

GLACIAL PHENOMENA IN THE VICINITY OF  
CARBONDALE

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The area particularly discussed in this paper is that of the Carbondale quadrangle, in the northwest corner of which the town bearing the same name is located. This quadrangle may be roughly divided into three topographic units according to the bed rock formations which underlie these units respectively, as shown in the accompanying figure. The northern unit is that underlain by the Carbondale formation, composed of sandstone and shale, which when eroded, gives rise to a gently rolling surface. The central unit, which is by far the largest of the three, is underlain by the massive sandstones and shales of the Pottsville formation. This part of the quadrangle is very rugged and constitutes a portion of the Illinois Ozarks. Sandstone bluffs and cliffs are numerous. The southern unit of the quadrangle is that underlain by the limestones, shales, and sandstones of the Chester group. It has a varied topography. In places it is like the northern unit, and elsewhere like the central unit, particularly in the areas where some of the prominent cliff-forming sandstones are well developed.

The north three-fourths of the quadrangle drains to the north; the south one-fourth to the south. The northward drainage eventually merges in Craborchard Creek, which flows westward across the northern part of the quadrangle, but turns abruptly to the north in the northwest corner to join Big Muddy River.

The Illinoian glacier spread over the northern half of the region just described. It came dominantly from the north and perhaps a little from the east. The ice of the glacier was probably porous and much crevassed from the buffeting against the hills of the country over which it had passed, and its advance was seemingly very slow. The rapid melting and pronounced deposition which accompanied the formation of the terminal moraines of the Wisconsin ice were essentially missing. The melting of the Illinoian ice seems to have been comparatively slow. The ice moved over the rolling topography of the north-

ern unit of the quadrangle without great difficulty, but when it encountered the rugged upgrade slopes of the Pottsville unit, the forces which were pushing it ahead seem to have been insufficient to send it completely up the grade. The southward progression of the glacier, therefore, is thought to have ceased more because of a lack of motion of the ice itself rather than to the predominance of melting over ice advance. There was probably a geologically brief period when the advance and the melting back of the ice were equal and the margin therefore maintained a fairly constant position. During that time deposits accumulated at the ice front in thicknesses somewhat in excess of those formed elsewhere in this region, but in this rough topography did not form a prominent moraine.

The first important event in the general glacial history of the region was the shutting off of the drainage of Craborchard Creek from Big Muddy River. It is not known where the ice first interrupted the drainage of the creek, whether near Big Muddy River or farther up stream, but eventually the result was the same. All the precipitation as well as the water from the melting of the glacial ice was therefore ponded in that part of the valley of Craborchard Creek not occupied by ice and its tributaries until it became high enough to cross the divide at the headwaters of the creek some 20 miles east of Carbondale near New Dennison. Just how high the water stood in the valley can now only be approximated, but it certainly stood as high as 435 feet above sea level, for that is the present height of the New Dennison col. The maximum depth of the lake was about 100 feet. With the continued advance of the ice, certain northward flowing tributaries of Craborchard Creek were cut off from the main stream and became local lakes. Some of these lakes at times found exit across divides into neighboring valleys which still discharged into Craborchard Creek. Two cols which were produced in this fashion, but probably during the early stages of Lake Craborchard, occur in Secs. 1 and 2, T.10 S., R.1 E., where the waters of Little Grassy and Caney creeks probably crossed the divide into Sugar Creek and thence joined the main drainage.

During the existence of these lakes, deposition of materials from the melting ice was constantly going on. In the Craborchard lake, which was probably by far the largest on this quadrangle, it seems possible that unstratified gray clay accumulated in portions of the lake basin where deposition was continuous. From time to time boulders and pebbles fell from bergs and ice blocks floating about on the lake and became imbedded in this lake bottom clay. Thus it is possible that some of the gray clay till-like material which contains sparse pebbles may have originated. This method of origin does not, however, preclude the probability that the greater part of the gray till was formed in the commonly accepted fashion, but is merely a suggestion as to how a very similar sort of deposit might have been formed under special conditions.

In the smaller lakes and the larger lake alike there were deposited in considerable thicknesses stratified materials composed for the most part of sand and silt. There is some gravel found with these sands and silts, but it occurs in lens-like deposits, some of which seem to have been built up as small deltas where comparatively rapid moving water entered a quiet body of water. In some of the smaller valley lakes in the central part of the quadrangle, fifty or more feet of these sands and silts accumulated. They are commonly underlain by pebbly clay till, and in places have this material intercalated with them. The valley of Sycamore Creek, in the eastern part of T. 10 S., R. 1 W. particularly, has excellent exposures of these sands and silts.

In two of the lakes the water seems to have become high enough to have spilled across the divide and found an outlet to the south to Ohio River. These lakes occurred in the valleys of Drury Creek and Little Grassy Creek respectively. The former lake had its inception when the ice shut off the drainage of Drury Creek from Craborchard Creek. By the time the ice had advanced south to a point about a mile and half south of Bosky Dell, the lake was about eight miles long and the water in it at that point was about 200 feet deep. The surface elevation of the lake was about 600 feet. Some of the



water spilled over a small col in Sec. 20, T.10 S., R.1 W., thence into Cedar Creek, and eventually into Mississippi River. The farther advance of the glacier, however, eventually shut off this exit and the water found its way across the divide to the south through a col just north of the town of Cobden. The elevation of this col is a little over 600 feet and drainage through it, and the previously mentioned col, may have been contemporaneous for a time. The Cobden col is not a particularly large col, its size suggesting that the quantity of the water passing through it at any time was not large. The col is cut in formations of the Chester group which are not particularly resistant to erosion. The character of the bedrock, therefore, would not have been a particular hindrance to the enlargement of the col had it contained a torrential stream. Glacial boulders have been found in the valley of Cache Creek south of the col, and though the presence of some of them doubtless may be assigned to transportation by human agencies, it is probable that most of the larger boulders were carried over the Cobden col in floating blocks of ice, and later left stranded farther down-stream.

It is a matter of interesting speculation whether with a head of 200 feet of water in Drury Lake some of the water of the lake may not have followed the natural trend of drainage to the north through the much crevassed glacial ice, eventually to find a mode of egress into the Mississippi or its tributaries; also, whether in places sedimentation may not have been going on within the body of the ice where it was saturated with water.

The lake in the valley of Little Grassly Creek was not as large as that in the valley of Drury Creek. Its maximum length was about three miles and it probably began when the ice blocked the valley in Sec. 19, T.10 S., R.1 E. The water in this lake stood at least as high as 570 feet above sea level. This is the present elevation of the Water Valley col over which the water from this lake found its way southward into Bradshaw Creek and eventually into Ohio River. The col is cut through a faulted area in which the Kinkaid limestone of the Chester group and a massive sandstone of the Pottsville formation are

exposed. The fractured character of the bedrock forming the floor of this col is a factor favoring rapid erosion. The col, however, is only about an eighth of a mile wide and does not itself seem likely to have carried a great volume of water, nor does Bradshaw Creek, into which the waters entered after crossing the col, show evidence of having carried an abnormally large volume of water.

Most of the materials which were presumably deposited in Little Grassy Creek lake have been eroded away, but in places in the valley a deposit of gray clay containing much rotted limestone boulders is found which was probably formed during the existence of the lake.

Very little outwash seems to have been developed in front of the margin of the ice after it had reached its maximum southern extent. Igneous boulders are found in places for distances of two miles or more south of the margin of the glacial deposits, but they are merely loose in the beds of the creeks and were not seen in any definite arrangement that could be considered characteristic of outwash deposits. The absence of these deposits is probably due to the rapid and pronounced erosion which has taken place since glacial times, and also to the tendency of the present drainage to transport the debris in the valleys to the north. Outwash boulders transported in this direction soon become mixed with other glacial material and are indistinguishable from it.

The retreat of the Illinoian ice seems to have been in a measure a replica of its advance in so far as the deposits which the ice left are concerned. Local lakes were formed in valleys, and Drury and Little Grassy lakes extended to the north until the ice ceased to obstruct the drainage in that direction. In these lakes more silt and sand accumulated, and elsewhere where water sorting was not active, a deposit of more or less heterogeneous materials.

To summarize, then, the outstanding features of the glaciation of the Carbondale quadrangle are as follows:

1. The advance of the ice to its maximum southern limit was accompanied by the formation of lakes in the valleys of many streams draining toward the ice. In the case of two lakes water rose high enough to cross the

divide of the Illinois Ozarks and to find an outlet to the south.

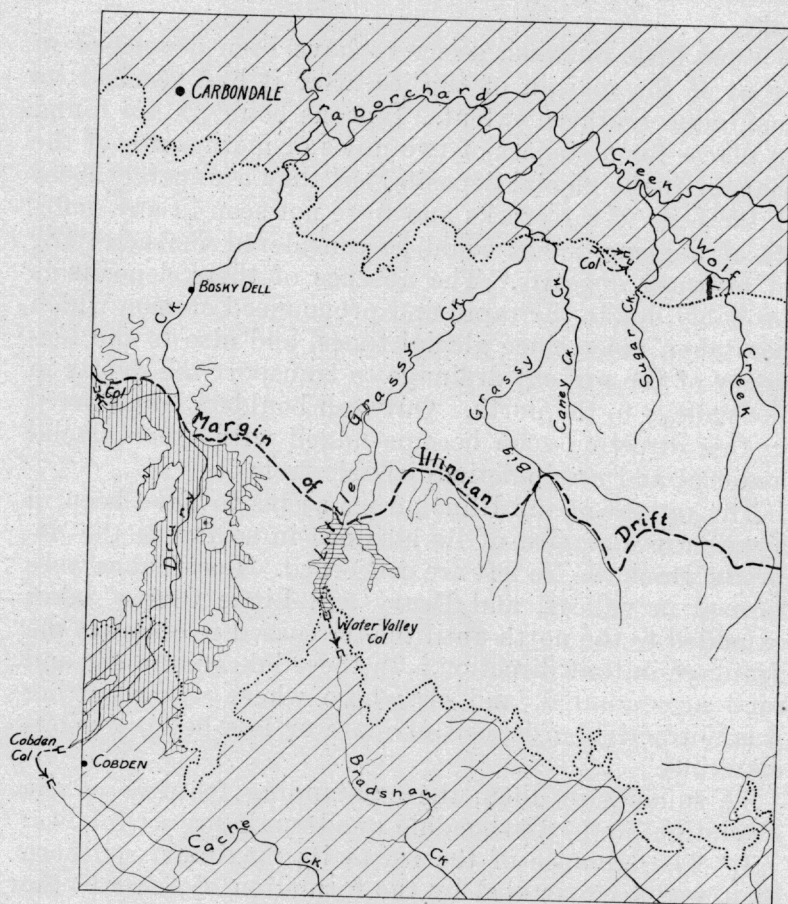
2. In these lakes were deposited primarily sand and silt. The silts are in some cases stratified, in others not stratified.

3. In an environment of such rough topography the terminal morainic deposits are not pronounced.

4. Outwash deposits are essentially lacking because they were either not formed or have been subsequently obliterated by erosion.

## CARBONDALE

## QUADRANGLE



Northern ruled area underlain by Carbonale formation  
 Central unruled " " " Pottsville "  
 Southern ruled " " " Chester group

Glacial lake in valley of Drury Ck.  
 " " " " Little Grassy Ck.