SOME ASPECTS OF THE GLACIAL PHYSIOGRAPHY OF NORTHEASTERN ILLINOIS

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The end moraines of northeastern Illinois are considerably varied in form. This variation is primarily the result of differences in the environmental conditions which prevailed during end moraine development. It is the purpose of this paper to consider some of the differences between the end moraines within a restricted portion of this area.

During the Wisconsin glacial stage, northeastern Illinois was invaded repeatedly by ice lobes emanating from the Lake Michigan basin. Although it is believed that deposits representing the Farmdale (Shaffer, Science, 1954, p. 693), Iowan (Shaffer, G. S. A. Bull. 1954, p. 455), Tazewell, and Cary substages (Bretz, 1955, p. 48) are present, the majority of the surface deposits in the area were laid down during Tazewell and Cary time. During Tazewell time the ice advanced westward well past the center of the state, developed an end moraine, and retreated eastward a short distance. This retreat was followed by a series of re-advances and retreats, each of which in general was not as extensive as the one which preceded it. A series of roughly concentric Tazewell end moraines were thus formed, all of which were concave eastward in plan (fig. 1). The Tazewell ice finally retreated an unknown but generally believed considerable distance as that substage ended; and, with the re-advance of the ice, the Cary substage began. The Cary end moraines have an orientation somewhat different from those of the Tazewell substage, being more closely aligned with the present lake shore in this area. They form another series of essentially parallel moraines, each representing a subdivision of Cary time.

Detailed study of these deposits has resulted in the development of a terminology for the several sub-intervals of the Tazewell and Cary substages (Leverett, 1899, pp. 20–1). The last advance of Tazewell ice which left a significant moraine has been designated as Marseilles, and the resulting end moraine the Marseilles moraine. The advance of the Cary ice overran some Marseilles deposits and created the Minooka or outermost Cary moraine. Due to a difference in the direction of motion of the ice which created them the two end moraines meet nearly at right angles in the Yorkville, Illinois Quadrangle; and the following remarks pertain primarily to the deposits of that quadrangle.

MARSEILLES GLACIATION

Although the Marseilles advance was primarily south and westward in Illinois, the ice movement had a northward component in the Yorkville Quadrangle. Hence, within the quadrangle the resulting end moraine was oriented SW-NE with its proximal side facing southeast. Apparently the Marseilles advance consisted of at least two cycles. In addition to the well-defined end moraine designated as the Inner Marseilles, there is a poorly-defined end moraine to the north (fig. 2) which is also considered to have been formed by the Marseilles advance (Powers, 1931). This land-form is designated as the Outer Marseilles end moraine. Its orientation is generally parallel to the Inner Marseilles moraine, and examination of natural exposures and auger samples show the constituent materials of the two to be quite similar. The till of the Outer Marseilles moraine contrasts rather markedly with the Farm Ridge till which adjoins it on the northwest. The latter has a different color, texture, and coherence. In general the Outer Marseilles till sheet is thin, a thickness of 10 ft. being representative. There

is considerably more outwash associated with it than with the Inner Marseilles deposits. The combination of factors is suggestive of an early advance of a shallow lobe during a relatively warm climate, a stand of short duration forming the Outer Marseilles moraine, a limited retreat, and then a vigorous re-advance of Marseilles ice to form the Inner Marseilles end moraine. The relative ruggedness of its upland, its elevation above the surrounding areas—150 ft. in places—and the sharp descent of the distal slope make the Inner Marseilles one of the best examples of an end moraine in northeastern Illinois.

MINOOKA GLACIATION

The Minooka end moraine, a north-south feature (fig. 2) extending all along the east edge of the quadrangle, intersects the Inner Marseilles moraine near the center of that edge. Representing an early phase of the Cary ice advance, this

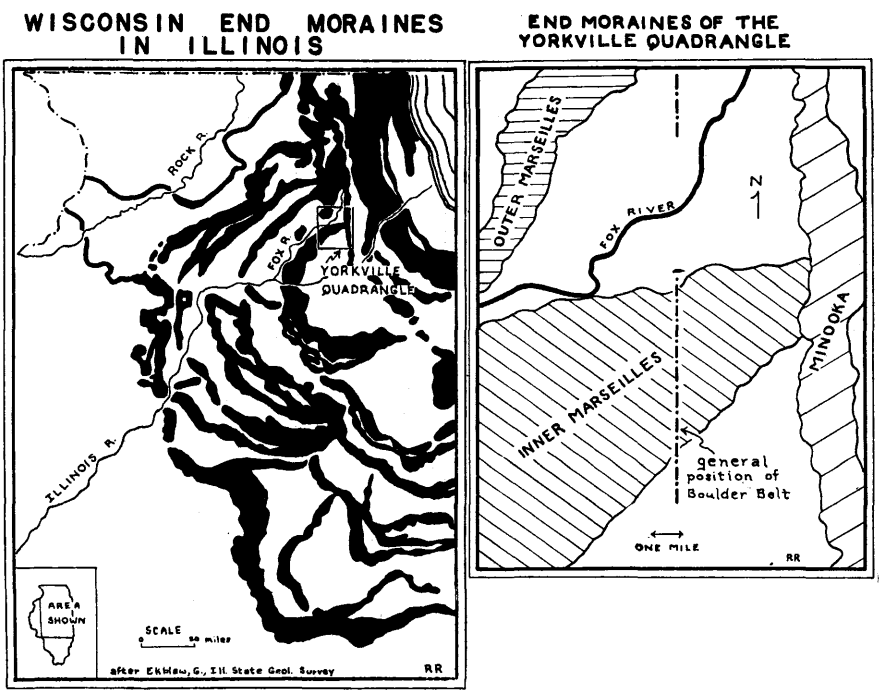

FIGURE 1 (left) and FIGURE 2. Some aspects of the glacial physiography of northeastern Illinois.

moraine differs from both the previously mentioned ones. It is a much more distinctive feature than the Outer Marseilles moraine in that it is more continuous and stands higher above its surroundings. It is less impressive than the Inner Marseilles, however, seldom rising over 60 ft. above the adjoining plain. It does not have the ruggedness of upland common to the Inner Marseilles either; indeed parts of the crest of this moraine seem exceedingly flat for a landform of this type. The relative flatness of summit of this moraine has been commented on by several writers, and over-riding of the moraine by Minooka ice or deposition beneath the ice have been suggested as explanations (Leverett, 1899, p. 327).

Actually the surface expression of most Minooka deposits is rather more subdued than that of many similar deposits, so that it must be recognized that the present surface may be typical of a Minooka end moraine.

THE BOULDER BELT

The possibility of overriding seems especially interesting, however, when two other factors are considered. The first of these is the uncharacteristically subdued crest of the Inner Marseilles moraine near its junction with the Minooka moraine. This subdued portion extends a little more than four miles west of the intersection of the two moraines. The other factor is the "boulder belt" described by Leverett (Leverett, 1899, p. 325). This feature is described as a discontinuous belt of boulders, mostly crystalline, with no till recognizably associated with it. It was oriented north-south, parallel to the Minooka moraine and about four or five miles west of it (fig. 2). Portions of this belt were found in the adjoining quadrangles both north and south of this one. Within this quadrangle it originally extended a distance of eight or nine miles, its northern end extending across the Inner Marseilles moraine. Some fifty years of farming in this agriculturally rich area have resulted in the removal and redistribution of most of the boulders. Many of them, however, are to be found collected in pastures and areas of poor drainage; and local residents can remember the boulder belt as a frequently discussed problem topic. Some of the boulders are rather large, one angular metamorphic being almost five feet long. The concept of overriding of the Minooka and Inner Marseilles moraines by Minooka ice to the position of the boulder belt may be the explanation for the several features mentioned above.

Although glacial advance is not always accompanied by end moraine formation, in general it seems to have so been in this area. The absence of a recognizable end moraine here thus raises a question.

However, the absence of a ridge of drift associated with the boulder belt is only one of several problems encountered in attempting to establish this concept. Not only is there no true end moraine; it is difficult to find a till sheet clearly associated with the boulder belt. This problem is due in part to the marked similarity in physical characteristics of Marseilles and Minooka tills. The depth of leaching in both is between 2 and 3 ft. The color of oxidized or unoxidized samples of the two tills is very similar. No appreciable difference in stoniness or lithology was found. Events subsequent to Minooka time serve to complicate the situation further. The areas of till plain west of the Minooka end moraine were flooded by large quantities of post-Minooka waters (Ekblaw and Athy, 1925, p. 417) which are likely to have eroded and/or buried most of what there was in the way of a till sheet. These waters were responsible also for the discontinuous nature of the boulder belt.

An alternate explanation of the relationships between end moraines mentioned earlier seems possible for several reasons. Just north of the point where the Marseilles moraine meets the Minooka there is a sand and gravel plain sloping westward away from the Minooka moraine. This is believed to be an outwash plain formed while the ice was halted at the position of the Minooka moraine. Parts of this plain stand above the elevations affected by the post-Minooka floodwaters. Overriding of the Minooka and Inner Marseilles moraines by Minooka ice should have left some evidence of its occurence on this plain. Also, the relative steepness of the distal slope of the Minooka moraine seems indicative of an unmodified surface rather than one which has experienced overriding.

CONCLUSION

That the Minooka ice did at one time move west of the position of the Minooka moraine seems indicated by the altered surface of the Inner Marseilles moraine,

the boulder belt, and the coincidence in location between the two. The consideration of these several factors leads to the conclusion that the sequence of events associated with the Minooka glaciation may well have been a repetition of the Marseilles glaciation. The original Minooka advance was made by a thin lobe of ice and with a somewhat warmer climate than was common to the bulk of Minooka time. The ice advanced to the position of the boulder belt, overriding and altering slightly a portion of the Inner Marseilles moraine. The boulder belt was left marking the farthest westward advance of Minooka ice, and this ice retreated rapidly by melting. The retreat of Minooka ice for a short distance was followed by a more vigorous re-advance, vigorous enough to eradicate any portion of the Inner Marseilles moraine which may have extended east of the Minooka moraine, and to create a fairly strong topographic feature in the Minooka end moraine. The relative smoothness of parts of the crest of the moraine may be either due to deposition beneath the ice, or simply a typical Minooka surface.

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