THE KANEVILLE ESKER, KANE COUNTY, ILLINOIS

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ABSTRACT. — A linear ridge consisting of sand and gravel, located in south-central Kane County, Illinois, was interpreted to be an esker as early as 1899.

Topographic configuration of the feature and associated landforms, sediments comprising the landform, alignment of these sediments, and nature and location of the associated materials support the eskerine interpretation.

A feature referred to as the Kaneville esker has been described by Leverett (1899, p. 284-286) and by Leighton, Powers, MacClintock and Workman (1931, p. 66-75). The location and the areal extent of the landform are also shown on maps accompanying publications by Block (1960, pl. 1); Suter, Bergstrom, et al. (1959, fig. 5); Fryxell (1927, pl. 1); and Hopkins, Mosier, et al. (1917, Soil Survey Map of Kane County, Northern Sheet). George E. Ekblaw of the Illinois State Geological Survey has suggested that the Kaneville esker might be a group of coalescing kames formed at the edge of an ice sheet (1962, personal communication). Another interpretation suggests that the Kaneville esker may have originated as a crevasse filling (Boardman, Odom, and Wilson, 1962, p. 9). The purpose of this paper is to describe the characteristics and mode of origin of the landform. However, the feature will be referred to occasionally as "the Kaneville esker" in order to avoid repetition of descriptive terms.

DISTRIBUTION AND FORM

The Kaneville esker is located in the southern part of Kane County about six miles west of Aurora, Illinois, in the extreme northeast part of the Bloomington Ridged Plain (Fig. 1), as defined by Leighton, Ekblaw, and Horberg (1948, p. 24). Specifically, the Kaneville esker extends from the NE ¼ of Sec. 15, T. 38 N., R. 7 E. to the SE ¼ NE ¼ Sec. 25, T. 39 N., R. 6 E. (Fig. 2). The feature displays an arcuate plan and may be divided into three topographic units referred to as the southeast section, the middle section, and the northwest section (Fig. 2).

The topographic form of the southeast section has been largely interpreted from the topographic map because the landform has been practically destroyed by removal of sand and gravel by man. This section appears to have consisted of several small, somewhat elongate hillocks that were from 20 to 50 feet higher than the valley of Blackberry Creek, which follows the trend of the landform for several miles. The crests of the hillocks had an elevation of about 690 to 700 feet above sea level at the extreme southeast end of the feature.

The middle section of the Kaneville esker consists of an elongate, irregularly crested ridge that is breached at several points. The ridge rises 40 to 70 feet above the adjacent plain, the height increasing to-

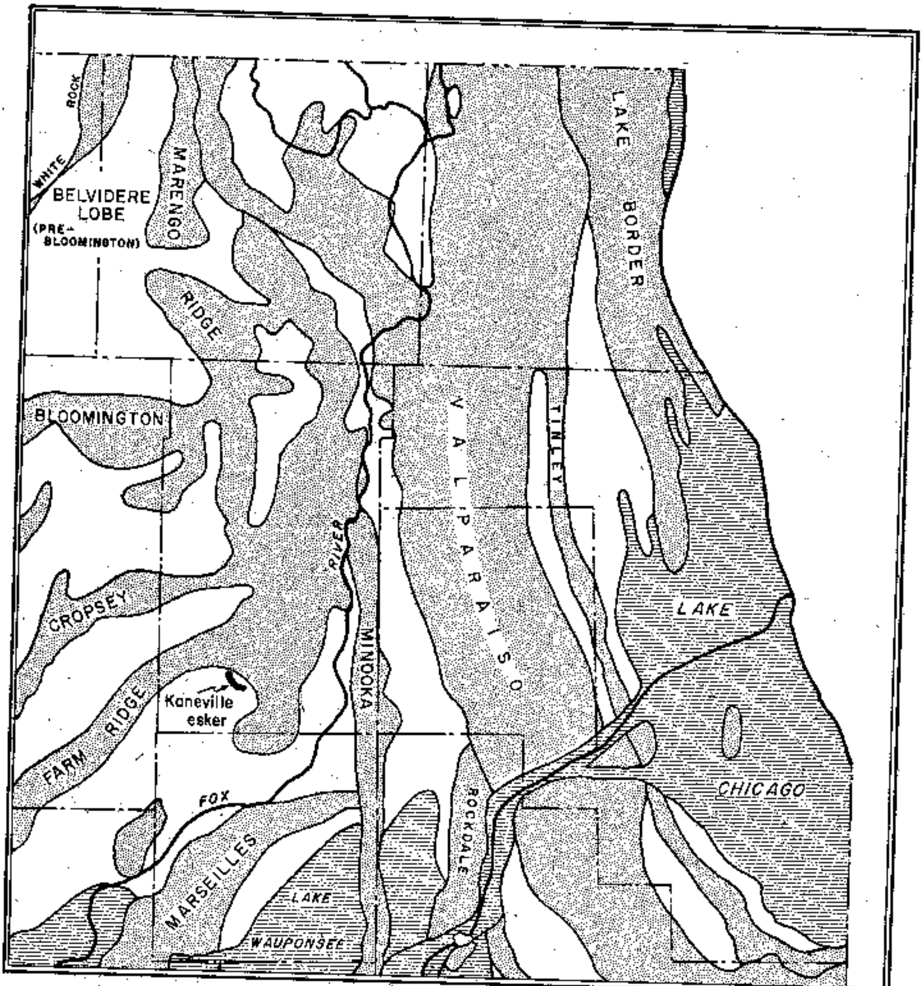

FIGURE 1. — Location of the Kaneville esker in relation to other glacial deposits in northeastern Illinois. (After Ekblaw, I.S.G.S., 1942.)

ward the northwest. The width ranges from about 400 feet to more than 600 feet, and the sides assume a maximum slope of about 25°.

The northwest section of the landform is complex and does not display the well-defined eskerine form characteristic of the middle section. This part of the feature is fan-shaped in plan and consists of a series of coalescing kame-like landforms that range from 50 to 70 feet in height.

A landform with the topographic configuration of a delta extends north and northwest from the Kaneville esker. Leverett (1899, p. 284) was the first to interpret the feature as a delta, and later Powers (Leighton, Powers et al., 1931, p. 72) agreed with Leverett's interpretation and

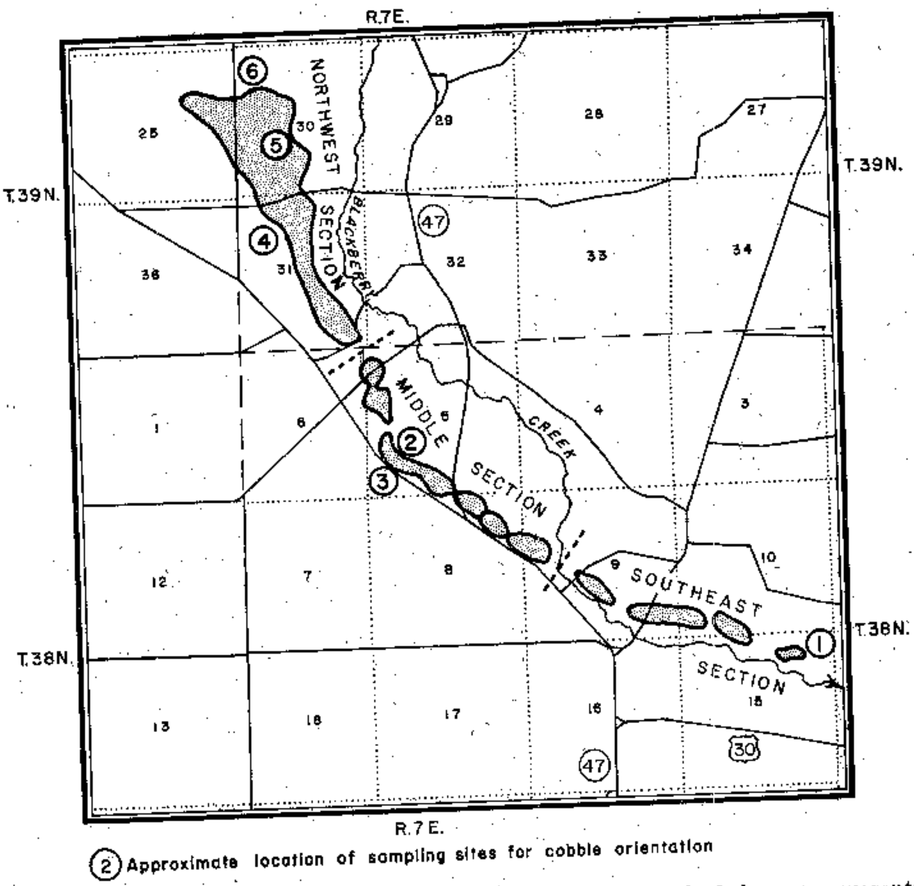

FIGURE 2. — Areal Extent of the Kaneville Esker. The shaded area represents the topographic extent of the landform.

correlated the delta with a pro-glacial lake which he called Lake Pingree. The maximum altitude of this postulated delta is approximately 810 feet. The maximum altitude of the hillocks at the extreme southeast end of the Kaneville esker is 700 feet. Thus the delta has a maximum altitude 110 feet higher than that of the hillocks which comprise the southeast part of the feature.

The linear arrangement of the landform implies lateral limitation of the area of deposition. This limitation undoubtedly resulted from the presence of glacial ice on at least one side, and possibly both sides of the deposit. If the eskerine interpretation of origin is accepted, the length and the linear pattern of the landform are satisfactorily explained. The sparsity of eskerine features in the southeast section could be accounted for by a lack of deposition especially since this area may represent the headwater of the esker stream. In addition, Powers (Leighton, Powers, et al., 1931, p. 75) expressed the belief that the southeast section was overridden by a later advance of glacial ice which could have altered any pre-existing landforms.

The middle section displays an irregular longitudinal profile and sharp crest, features that strongly suggest an eskerine origin. The northwest section appears to be closely related to the eskerine forms of the middle section but a significant topographic difference, as described previously, exists between the two sections. The northwest section may have been formed at or near the mouth of the esker stream in direct contact, at least in part, with glacial ice. This section may represent a transitional zone between the proglacial delta form to the north and west and the ice-restricted eskerine features of the middle section to the south and southeast. If this interpretation is correct, the landforms of the northwest section, although not truly eskerine in character, lend support to the proposition that the feature is actually an esker and not a group of ice-marginal kames or a crevasse filling.

Perhaps the principal objection to the eskerine interpretation is the increase in altitude between the southeast and the northwest sections of the feature. This difference in height may be explained by 1) an uphill flow of the esker stream under hydraulic pressure, 2) superimposition of englacial or superglacial stream sediments upon an uneven subglacial topography, or 3) a combination of these two possibilities.

The interpretation that the feature is ice-marginal in origin seems to have been postulated principally on the basis of 1) the arcuate plan of the landform and 2) the possibility that morainal trends to the southwest might conform to this pattern (George E. Ekblaw, 1962, personal communication). According to this interpretation, the hills which comprise parts of the landform represent frontal kames that may coalesce in places. Powers (Leighton, Powers, et al., 1931, p. 72) recognized that, on the basis of a till deposit, the southeast section was overridden by a later advance of the ice that might have altered the form of some of these kames.

The middle section of the feature is difficult to explain if the ice-marginal interpretation is accepted. The construction of ice-marginal features possessing such linear continuity and cross-sectional symmetry that are typical of this section would require conditions difficult to visualize.

The relationship between the Kaneville esker and the delta is also difficult to explain by the ice-marginal hypothesis without some explanation of the source of the meltwater and sediments that comprise the delta. Possibly the delta is not related to the Kaneville esker. However, the proximity and form of the two features seem to indicate something more than fortuitous location.

If the crevasse-filling hypothesis is accepted, the difference in altitude between the extreme ends of the landform implies a southeast flow of meltwater or superimposition onto the subglacial topography. The landforms of the southeast section offer no evidence of a southeast flow of meltwater. To the contrary, the configuration of the northwest section suggests the terminus of a meltwater stream, not a headwater area. Superimposition of crevasse sediments upon the subglacial topography might possibly explain the relationship between the delta and the landform but, if this did occur, the gradient along the present landform must be the reverse of the gradient present during the construction of the feature. The irregular crest of the landform is not in harmony with the crevasse-filling interpretation. The crests of crevasse fillings are usually smooth in longitudinal profile. In addition, the sharp-crested cross-sectional profile of the Kaneville esker presents a striking contrast to the flat crest which is commonly associated with crevasse fillings. The length of the landform, approximately five miles, is greater than that believed to be associated with most crevasse fillings (Flint, 1957, p. 15 and Thwaites, 1961, p. 52). The arcuate plan of the landform is also anomalous with the nearly straight trend which is typical of known crevasse fillings (Thwaites, 1961, p. 52). In almost every respect, the topographic configuration of the landform contradicts the crevasse-filling hypothesis.

Characteristics of the Sediments

Ice-contact deposits are characterized by complex stratification and cross-bedding, great variation and abrupt changes in grain size, and slumping of the sediments. Such characteristics are common in the sediments associated with the Kaneville esker.

The gross stratification of the sediments is more or less horizontal but near the flanks of the landform some bedding planes are approximately parallel to the sloping surface of the feature. In general, the sediments consist of lenses of coarse gravel which are interfingered with layers of sand. Cut-and-fill deposits are common, and cross-bedding, ranging from large to small scale, is present at numerous exposures. The dominant dip of the cross-beds is to the north and northwest.

Orientation of the long axes of fifty cobble-sized stones was determined at each of six locations. The results, graphically described in Figure 3, indicate that the flow of the depositional medium was generally parallel to the strike or trend of the landform.

The sediments consist primarily of materials larger than the size of fine sand (¼ mm.). Dolomite, believed to be derived principally from Niagaran rocks of Silurian age, comprises the bulk of the coarse sediments.

Till is found along both sides of the glacio-fluvial sediments and in some instances overlies the gravel along the flanks of the landform. At no outcrop did the writers find the till to extend completely over the water-deposited materials. However, Powers (Leighton, Powers, et al., 1931, p. 72) recognized a till overlying glacio-fluvial sediments in the southeast section but, as mentioned previously, associated the till with a later advance of the ice. Furthermore, the overlying till as described by Powers is distinctly different from the flanking till recognied by the writers. The flanking till is sandy, with dolomite comprising the bulk of the pebble content. Cobbles and boulders are rare. The color of the

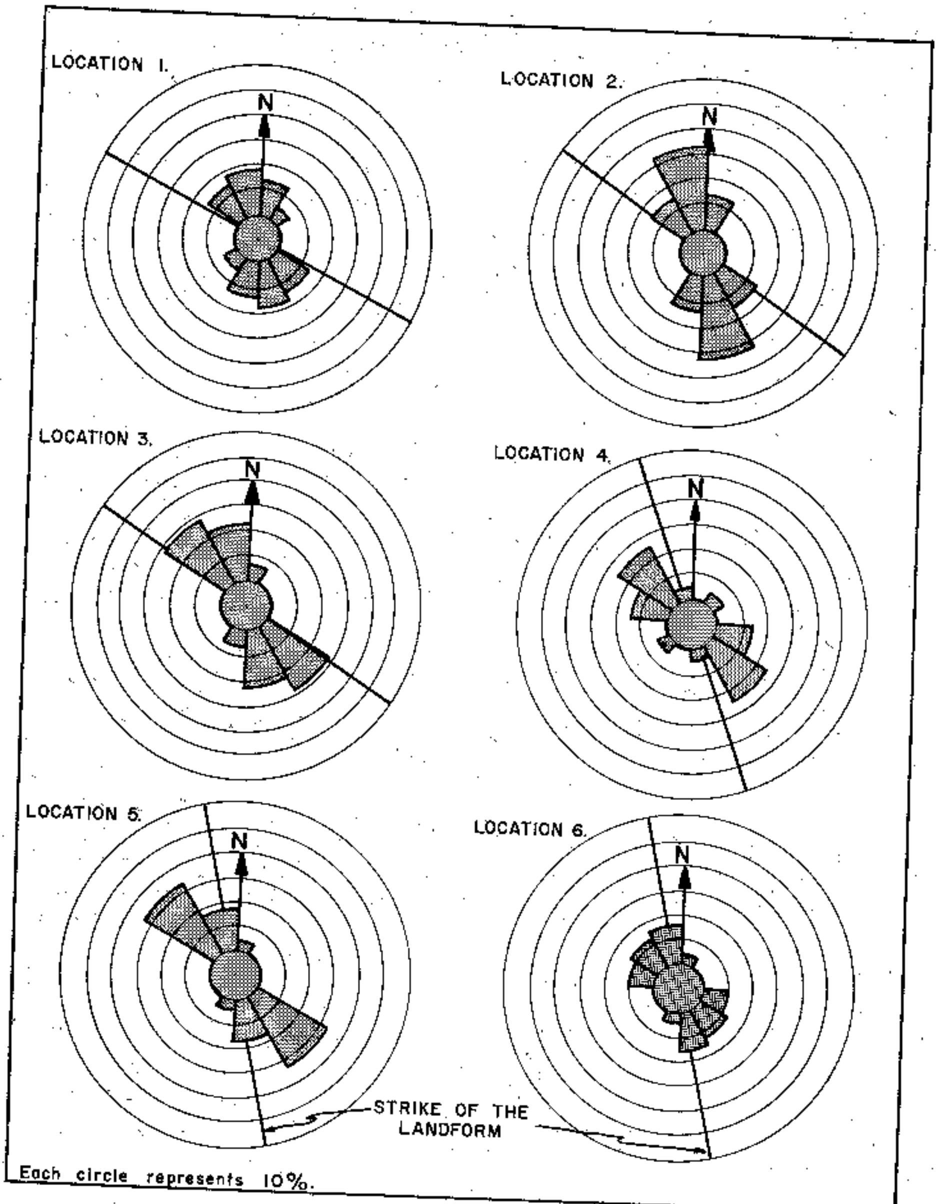

FIGURE 3.—Cobble orientation, showing the relationship of the long axis orientation to the strike of the landform.

till varies from light-brown to brown with a reddish cast. The exposed till overlying the glacio-fluvial sediments is rarely more than six feet thick. At one location along the north flank within the southeast part of the landform, the till is interrupted by a thin, nearly horizontal, discontinuous carbonaceous zone. The till above this carbonaceous layer is not obviously different from the till below, but it is possible that the carbonaceous zone separates two tills of different ages.

At several locations near the northwest end of the Kaneville esker, the stratified sands and gravels merge horizontally and vertically with slumped, laminated silts and clays that contain occasional pebbles and cobbles. The nature of these sediments obviously suggests deposition in calmer water than that in which the sand and gravel were deposited. The transitional contact between the fine sediments and the sands and gravels indicates that both may have been deposited by meltwater associated with an esker stream. The nature and location of the silts and clays might be explained by the periodic occurrence of unusual volumes of meltwater, which caused the stream to overflow its normal channel. During these periods of high water, sand and gravel could have been deposited in the main channel as bedload, and silts and clays which were carried in suspension by the stream could have been deposited on the uneven surface of the adjacent ice. Under these conditions a transitional zone may have been present between the coarse and fine sediments. The occasional coarse particles in the fine sediments might have melted out from blocks of floating ice. A decrease in the volume of water would have left the clays and silts resting, at least in part, on the flanking ice. Subsequent melting of the supporting glacial ice would have permitted the fine sediments to be superimposed directly on the underlying glacial drift. This interpretation can account for both the contorted laminations of the silts and clays and for the gradational contact between the coarse and fine sediments that exist within this part of the feature.

The carbonaceous material that exists within the silts and clays probably represents organic matter present in the general depositional environment. The character and concentration of the carbonaceous matter in such a small area make it doubtful that the material represents a pre-existing organic deposit that was reworked by ice and then redeposited by meltwater. In the opinion of the writers, some form of vegetation probably existed within the glacial environment at the time the feature was being formed.

Summary and Conclusion

The eskerine theory most plausibly explains the origin of the Kaneville esker. The topographic configuration of the landform presents the most convincing evidence for the acceptance of this interpretation. The linear pattern and irregular crest are typical of eskerine forms. Furthermore, this interpretation is supported by certain sediment characteristics, including the alignment of sedimentary particles generally parallel to the trend of the landform and the northwesterly dip of the crossbedding. The till overlying both flanks of the feature suggests that glacial ice existed along both sides of the landform during its formation. The location and the altitude of the delta are most easily explained by the presence of an esker stream flowing to the northwest. Thus, on the basis of the evidence presented, this landform merits its designation as an esker.

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