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Numerous low mounds of irregular shape in the vicinity of Grand Mound and De Witt, Iowa, are glacial features coming under the category of kames. Twenty-two kames have been identified within an oblong area about two or three miles wide and 12 miles long, lying immediately south of the Chicago, Northwestern railroad and U. S. Highway 30 (see Figure 1). The area extends eastward from about two miles east of the town of Calamus, passing south of the town of Grand Mound and continuing two miles southeast of the city of De Witt. Parts of the kame field lie in Olive, Orange and De Witt townships, Clinton county.

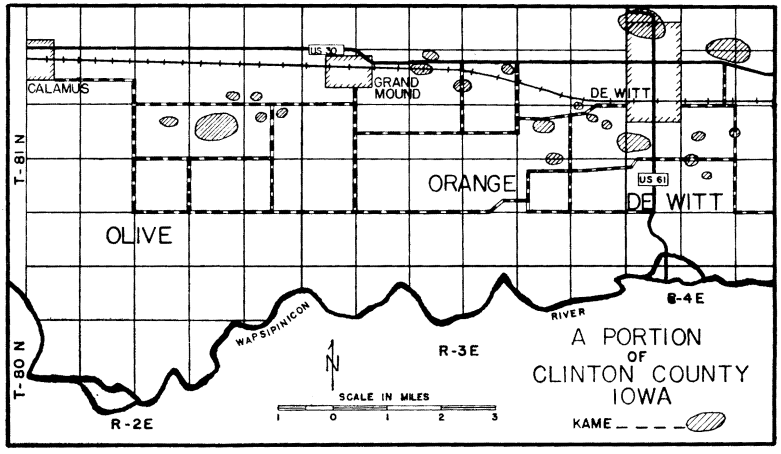

Figure 1. Location of the Grand Mound De Witt kame field.

In addition to the 22 recognizable kames, the topographic swell under the town of Grand Mound is probably another kame. The two high, steep-sided hills along the north and northeast edge of the city of De Witt, which are mantled with a thick loess cover, are probably pahas, rather than kames, (Scholtes 1951). Most of the hills rise about 20 to 30 feet above the Iowan till plain and range in size from 200 feet to nearly a mile in diameter. The largest kames are sites of gravel pits, one in Sec. 23, T8N, R2E,

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about two miles southwest of Grand Mound, and the other an abandoned pit (used formerly by the Milwaukee railroad), located ¾ of a mile south of the city of De Witt on Iowa Highway 61 (see Figure 1).

The best exposed example of the interior of one of these kames was in the big gravel pit west of Grand Mound in Sec. 23. Their internal structure, wherever it was visible, was essentially the same throughout the group; i.e., alternating beds of sand and gravel arranged in typical cross-bedded attitudes. Much of this material was poorly sorted and indistinctly bedded. Occasional patches of oxidized and leached till are mixed in with the gravel.

Table 1

Composition of kame gravel based on pebble counts at three locations, expressed in per cent

Type of rock	West of Grand Mound	East of Grand Mound	De Witt
granite	10	9	12
basic ingneous rocks	8	22	22
quartzite	1	2	7
conglomerate & sandstones	1	0	1
chert	6	7	4
limestone & dolomite	73	59	53
	99	99	99

Table 1 gives the approximate percentage composition of the gravel from three kames, the percentage compositions in columns 2 and 3, having been recalculated from Udden (1904, p. 421). The high proportion of carbonate pebbles indicates a local source for the gravel. Since the kame gravel presumably was derived from ablation debris on the surface of wasting Iowan ice, these percentages suggest that this drift has a more or less local origin. The granite pebbles are the far travelers of the deposit and are similar in composition to the large and abundant granite erratics typical of Iowan drift throughout all of eastern Iowa. Some zones of the gravel are intensely iron-stained and in the deeper zones pebbles are heavily coated with calcium carbonate.

Udden (1904, p. 420-421) described two of these features—the Milwaukee pit mentioned about and a pit in the northwest quarter of Sec. 16 just east of Grand Mound—as follows: ". . . The ridges are no doubt to be regarded as eskers or kame deposits built up by glacial streams." However, none of these features have the requisite serpentine steep-sided ridge form of a typical esker and should, therefore, be classified as kames.

Kames are defined by Flint (1947, p. 147) as ". . . low, steep-sided hills with a knoll-like, short ridge-like or mesa-like form and consisting of ice-contact stratified drift." As described by Flint and

by Jahns and Willard (1942), kames are formed by the accumulation of debris swept off the surface of the ice into holes by superglacial meltwater. The stratified drift is held in place by the low ice walls and the shape and size of the kame is controlled by the dimensions of the gap in the ice. The approximate ice thickness at the time of formation of the kame will be about the same as the height of the kame. As the glacier wastes away, the meltwater streams will be lowered; and if aggradation continues, it does so at lower elevations.

The kames in the Grand Mound-De Witt field are located within the margin of a long narrow lobe of Iowa ice, sometimes called the Clinton lobe (see Udden, 1904, p. 416; Alden and Leighton, 1915, p. 179; Schaffer, 1954, p. 446; Kay, 1943, p. 100.). Typical features associated with Iowan drift, such as youthful topography, numerous large erratics, a pebble band near the top of the till and an average depth of leaching of about three to five feet indicate that this area was covered by Iowan ice. Alden and Leighton express doubt of the existence of such a long narrow tongue of Iowan ice but earlier and subsequent workers accept as valid this Iowan lobe. Udden (1904, p. 421) comments on the age of these gravels as follows: ". . . The overlying sandy material is, of course, Iowan and though there is an unconformity between this and the underlying beds, both may very well be derived from the same drift. The ridges are no doubt to be regarded as eskers or kame deposits built up by glacial streams. Were these streams on the Iowan ice or on the Illinoian? This question must be left undecided. Their intimate association with the Iowan drift and their general relation with the Iowan topography render presumptive their identity with this drift." No suggestion of the unconformity mentioned by Udden was seen in any of the numerous gravel pits examined. The similarity of the composition of the kame gravel to typical Iowan drift strongly suggests that the kames are Iowan in age.

The presence of this group of features indicates that the Iowan glacier ceased its forward movement and remained stagnant while the kame gravels were accumulated. Since these gravels appear undistrubed by ice push, the Iowa glacier in this area probably melted completely away by downwastage as a stagnant ice mass. Because of the very narrow Iowan lobe stretching from Linn county across Clinton county, stagnation would be more likely to occur here than elsewhere. The lack of distinct end moraines associated with the Iowan glacier indirectly suggests melting by downwastage. The kame field described above substantiates this conclusion, at least in terms of the Clinton lobe of the Iowan.

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