PLEISTOCENE AND RECENT HISTORY OF ALEXIS QUADRANGLE AND VICINITY.[1]

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Introduction.

This paper summarizes the results of Pleistocene studies made in connection with the geologic mapping of the Alexis quadrangle, Mercer and Warren counties, Illinois, for the Illinois State Geological Survey, and discusses a significant Pleistocene section in the Milan quadrangle, which has been described by Savage and Udden.[2] The section is redescribed here, because it shows two gumbotils, and the original description preceded the introduction of the term gumbotil into Pleistocene literature. The writer wishes to acknowledge the assistance given by Dr. M. M. Leighton, who visited these sections with him, and made many helpful suggestions in interpreting them.

The Pleistocene deposits exposed in the Alexis area belong to the Kansan and Illinoian glacial stages and the Yarmouth, Sangamon, and Peorian interglacial stages.

Kansan Glacial Stage.

The oldest known Pleistocene deposit in the Alexis quadrangle is till of the Kansan glacial stage. Where exposed, it is usually a black or dark blue gray, highly carbonaceous and calcareous till. It contains more large boulders than the overlying Illinoian till. One granite boulder 8 feet in diameter was found in the Kansan till of the Alexis guadrangle. The drift is believed to belong to the Keewatin center of glaciation, as no jasper conglomerate or other rocks characteristic of the Labrador center have been discovered in it. The direction of ice advance was from the west or northwest.

Yarmouth Interglacial Stage.

The Yarmouth interglacial stage is represented by soil and gumbotil formed from the Kansan till where it was

[1]Published by the courtesy of the Chief, Illinois State Geological Survey.

[2]Savage, T. E., and Udden, J. A., Geology and mineral resources of the Edgington and Milan quadrangles: Illinois State Geological Survey, Bull. 38, pp. 164-165, 1922.

exposed to weathering on poorly drained upland surfaces. This gumbotil is ashy gray in color. A freshly broken chunk shows a pitted surface. This gumbotil is best developed in an exposure in the Milan quadrangle, 1½ miles northwest of Cable, in a number of gullies on the north side of a creek valley.[3]

Pleistocene section measured from outcrops and augur borings, ¼ mile east of the middle of the west line of sec. 8, T. 15 N., R. 1 W.

	Thickness		Depth	
	Ft.	In.	Ft.	In.
12. Loess, Grassy slope at top, not gullied (Peorian)	11	0	11	0
11. Loess, calcareous (Peorian)	7	6	18	6
10. Gumbotil, grayish brown (Illinoian)	1	6	20	0
9. Till, calcareous, brownish above, blue gray below (Illinoian)	16	6	36	6
8. Sand, containing some pebbles with diameters as large as ¼ inch, grading to fine sand without pebbles at base	2	10	39	4
7. Silt, sandy, light gray, grading to fine sand near base, calcareous	1	8	41	0
6. Sand and silt, white, noncalcareous		6	41	6
5. Silt, white, calcareous		6	42	0
4. Sand, brownish, noncalcareous		3	42	3
3. Soil, black, noncalcareous (Yarmouth)	1	9	44	0
2. Gumbotil, gray, with minute quartz and chert pebbles (Kansan)	2	6	46	6
1. Till, dark blue gray, strongly calcareous (Kansan), Reported 30 feet by Savage and Udden	4 exposed		50	6

Kansan gumbotil is also exposed at two or three localities in the Alexis quadrangle below the Illinoian till, but the relations are not so clear as they are in the section described above.

Another type of Yarmouth sediment occurs in the southern part of the Alexis quadrangle. In a number of recently cut gullies on the south side of Henderson Creek, a thick bed of reddish cross-bedded sand overlies the Kansan drift and underlies the Illinoian drift. The most typical section of these beds is described on page 256.

The reddish color and noncalcareous character of the sand (No. 3 of table on page 256) suggest that it was exposed to weathering with frequent wetting and drying for a long time before the Illinoian till covered it. It may have been an outwash deposit from the receding Kansan ice-sheet. Many farm wells obtain water from sands and gravels below the Illinoian till. Stumps and logs are reported in farm well drillings at depths of 30 to 40 feet.

[3]Savage, T. E., and Udden, J. A., *op. cit.*, p. 167.

Pleistocene section in a gully on the south side of Henderson Creek, about 700 feet southwest of the NE. cor. sec. 10, T. 12 N., R. 3 W.

	Thickness		Depth	
	Ft.	In.	Ft.	In.
11. Soil (Recent)	1	9	1	9
10. Loess, brown to buff, leached (Peorian)	10	6	12	3
9. Loess, gray to buff, calcareous (Peorian)	8	9	21	0
8. Silt, sandy, brown to chocolate colored, noncalcareous, with humus and carbonized plant traces (Late Sangamon)	2	9	23	9
7. Gumbotil, brownish, with pitted surfaces, and a few chert pebbles (Illinoian)	1	10	25	7
6. Till, rusty colored, very sandy, reacting slightly with acid (Illinoian)	15	0	40	7
5. Boulder concentrate at base of till (Illinoian)	1	0	41	7
4. Silt, sandy, light yellow, cross-bedded, noncalcareous (Illinoian or Yarmouth)	1	0	42	7
3. Sand, reddish, cross-bedded, irregularly color banded (Yarmouth)	18	0	60	7
2. Till, light blue gray, leached, (not typical gumbotil) with slight gravel concentrate at surface (Kansan)	4	6	65	1
1. Till, black or dark blue gray, highly calcareous, weathering whitish, as a result of efflorescence of calcium salts (Kansan)	20 exposed		85	1

It is believed that the Yarmouth sands and soils and the Kansan gumbotil are much more extensive in this region than their exposures indicate. The amount of dissection during Yarmouth time is not clearly indicated, but it is believed that the larger stream valleys were developed then.

Illinoian Glacial Stage.

Outwash deposits from the advancing Illinoian ice-sheet seem to be shown in the calcareous silts, sands, and pebble beds (Nos. 5-8 in the section near Cable, in the Milan quadrangle, described above). Illinoian till covered the entire area of the Alexis quadrangle. Proof that this till belongs to the Labrador center of glaciation is found in occasional pebbles of jasper conglomerate which are probably from the Lorraine quartzite, northeast of Lake Huron. Many large blocks of coralline limestone containing colonies of *Chaetetes milleporaceus* are prsent in the till at two localities. This limestone is believed to be the Lonsdale limestone (Pennsylvanian) which is exposed near Illinois River from Peoria north to La Salle. Fragments of Burlington limestone and chert are found in the Illinoian till in the southern part of the quadrangle. The direction of movement of the Illinoian glacier, as determined from these constituents, must have been from the

east or southeast. Thus the direction of Illinoian ice invasion was directly opposite from that of the Kansan invasion.

The Illinoian till is blue gray where unweathered. It is less calcareous and carbonaceous than the Kansan till, although perhaps only locally. It is not certain to what extent the valleys, which were excavated in Yarmouth time, were filled with Illinoian till. It appears that the larger valleys were only partly filled with till, because the depth and width of valleys in which Sangamon deposits accumulated seem too large to be the result of Sangamon erosion.

Sangamon Interglacial Stage.

Following the recession of the Illinoian glacier a gumbotil was formed from the Illinoian till on flat or poorly drained upland surfaces, which is similar to the gumbotil on the Kansan till. Above the Illinoian gumbotil there is usually a layer of loess or loess-like silt which, in the Alexis quadrangle, is not known to exceed three feet in thickness. It is noncalcareous, and in many places contains small carbonized traces of plant material. It is probably a late Sangamon deposit, equivalent in age to the Sangamon loess described by Leighton.[4] It is not thick enough in the Alexis quadrangle to show a calcareous zone. A black soil in many places overlies the Sangamon loess-like silt or the Illinoian gumbotil.

The amount of erosion which was accomplished during Sangamon time was sufficient to strip all Illinoian till from the surface in some places. In a gully exposure near the northwest cor. SE. ¼ NE. ¼ sec. 12, T. 12 N., R. 3 W., the late Sangamon loess-like silt rests on the Illinoian till, and a few feet away on the Yarmouth reddish sands. In a cut bank along the edge of a low terrace along the south side of Pope Creek the section described on page 258 is exposed:

No. 1 of this section is believed to be Sangamon, overlaid by Peorian loess. The position of this old soil at the present water level shows that no actual deepening of the valley of this stream has taken place since Sangamon

[4] Leighton, M. M., The Farm Creek exposure near Peoria, Illinois—a type Pleistocene section: Illinois State Acad. Sci. Trans., vol. 18, pp. 402-404, 1925.

time. Other terrace remnants of similar form are common along the larger streams, and the loess has been found to form the terrace material in one other place. This shows that the levels of the larger streams of the area in late Sangamon time were generally as low as they are at present.

Pleistocene section of a cut bank on the south side of Pope Creek in the NW. ¼ sec. 4, T. 13 N., R. 3 W.

	Thickness		Depth	
	Ft.	In.	Ft.	In.
6. Loess or loess-like silt, yellowish, soft	2	0	2	0
5. Loess or clay, yellowish brown, non-calcareous	3	0	5	0
4. Clay, slightly sandy, becoming more sandy toward base	3	6	8	6
3. Sand, brownish at top, yellowish at base, well stratified	3	6	12	0
2. Loess, blue gray, highly calcareous (Peorian)	4	0	16	0
1. Soil, black, with no pebbles, to level of Pope Creek (Sangamon)	3	0	19	0

Iowan Glacial and Peorian Interglacial Stages.

No deposits of Iowan age are known in this region unless the main loess deposition started here in late Iowan time. If the thin Sangamon loess was calcareous when deposited, it seems to have been completely leached before the deposition of the overlying calcareous Peorian loess. If the Sangamon loess formerly covered the entire surface it was eroded from many of the slopes before the Peorian loess was deposited.

Loess of late Iowan or Peorian age covered the uplands, slopes, and valley plains of the main streams and their larger tributaries. It rests on the Sangamon loess, on the eroded surface of the Illinoian till, on Yarmouth sands, and on the Pennsylvanian and Mississippian strata which form the bed rock of this area. The loess varies from 6 feet or less to 20 feet in thickness. Where it is thicker than 8 feet there is an upper, buff colored, noncalcareous zone and a lower gray calcareous zone. Fossils of air-breathing gastropods were collected in the calcareous zone of the loess at three localities. The section of a terrace along Pope Creek described above shows stratified sands and clays 7 feet in thickness between calcareous loess below and noncalcareous loess or loess-like silt above. This suggests that the valley was flooded during the time of loess deposition and an alternation of fluviatile and eolian deposits resulted.

Wisconsin Glacial Stage and Recent Time.

No deposits which can be definitely ascribed to the Wisconsin glacial stage are present in this area. As loess deposits are found on the Bloomington moraine of the Wisconsin glacier in the vicinity of Peoria and elsewhere, a part of the loess of the Alexis area may be post-Wisconsin in age.

The larger streams meander in a series of small curves which are mainly restricted to the valley plain. Actively eroded cut banks are few along the larger streams. The valley plains show a series of large meander curves not related to the present meandering of the streams. This is believed to represent a period of active valley widening on the part of these streams before the Peorian loess deposition overloaded the valleys with debris. The fact that considerable remnants of these loess-covered terraces are still preserved along four of the five large streams of the area shows that these streams have not renewed active valley widening since the deposition of the Peorian loess.

The smaller streams in areas of cleared forest or cultivated slopes have trenched below their alluvial plains, which are preserved as terraces. The greatest amount of trenching is seen in those streams which have cut into the soft Yarmouth sands. This renewed erosion is probably the result of deforestation by man and cultivation of some of the steeper slopes.

Summary.

The Pleistocene and recent events in the Alexis region may be summarized as follows:

1. Kansan. Deposition of black, carbonaceous, very calcareous, bouldery till, probably from the Keewatin center.

2. Yarmouth. A very long interglacial epoch; development of a gray gumbotil from the till on poorly drained upland surfaces; formation of a black humus soil; deposition and oxidation of sands and silts; erosion of present main valleys nearly to their present size and depth.

3. Illinoian. Deposition of calcareous sands and silts in advance of the Illinoian glacier; deposition of blue cal-

careous stony till from the Labrador center, the direction of ice movement locally being from the east or southeast; partial filling of Yarmouth valleys with till.

4. Sangamon. Formation of brownish gray gumbotil and black soil on poorly drained surfaces; deepening of valleys of major streams at least to present depth; deposition of loess or loess-like silt in late Sangamon; beginning of leaching of this loess.

5. Iowan. Minor amount of leaching and some erosion on steeper slopes.

6. Peorian. Deposition of loess on uplands, slopes, and valley plains.

7. Wisconsin and recent. Leaching of part of Peorian loess; erosion of loess from smaller valleys and partial erosion from larger valleys, the remnants of Peorian valley plains forming terraces; recent renewal of erosion in smaller valleys, resulting from deforestation and cultivation of steeper slopes.