# The Physiography and Surficial Geology of the Carlinville Quadrangle, Illinois*

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The Carlinville quadrangle is located in southwestern Illinois about 20 miles south of Springfield. It is one of the five quadrangles in this part of the State which have been mapped geologically. It is near the western edge of the Illinois coal field and the Herrin (No. 6) coal which is at depth in the quadrange and crops out in the adjacent quadrangle to the west. (See Fig. 1.)

The upland surface is impressively flat and the divides are relatively broad between the stream valleys. The higher elevations of 690 to 700 feet are in the northwest part of the quadrangle, and from that level the till plain descends gradually to altitudes of 620 to 630 feet above sea level west of Carlinville. The streams crossing the quadrangle rise in the Jacksonville moraine, the divide between the Sangamon and Mississippi River basins. The streams have a dendritic drainage pattern but in several areas the valley development is somewhat anomalous to the dendritic plan. Sugar Creek, in Shaw Point township, is in a valley parallel to that of Macoupin Creek but its waters move in a direction opposite to the flow of that stream. Macoupin Creek, where joined by Sugar Creek, is deflected almost at a right angle to its course east of Coops Mound, but regains the line of that course through Carlinville township. Other streams, Hurricane Creek, Richardson Branch, and numerous unnamed tributaries fall into this pseudo-trellis drainage pattern. Cottonwood Creek, east of Sugar Creek, is another small stream whose course is directed against the regional slope of the entire area.

It is thought that these anomalies reflect the glacial history of the region. Numerous broad, faintly defined linear depressions, more apparent in the field than on the topographic maps, probably exert some degree of control in the adjustments of the present valley development. And the trellis-like stream pattern, apparent in the Raymond quadrangle, probably is aligned with the movement of outwash from the Jacksonville moraine.[1]

The most commanding of the topographic features of the quadrangle is its impressive flatness. The Jacksonville moraine, crossing the northeast corner of the quadrangle, is low and inconspicuous. The slight elevations on its slopes tend to be elongate in the same alignment as the stream adjustment, previously described. Coops Mound, the most commanding elevation within the quadrangle, rises from 60 to 80 feet above the upland surface. Well weathered gravel in the base of the Mound and its elongate outline support the opinion that it is an esker.[2] Brushy Mound, six miles southwest of Coops Mounds, and several isolated hills farther east are elongate in a direction with the elongation of Coops Mound. Hills farther south in the Mount Olive quadrangle have more of a meridional elongation.

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[1] Ekblaw, George E., personal communication.

[2] Leighton, M. M., personal communication.

Probably the present drainage is modified to some extent by preglacial topography. The existence of a deep preglacial valley in the southeastern part of the quadrangle has been recognized in earlier investigations.[3] Comparatively little erosion of the bedrock has been accomplished recently by the larger streams. It is thought that the lower part of the valley of Macoupin Creek and that much of the valley of Otter Creek lie in valley courses cut by preglacial streams. A test boring in the valley floor of Otter Creek in the NW¼ sec. 8, T. 11 N., R. 7 W., five miles east of Palmyra, penetrated glacial deposits for 106 feet before reaching bedrock. No exposures of the bedrock in the valley of Otter Creek have been discovered. Four outcrops in two of the tributaries of Otter Creek are known. By inference, then, a preglacial valley of considerable magnitude is followed by Otter Creek. Recent mapping by Mr. Buhle, by electrical resistivity methods, has disclosed the probability that another still larger preglacial valley lies between the valley of Otter Creek and the preglacial drainage lines of the southeastern part of the quadrangle.

Investigations by MacClintock, Wanless, Bell and others have disclosed that deposits of the Nebraskan ice sheet and the associated interglacial deposits extend over parts of western Illinois as far south as Winchester. MacClintock has located two instances of Kansan drift in the Carlinville quadrangle.[4] Several other localities afford evidence of probable or doubtful pre-Illinoian deposits. The several deposits that indicate probable Kansan or Yarmouth age of material are described in summary as follows:

Leached and deeply weathered tills are in and near the city of Carlinville. The first location is in the clay pit of the Carlinville Tile Company in the southern part of the city. Till, at least seven feet in thickness, leached except in the basal part, is gray, sticky and putty-like when wet, and contains a few pebbles of both basic and siliceous igneous rocks. The upper slopes are in a slumped condition but much of the till is thoroughly oxidized and there are local patches of leached till which may be representative merely of the soil profile in the Illinoian drift.

Two and one-half miles east of Carlinville, in the NW¼ sec. 36, T. 10 N., R. 7 W., a till of variable thickness, ranging to a maximum of nearly twelve feet rests on the LaSalle limestone and is covered by about seven feet of Illinoian till. The lower till is leached and oxidized in the upper four and one-half feet, is buff to reddish brown and contains pebbles of chert and quartz. This deposit is cited by MacClintock as Kansan drift.[5]

Another instance of a possible pre-Illinoian deposit is a striated till in the SW¼ sec. 14, T. 11 N., R. 8 W., near the Duncan school in South Palmyra township. These were first noted by Dr. Needham in 1929 and the surface thus marked is again above the water of a temporary farm reservoir, but the striae have been obliterated by standing water and the trampling of cattle. The striae were on the slightly undulatory surface of a slip-off slope of a small stream, were uniformly spaced and about pencil length. If true striae, they possibly were made by the first Illinoian advance, or may mark a re-advance during that epoch. If a record of ice advance, the movement was in a direction south 46 degrees west.

The remaining instances of probable pre-Illinoian deposits have in common humus bands, tills or till-like deposits, silts and fossiliferous horizons, the fossils occurring either in the humus or in the silts. On the basis of fossil determinations, therefore, made by Dr. Frank Baker of the Illinois

[3] Warren, W. D. P., Ground water supplies from preglacial valleys; Municipal and County Engineering, Vol. 62, pp. 184-190, 1922.

[4] MacClintock, Paul, Correlation of the pre-Illinoian drifts of Illinois, Jour. Geol., Vol. 41, pp. 710-722, 1933.

[5] MacClintock, Paul, *op. cit.*, pp. 713, 714, and 721.

Natural History Museum, the age of several of the deposits is regarded as Yarmouth. The Yarmouth humus and associated silts have so many similar features, that, in addition to locations, descriptive comments on all of the occurrences probably will suffice.

Three of the localities are in the drainage basin of a single tributary to Otter Creek which extends through sections 9 and 16 of T. 11 N., R. 7 W., South Otter township. All occurrences are fossiliferous, but the humus band

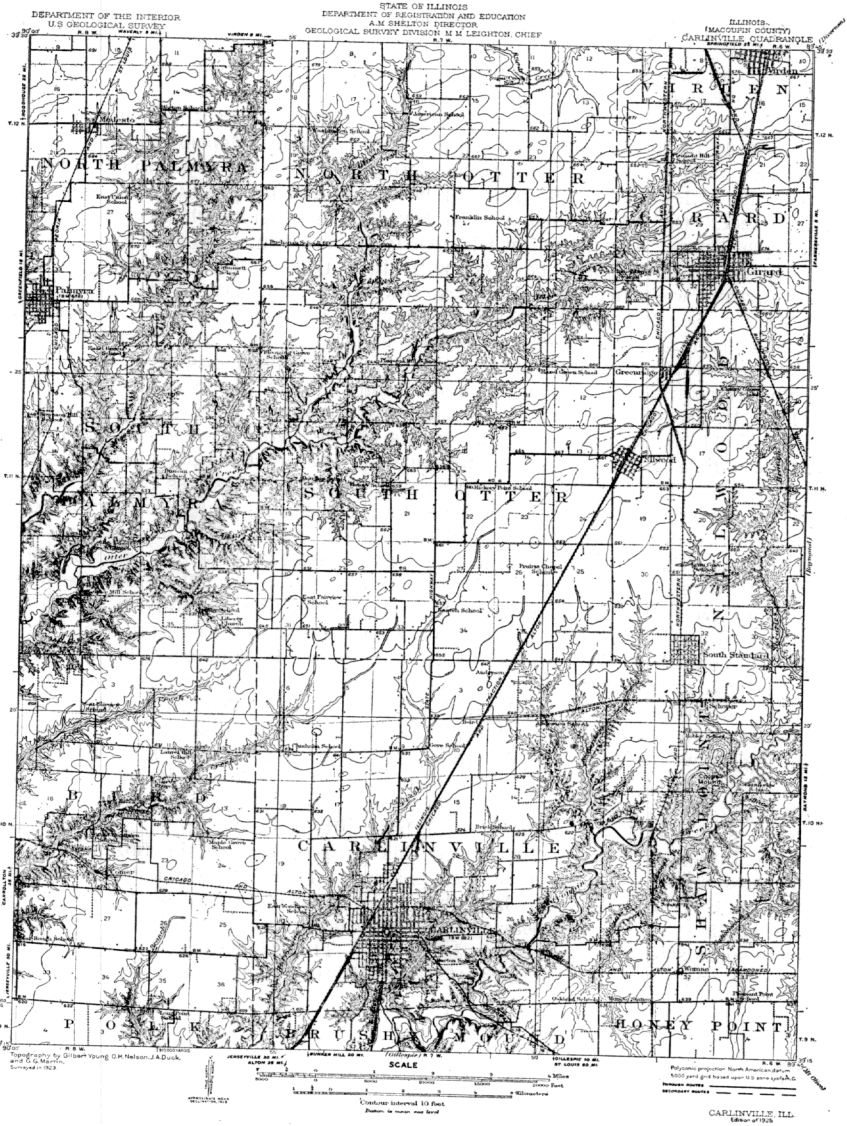


Fig. 1.—Topographic Map of the Carlinville Quadrangle.

is in only two of them. The remaining location in South Otter township is in the SE¼ sec. 10, T. 11 N., R. 7 W. The other occurrences, here mentioned, are in North Palmyra, Carlinville and Shaw Point townships and with one exception are all fossiliferous.

In two of these occurrences a considerable thickness of Illinoian till lies upon the Yarmouth and Kansan deposits. An exposure in the east wall of Sugar Creek, NE¼ sec. 30, T. 10 N., R. 6 W., Shaw Point township exhibits twenty feet of Illinoian till, associated with sand and silt, overlying the humus band and fossiliferous silt of the Yarmouth. At the base of this exposure is a till, seven feet in thickness, calcareous, and somewhat sandy, which is regarded as Kansan till. In this instance the Yarmouth deposits are about midway in the valley wall, somewhat in contrast to some of the other occurrences.

The other example of a thick deposit of Illinoian till resting on the Yarmouth is in South Otter township. The Yarmouth deposit is peat, with about two feet of its total thickness rising in the valley wall and forming part of the valley floor. The peat has been explored by soil auger to a depth of five feet. On its surface a thin layer of molluscan shells contains a Yarmouth fauna. The Illinoian till, overlying, is about 20 feet thick.

Another peat deposit, covered with thin till, is located nearly seven miles farther west in North Palmyra township. The peat here is thinner than in the South Otter township occurrence, is associated with a leached zone of considerable areal extent, but its stratigraphic relationship with the leached horizon is not apparent. Fossils have not been observed.

The remaining occurrences where humus bands are present are quite similar. In association with one occurrence in South Otter township, SE¼ sec. 16, T. 11 N., R. 7 W., certain aspects of the outcrop deserve additional mention. This is the other occurrence in the quadrangle cited by Dr. MacClintock.[6] The humus zone is present, of greater thickness than in other outcrops, mixed with sand, calcareous, and containing twigs and branches. Its fossils are delicate pelecypod and gastropod shells. The material under the humus, "till-like"[7] in appearance, nevertheless presents several contrastive features when compared with characteristic Kansan till. Its somewhat anomalous character has prompted the suggestion that possibly it is but a floodplain deposit of recent alluviation with its soil zone covered by slump material from the valley walls.[8] This suggestion is supported by the fact that in local areas active slumping is in progress. Where this slumping is the most pronounced, the local relief is about 70 to 90 feet in contrast with the lesser relief of 20 to 40 feet in the region under discussion. Decided slumping, however, is developed in a region of slight relief near the peat exposures in South Palmyra township where the differences in elevation range from 30 to 50 feet. Even in this vicinity, however, are small inclusions of green silts which are suggestive of lake silts.[9]

The interpretations of Dr. Frank Baker in respect to the fauna of this occurrence obviously have a further bearing on the questionable character of the underlying "till". He has observed that sediments bearing the molluscan shells " . . . . . appear to have been laid down on a river floodplain, or near some stream of greater or less size." This biological evidence fits in well with the geological picture of a pre-Illinoian surface of slight relief,

[6] MacClintock, Paul, *op. cit.*, pp. 713, 714, and 721.
[7] Leighton, M. M., field comments.
[8] Ekblaw, George E., personal communication.
[9] Leighton, M. M., personal communication.

crossed by the floodplains of either preglacial or pre-Illinoian streams and marked further by bodies of standing water as evidenced by the peat deposits. These conditions may have persisted through both Nebraskan and Kansan times, and the floodplain alluvium of these stream valleys may be the "till-like" material in some of the exposures. The tendencies toward the deposition of marls, supported by the presence of molluscan remains, may have been accompanied further by the precipitation of calcium carbonate in the waters of ponds and floodplain depressions. The low-lying character of this area has been persistent enough through the Yarmouth epoch to preclude the development of the well-drained profile of weathering except in this part of the quadrangle.