creek valley in the northern part of the county consisting of three patches. New Moorefield is located on one, the second is east of the so-called Indian Mound, while the third is in the Buck Creek valley south of New Moorefield. This last area ranges in elevation from 1040 feet at the south to 1080 feet at the north county line. The entire outwash level is on Plate II colored in blue. The plain at Enon is very flat with Mud Run rather deeply impressed into it. The segment from Medway northward undulates markedly in contrast to the flat Enon plain, and near New Carlisle has a series of small kames associated with it. The Buck Creek valley segment is a flat plain sloping both southward and eastward.

At the time of formation of this outwash plain, the Miami lobe ice front must have been south of the position of the Boulder Belt, yet it had retreated back from the Springfield Moraine to permit the formation of the outwash west of it. Another reason for stating that the position of the Miami lobe ice was south of the Boulder Belt position is that the drainage of this outwash was to the south through an outlet approximately two miles east of Osborn. (See Plate I) This shows that the Mad River was blocked at Dayton, which could have been accomplished only by ice south of the Boulder Belt position.

At the north end of the plain, just south of New Carlisle, is the kame already described. The presence of this kame indicates that this at one time was an ice contact plain.
The southern end, north and west of Medway, contains many kettle holes, of which the Crystal Lake valley series is the largest. These kettles form a complete chain down the valley, suggesting the presence of an old channel, from the north, past Medway into the Enon area in the outwash. The plain grades to the north into the Boulder Belt. At some places there is a definite topographic break between the two, but at others the plain grades directly into the belt with no break in slope.

The composition of this outwash from New Carlisle to Medway differs from that of the others so far described. It is a mixture of all types of material, from cobbles, gravel, and sand, to fine silts and clays. At some places, as just southeast of New Carlisle (See Fig. 20 and 21), gravel pits have been opened in the plain exposing thirty to forty feet of gravel. Just one mile southeast of this pit another one was opened, from which a large amount of gravel was removed. The operation was forced to close, however, where silt and clay masses were found in all directions from the gravel.

Mad River Valley Train

This valley train includes most of the lowest level outwash, which is barely above the present day floodplain in places. Under this heading will be included all of the outwash graded to the same broad valley of Mad River, namely: Beaver Creek (See Figs. 22 and 23), Sinking Creek, Buck Creek, and Honey Creek, as marked on Plate II in orange. All of these must have formed at the same time, since they grade uniformly one into the other. The gradients may be different,
Figure 20. Gravel pit in the Enon Outwash series, showing the cross-bedding from the northwest.

Figure 21. Gravel pit in the Enon Outwash series, showing the cross-bedding from the northwest.

Figure 22. Beaver Creek Valley Train, tributary to the main Mad River Valley Train.

Figure 23. Beaver Creek Valley Train, tributary to the main Mad River Valley Train.
however, since the shorter tributaries will have the steeper gradients as is the case in most river systems. The elevation where the outwash is noted at the south county line is 800 feet, rising northward so that the Mad River Valley at the north county line is at an elevation of 960 feet. The tributaries, however, are higher as stated before, so that the head of Beaver Creek is at 1180 feet, of Buck Creek at 1050 feet, of Sinking Creek at 1130 feet, and of Honey Creek at 920 feet.

At the time of formation of this level of outwash, the Miami lobe ice must have stood midway in the Boulder Belt. This means the ice retreated far enough to open the Dayton outlet to the south, the one still in use today, proving merely retreat to the Boulder Belt. That the ice retreated midway in the Boulder Belt can be shown by the fact that many of the tributary valley trains head in the center of the moraine, showing the ice margin was there. 20

Throughout all these valleys, many gravel pits are in operation, showing gravel to depths of sixty feet or more, as at Eagle City north of Springfield, or in the Patterson Field gravel pits at the county line north of Osborn, and in the State Highway Department pit at Enoa. The gravels are not so deep throughout the valley, however, because bedrock was reached at just over four feet in a cellar excavation in the center of the valley four miles north of Springfield. 21

At the Springfield Water Works, on the other hand, a

20. Goldthwait, R.P., Personal communication.
test well was drilled 422 feet to the bedrock. In this case, the great depth is explained by the Teays River channel already described on page 5.

East of Springfield, in the Mad River valley, there are several levels of terraces, just slightly above the main outwash level, though seemingly not continuous for any great distance. Presumably these show early phases in the cut and fill of this lowest Mad River valley train, possibly as the Scioto lobe ice was retreating from the position of the South Charleston Moraine to the Brighton Moraine in the later phases of the deglaciation of the county.

Clastic Dikes

In the northern end of the county, one half mile north-west of Catawba, about one hundred yards southwest of Ohio Route 37 can be seen an exposure of clastic dikes (see Fig. 24 and 25) composed of slightly banded brown clay till in a blue-gray till matrix. In order for such a phenomenon to occur, the blue gray till must have been fairly well consolidated and the brown till must have been in an extremely fluid condition, so that the laws of hydrostatic pressure could operate. This pressure must have been exerted in all directions equally for the brown dikes are oriented in all directions. They are now tougher than the blue-gray till, because the dikes stand up as ridges in the stream bed where erosion has laid both bare.

Conglomerate

A conglomerate composed of cobbles is exposed at several localities in the area north and northeast of New Moorefield
Figure 24. Stream cut exposing Clastic Dikes.

Figure 25. Stream cut exposing Clastic Dikes.
(See Fig. 26 and 27). This conglomerate has a calcareous cement, probably derived from the high percentage of limestone and dolomite pebbles in the gravel above. It must be a postglacial cementing rather than glacial cementing. It is distinctive mainly because it is so widespread in that area, and is found near the 1080 foot contour always.

**Muck Areas**

The muck areas are confined to the western edge of the county. Those areas in the vicinity of Medway are at the level of the Mad River Valley Train. They are in the valley of glacial Honey Creek and were formed in original kettles which became swamps after the disappearance of the ice. Those areas to the south of Enon are at the level of the Enon outwash and may have been formed by the change of drainage from Enon outwash time to Mad River outwash time. This change, affected by the southward slope of the Enon plain, would affect a temporary damming of the streams. The muck areas in the Mad River valley proper were probably formed in the abandoned braided channels of the original Mad River Valley Train, made before the postglacial stream cut its course slightly deeper.
Figure 26. Conglomerate exposed at Indian Mound, North of New Moorefield.

Figure 27. Close-up of conglomerate exposed at Indian Mound, North of New Moorefield.
Glacial History

The first events of Pleistocene time in Clark County must be inferred from evidence outside the county. Only late Wisconsin deposits are exposed within the county. It can be inferred from drainage changes and buried channels that Kansan or Nebraskan ice actually did cover the area but no older tills are exposed. From evidence in the southern part of the state, it can be shown that the Illinoian ice advanced to the region of Cincinnati, and that an early Wisconsin substage covered much of the area to the south of Clark County.  

Perhaps at some future date correlations by means of well information will be possible to prove the existence of earlier advances over this area.

Striae on the bedrock, as described on pages 14 and 15, are the earliest evidence of a middle-late Wisconsin advance. Leverett mentions these striae and also another set north of Springfield in the valley of the Mad River. This second set could not be found and no description was given of their location.

The first event of middle-late Wisconsin time actually traceable in Clark County was the advance of the Scioto lobe ice to the position of the Xenia moraine, which in this thesis is thought to be a continuation of the Cuba moraine of Leverett. The curvature of the Xenia moraine to the southwest would indicate the advance of the Scioto lobe ice to this position before the advance of the Miami lobe ice. It is impossible to

22. Leverett, Frank, U.S.G.S., Monograph XLI, Plate XI
23. Ibid. p. 327.
24. Ibid. p. 341.
reconstruct the position of the Miami lobe margin at this same
time. However, the presence of cross-striations in Greene
County immediately to the south\textsuperscript{25} shows that the two lobes
alternately advanced or retreated over some of this inter-
lobate area. The absence of early Wisconsin deposits in the
county indicates they completely overlapped the area though
this does not necessarily mean that they ever touched. If
the two lobes ever did touch, the drainage of meltwater must
have been superglacial and/or subglacial, with Clifton Gorge
a possible subglacial channel. It is more probable that they
never did touch. The Xenia moraine, with its northern ex-
tension at the position of the Thorp moraine, represents the
oldest moraine at the surface within the county. The ice re-
mained at this position for an indeterminate time, and then
its northern edge retreated to the position of the Selma
Moraine. With further readjustment, the entire ice front
retreated to the line of the present Reesville Moraine and
remained there until a late phase in the glacial history of
the county. Either during or just following this retreat the
Miami lobe ice advanced to the position of the Pitchin Moraine.
With this advance, formation of the Little Miami outwash
series began, a process which was altered only when the
Miami lobe ice began its retreat.

The retreat of the Miami lobe ice from the Pitchin
Moraine to the Springfield Moraine opened a lower outlet to
the south, marking the beginning of the Clifton series of
outwashes. Soloto lobe ice remained meanwhile at the Reesville

\textsuperscript{25} Goldthwait, R.P., Personal communication.
Further retreat of the Miami lobe ice to a position just in front of the Boulder Belt Moraine but still blocking the Mad River Valley to the southwest caused a further lowering of the outlet to the south. The Enon series of outwashes was formed in front of this ice margin with an outlet two miles east of Osborn. Scioto lobe ice still remained at the Reesville Moraine position.

The Miami lobe ice again retreated, this time to a position at about the center of the Boulder Belt Moraine. With the ice in this position, the Mad River Valley Train system was formed with the present Mad River Valley as an outlet toward Dayton.

Again it was a retreat of the Miami lobe ice which caused a change. As ice left the position of the Boulder Belt Moraine, a lower outlet to the west was opened for Honey Creek, which now flows directly west from New Carlisle instead of south through its former channel.

The Miami lobe ice kept up its retreat to the position of the Mississinawa Moraine in Miami and Shelby Counties when the next event of importance occurred. With the Scioto lobe ice at the South Charleston Moraine and the Miami lobe ice at the Mississinawa Moraine the source area for material for both lobes shifted. Evidence of the shift is found in the abrupt change in soils and stone count from the South Charleston Moraine eastward and probably one from the Mississinawa Moraine northward. This change serves to suggest a time line
and a correlation line between the two lobes so that it is likely that the South Charleston Moraine is the equivalent of the Mississinawa Moraine. By the use of this time line and the use of the outwash levels it is possible to say that the Miami lobe ice disappeared from Clark County before the Scioto ice. Soon after this the ice must have retreated from the South Charleston Moraine, in a temporary halt formed the Brighton Moraine, then the Bloomingburg Moraine.

Then it disappeared from Clark County. With this retreat, the eastward drainage systems of Deer Creek and Paint Creek were formed, and the deglaciation was completed.
Reconnaissance Map of the GLACIAL DEPOSITS in SOUTHEASTERN OHIO

Figure 28
ECONOMIC CONSIDERATIONS

The most abundant and most widely used economic product in Clark County is its gravel. The best deposits are those found in the Mad River Valley Train. This area is worked from New Moorefield at the north to Caborn at the south, with exceptions as already noted (p. 58) the bedrock is very close to the surface. The major trouble encountered in the pits is the nearness of the ground water table to the surface, a difficulty overcome with drag-line equipment, as at New Carlisle, and at Eagle City. In the Enon outwash series the gravel may be in lenses, and therefore is usually not obtainable in large enough quantities for commercial use. (See p. 53)

There are other good local sources of gravel, as the Clifton outwashes, the Enon Kame area, the Springfield Moraine both north and south of the city, and the Thorp Moraine creates. The kame areas are rather poor sources since they are so irregular.

Associated with the gravel is sand, in some places completely separate and in others obtained by washing processes. The sand as a separate unit can be found at Lagonda, just north of Springfield, at the Enon Kame area and in a sand pit just west of New Moorefield. This sand is used in cement, road-building, brick-laying, and molding. Sand is obtained by washing processes at all the gravel pits, notably the State Highway Department pit at Enon, a pit just south of the Fairfield Road at the Mad River Special School District School, and in all the pits associated with Patterson Field.

The sand and gravel has just been touched insofar as reserves are concerned. Gravel is available all around the
borders of the Springfield Moraine north of the city, and for several miles south of the city. The Mad River Valley contains gravel resources that can never be exhausted. All of the outwash plains contain gravel, unworked so far, in commercial quantities.

There is only one active dolomite quarry in the county, but there are four abandoned ones. They all worked the Cedarville and Springfield formations for road metal and agricultural lime. The active one is just west of the Old Mill Road which is west of Springfield. Two of them also mark the sites of old mills, both being located on Honey Creek in the northwestern corner of the county.

There is a vast reserve of dolomite near the surface in Clark County. The exposures along the Mad River west of Springfield are likely to furnish all the material needed for the county. The two hills of Brassfield limestone (see p. 9) offer possible resources for cement since the overburden is very thin and a thick section of the limestone is exposed.

The water supply of Clark County is especially good. There is not a location in the county where water can not be gotten by drilling, though wells in some of the till plains are poor. The best supply is found north of Springfield from the west bank of the Mad River to the east bank of Buck Creek. These wells and springs are of the constant flow type, and every farmer contacted reported his well or spring had never gone dry in forty or fifty years. In the North Hampton Till Plain, the wells are very good, except on the
south edge where most of the wells go into bedrock. As a result they are more expensive to drill and are not as good when completed.

To the east, in the thick till area, wells must be drilled approximately 185 feet to gravel. The water obtained here is hard and the wells are not dependable.
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